

ภาคผนวกที่ 4

เอกสารสอบเทียบความถูกต้องของเครื่องมือ

**ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง
และเครื่องมือตรวจวิเคราะห์คุณภาพสิ่งแวดล้อม**

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
1. คุณภาพอากาศจากปล่อง		
Styrene	Personal Pump SKC No. B26, B77, R02, R10, R12, R19, R22, R28, R29, R31, R38, R42, R45 Rotameter No. L-R02, R03	GC/FID
Acrylonitrile	Personal Pump SKC No. B26, B77, R01, R02, R10, R12, R28, R29, R31, R33, R37, R43, R45 Rotameter No. L-R02, R03	GC/FID
Sulfur Dioxide	Personal Pump SKC No. B61, B78, R02, R10, R12, R13, R19, R22, R29, R31, R38, R40, R43, R44, R45 Rotameter No. H-R02, R03	-
Oxides of Nitrogen	Vacuum Gauge	Spectrophotometer
2. คุณภาพอากาศในบรรยากาศ		
1,3-Butadiene	Mass Flow Meter	GC/MS
Acrylonitrile	Mass Flow Meter	GC/MS
Styrene	Mass Flow Meter	GC/MS
Nitrogen Dioxide	Serial No. 769, 4466, 243, CM13090047	Serial No. 769, 4466, 243, CM13090047
Sulfur Dioxide	Serial No. 3431, 3489, 066, 1310957747	Serial No. 3431, 3489, 066, 1310957747
3. คุณภาพน้ำ		
Temperature	-	Thermometer
pH	-	pH Meter
Total Suspended Solids	-	Digital Balance
Total Dissolved Solid	-	Digital Balance
BOD ₅	-	BOD Analyzer
COD	-	COD Reactor
Grease & Oil	-	Digital Balance
Cyanide	-	Spectrophotometer
1,3-Butadiene	-	GC/MS
Styrene	-	GC/MS
Acrylonitrile	-	GC/MS
Total Coliform Bacteria	-	Incubator/Water Bath
Nitrate-Nitrogen	-	Spectrophotometer

ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง
และเครื่องมือตรวจวิเคราะห์คุณภาพสิ่งแวดล้อม (ต่อ)

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
4. ระดับเสียงในบริเวณชุมชน L_{eq} 24 hr และ L_{90}	Acoustic Calibrator Sound Level Meter No. ACO-R15 Sound Level Meter No. CR-B02, B03	-
5. ระดับเสียงในพื้นที่โรงงาน L_{eq} 8 hr และ L_{max}	Acoustic Calibrator Sound Level Meter No. ACO-B18, B29, R41, R50, R51, R52	-
6. คุณภาพอากาศในสถานประกอบการ Styrene	Personal Pump No. R01, R09, R10, R16, R18, R20, R34, R44 Rotameter No. L-R01	GC/FID
Acrylonitrile	Personal Pump No. R09, R13, R16, R18, R20, R34, R44, Rotameter No. L-R01	GC/FID
1,3-Butadiene	Personal Pump No. R03, R04, R29 Rotameter No. L-R01	GC/MS

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

Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Environmental Conditions

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

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (ml/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R ²
B01	SKC	224-PCXR4	262101	05/01/2026	1,000	1,500	2,000	1,004	1,501	2,003	1.010x - 18.941	0.999
B02	SKC	224-PCXR4	626166	05/01/2026	1,000	1,500	2,000	1,000	1,500	2,002	1.012x - 23.432	0.999
B03	SKC	224-PCXR4	612968	05/01/2026	1,000	1,500	2,000	993	1,503	2,001	1.008x - 15.587	1.000
B04	SKC	224-PCXR4	602804	06/01/2026	1,000	1,500	2,000	1,001	1,498	1,996	0.997x + 2.672	1.000
B05	SKC	224-PCXR4	612693	07/01/2026	1,000	1,500	2,000	999	1,494	1,993	0.995x + 1.555	1.000
B06	SKC	224-PCXR4	262188	06/01/2026	1,000	1,500	2,000	1,002	1,501	2,004	1.007x - 12.528	1.000
B07	SKC	224-PCXR4	626262	06/01/2026	1,000	1,500	2,000	1,003	1,501	2,002	1.010x - 19.021	0.999
B08	SKC	224-PCXR4	626100	06/01/2026	1,000	1,500	2,000	1,005	1,500	2,006	1.006x - 8.619	1.000
B09	SKC	224-PCXR4	626479	05/01/2026	1,000	1,500	2,000	1,001	1,500	2,000	1.007x - 14.458	1.000
B10	SKC	224-PCXR4	091950	05/01/2026	1,000	1,500	2,000	998	1,503	2,000	1.001x - 5.945	1.000
B11	SKC	224-PCXR8	564315	05/01/2026	1,000	1,500	2,000	993	1,494	1,993	1.010x - 25.765	0.999
B12	SKC	224-PCXR4	034656	05/01/2026	1,000	1,500	2,000	995	1,497	1,998	0.996x - 4.790	0.999
B13	SKC	224-PCXR4	602073	05/01/2026	1,000	1,500	2,000	994	1,499	1,975	0.990x + 6.525	0.999
B14	SKC	224-PCXR4	626313	05/01/2026	1,000	1,500	2,000	993	1,499	1,994	1.001x - 7.291	1.000
B15	SKC	224-PCXR4	626474	05/01/2026	1,000	1,500	2,000	992	1,505	2,002	1.012x - 23.464	1.000
B16	SKC	224-PCXR4	626477	06/01/2026	1,000	1,500	2,000	993	1,496	1,991	0.996x + 0.945	1.000
B17	SKC	224-PCXR4	626860	06/01/2026	1,000	1,500	2,000	1,000	1,500	2,001	1.007x - 14.414	1.000
B18	SKC	224-PCXR4	691484	05/01/2026	1,000	1,500	2,000	994	1,502	2,002	1.015x - 30.763	0.999
B19	SKC	224-PCXR4	691599	05/01/2026	1,000	1,500	2,000	993	1,490	1,999	1.006x - 14.713	1.000
B20	SKC	224-PCXR4	691587	05/01/2026	1,000	1,500	2,000	991	1,500	1,997	1.005x - 13.565	1.000
B21	SKC	224-PCXR4	691531	05/01/2026	1,000	1,500	2,000	1,002	1,500	2,000	1.002x - 6.050	1.000
B22	SKC	224-PCXR4	691654	05/01/2026	1,000	1,500	2,000	1,008	1,498	1,995	1.000x - 6.158	0.999
B23	SKC	224-PCXR4	798393	06/01/2026	1,000	1,500	2,000	992	1,498	1,972	0.990x + 3.813	0.999
B24	SKC	224-PCXR4	626363	06/01/2026	1,000	1,500	2,000	1,003	1,493	2,002	1.001x - 5.201	1.000
B25	SKC	224-PCXR4	798489	06/01/2026	1,000	1,500	2,000	993	1,496	1,995	1.003x - 10.857	1.000
B26	SKC	224-PCXR4	798479	06/01/2026	1,000	1,500	2,000	994	1,505	2,002	1.012x - 23.253	1.000
B27	SKC	224-PCXR4	691673	06/01/2026	1,000	1,500	2,000	996	1,506	1,989	0.994x + 5.799	1.000
B28	SKC	224-PCXR4	691570	06/01/2026	1,000	1,500	2,000	995	1,502	1,998	0.999x - 5.193	1.000
B29	SKC	224-PCXR4	626472	05/01/2026	1,000	1,500	2,000	995	1,491	1,993	0.999x - 4.662	1.000
B30	SKC	224-PCXR4	691489	05/01/2026	1,000	1,500	2,000	1,003	1,500	1,998	1.002x - 6.804	1.000
B31	SKC	224-PCXR4	691509	05/01/2026	1,000	1,500	2,000	993	1,500	1,997	0.992x + 4.256	1.000
B32	SKC	224-PCXR4	091567	05/01/2026	1,000	1,500	2,000	994	1,487	1,972	0.990x - 2.389	0.999
B33	SKC	224-PCXR4	091756	05/01/2026	1,000	1,500	2,000	993	1,496	1,998	1.013x - 28.816	0.999
B34	SKC	224-PCXR4	612962	05/01/2026	1,000	1,500	2,000	994	1,502	2,003	1.011x - 21.717	1.000
B35	SKC	224-PCXR4	602682	06/01/2026	1,000	1,500	2,000	998	1,493	2,000	1.001x - 2.561	1.000
B36	SKC	224-PCXR4	626164	06/01/2026	1,000	1,500	2,000	993	1,497	1,994	1.003x - 8.755	1.000
B37	SKC	224-PCXR4	626256	06/01/2026	1,000	1,500	2,000	993	1,508	2,007	1.009x - 10.996	1.000
B38	SKC	224-PCXR4	626167	06/01/2026	1,000	1,500	2,000	993	1,502	2,000	1.013x - 28.162	0.999
B39	SKC	224-PCXR4	034637	06/01/2026	1,000	1,500	2,000	1,000	1,497	1,993	0.991x + 9.544	1.000
B40	SKC	224-PCXR4	798349	06/01/2026	1,000	1,500	2,000	1,000	1,499	1,994	0.998x - 0.160	1.000

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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Personal Pump Calibration Report

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Model : Defender 510-H

S/N : 136164

Environmental Conditions

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

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (mL/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R ²
B41	SKC	224-PCXR4	612669	05/01/2026	1,000	1,500	2,000	995	1,490	1,997	1.004x - 11.846	1.000
B42	SKC	224-PCXR4	626041	05/01/2026	1,000	1,500	2,000	996	1,510	1,999	0.999x - 0.630	1.000
B43	SKC	224-PCXR4	034636	05/01/2026	1,000	1,500	2,000	1,000	1,493	2,004	1.004x - 6.760	1.000
B44	SKC	224-PCXR8	529341	05/01/2026	1,000	1,500	2,000	995	1,512	1,995	1.000x - 4.571	0.999
B45	SKC	224-PCXR8	529594	05/01/2026	1,000	1,500	2,000	997	1,503	2,001	1.004x - 10.178	1.000
B46	SKC	224-PCXR8	566743	05/01/2026	1,000	1,500	2,000	997	1,491	2,007	1.013x - 21.797	1.000
B47	SKC	224-PCXR8	566747	06/01/2026	1,000	1,500	2,000	995	1,508	1,999	1.007x - 15.240	0.999
B48	SKC	224-PCXR8	566753	06/01/2026	1,000	1,500	2,000	998	1,493	1,992	0.997x - 0.746	1.000
B49	SKC	224-PCXR8	566780	06/01/2026	1,000	1,500	2,000	994	1,475	1,991	1.002x - 18.905	0.999
B50	SKC	224-PCXR8	500400	06/01/2026	1,000	1,500	2,000	990	1,498	1,992	0.991x + 4.770	0.999
B51	SKC	224-PCXR8	500363	06/01/2026	1,000	1,500	2,000	995	1,498	1,994	1.008x - 21.051	0.999
B52	SKC	224-PCXR8	093186	06/01/2026	1,000	1,500	2,000	1,001	1,494	1,995	0.993x + 6.362	1.000
B53	SKC	224-PCXR8	707670	06/01/2026	1,000	1,500	2,000	992	1,502	2,007	1.016x - 28.087	1.000
B54	SKC	224-PCXR3	509821	06/01/2026	1,000	1,500	2,000	1,000	1,497	2,002	1.009x - 18.056	1.000
B55	SKC	224-PCXR3	510710	05/01/2026	1,000	1,500	2,000	999	1,497	2,001	1.008x - 15.994	1.000
B56	SKC	224-PCXR3	511450	05/01/2026	1,000	1,500	2,000	996	1,510	2,001	1.005x - 11.080	0.999
B57	SKC	224-PCXR3	510798	05/01/2026	1,000	1,500	2,000	1,000	1,493	2,001	1.000x - 1.575	1.000
B58	SKC	224-PCXR3	509852	05/01/2026	1,000	1,500	2,000	997	1,473	1,995	1.000x - 11.132	0.999
B59	SKC	224-PCXR3	509862	05/01/2026	1,000	1,500	2,000	961	1,461	1,969	1.021x - 71.317	0.999
B60	SKC	224-PCXR3	512655	06/01/2026	1,000	1,500	2,000	971	1,469	2,001	1.027x - 56.285	0.999
B61	SKC	224-PCXR3	503915	06/01/2026	1,000	1,500	2,000	1,000	1,476	2,001	1.006x - 16.496	0.999
B62	SKC	224-PCXR3	505975	06/01/2026	1,000	1,500	2,000	997	1,503	2,001	1.004x - 10.186	1.000
B63	SKC	224-PCXR3	511432	06/01/2026	1,000	1,500	2,000	1,000	1,496	1,994	0.996x - 0.574	1.000
B64	SKC	224-PCXR3	508302	06/01/2026	1,000	1,500	2,000	1,000	1,500	1,997	1.000x - 4.850	1.000
B65	SKC	224-PCXR3	508310	05/01/2026	1,000	1,500	2,000	998	1,505	1,999	1.001x - 5.999	1.000
B66	SKC	224-PCXR3	509861	05/01/2026	1,000	1,500	2,000	1,003	1,501	2,006	1.009x - 15.631	0.999
B67	SKC	224-PCXR3	506295	05/01/2026	1,000	1,500	2,000	996	1,496	1,993	0.999x - 4.016	1.000
B68	SKC	224-PCXR3	505872	05/01/2026	1,000	1,500	2,000	1,003	1,491	2,001	0.995x + 5.309	1.000
B69	SKC	224-PCXR3	508375	06/01/2026	1,000	1,500	2,000	994	1,507	2,002	1.008x - 16.847	0.999
B70	SKC	224-PCXR3	510623	06/01/2026	1,000	1,500	2,000	993	1,506	2,003	1.010x - 18.889	1.000
B71	SKC	224-PCXR3	508367	07/01/2026	1,000	1,500	2,000	997	1,501	1,994	0.999x - 0.148	1.000
B72	SKC	224-PCXR3	505977	06/01/2026	1,000	1,500	2,000	1,000	1,503	2,003	1.004x - 8.252	1.000
B73	SKC	224-PCXR3	512606	06/01/2026	1,000	1,500	2,000	996	1,495	1,995	0.998x - 1.627	1.000
B74	SKC	224-PCXR3	505993	06/01/2026	1,000	1,500	2,000	995	1,506	1,999	1.008x - 17.629	0.999
B75	SKC	224-PCXR3	509820	05/01/2026	1,000	1,500	2,000	997	1,491	1,999	1.001x - 6.461	1.000
B76	SKC	224-PCXR3	509811	05/01/2026	1,000	1,500	2,000	1,000	1,472	2,004	1.008x - 18.391	1.000
B77	SKC	224-PCXR3	508301	05/01/2026	1,000	1,500	2,000	993	1,471	1,995	1.000x - 10.813	0.999
B78	SKC	224-PCXR3	510677	05/01/2026	1,000	1,500	2,000	999	1,477	2,000	1.003x - 12.304	0.999
B79	SKC	224-PCXR3	510920	06/01/2026	1,000	1,500	2,000	1,001	1,500	1,997	0.998x + 0.215	1.000

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	01/04/2026	1,000	1,500	2,000	1,002	1,503	2,004	1.002x - 1.364	1.000
B02	SKC	224-PCXR4	626166	01/04/2026	1,000	1,500	2,000	1,004	1,501	2,003	1.001x - 0.594	1.000
B03	SKC	224-PCXR4	612968	01/04/2026	1,000	1,500	2,000	1,003	1,502	1,994	1.003x - 9.098	0.999
B04	SKC	224-PCXR4	602804	01/04/2026	1,000	1,500	2,000	1,000	1,502	1,998	0.998x + 0.642	1.000
B05	SKC	224-PCXR4	612693	01/04/2026	1,000	1,500	2,000	1,001	1,504	1,999	1.000x - 1.767	1.000
B06	SKC	224-PCXR4	262188	01/04/2026	1,000	1,500	2,000	999	1,500	2,002	1.001x - 3.590	1.000
B07	SKC	224-PCXR4	626262	01/04/2026	1,000	1,500	2,000	997	1,506	2,003	1.004x - 9.859	0.999
B08	SKC	224-PCXR4	626100	01/04/2026	1,000	1,500	2,000	1,003	1,503	2,005	1.003x - 4.160	1.000
B09	SKC	224-PCXR4	626479	01/04/2026	1,000	1,500	2,000	998	1,497	1,997	1.000x - 3.382	1.000
B10	SKC	224-PCXR4	091950	01/04/2026	1,000	1,500	2,000	1,004	1,506	1,996	1.003x - 7.323	0.999
B11	SKC	224-PCXR8	564315	01/04/2026	1,000	1,500	2,000	1,000	1,493	2,003	1.005x - 10.601	1.000
B12	SKC	224-PCXR4	034656	01/04/2026	1,000	1,500	2,000	997	1,495	1,997	0.998x - 1.755	1.000
B13	SKC	224-PCXR4	602073	01/04/2026	1,000	1,500	2,000	1,001	1,501	1,986	0.996x + 2.864	0.999
B14	SKC	224-PCXR4	626313	01/04/2026	1,000	1,500	2,000	999	1,494	1,997	0.999x - 1.898	0.999
B15	SKC	224-PCXR4	626474	01/04/2026	1,000	1,500	2,000	996	1,498	1,993	1.007x - 17.126	0.999
B16	SKC	224-PCXR4	626477	01/04/2026	1,000	1,500	2,000	1,002	1,499	1,997	0.997x + 1.352	1.000
B17	SKC	224-PCXR4	626860	01/04/2026	1,000	1,500	2,000	996	1,510	1,999	1.005x - 12.252	0.999
B18	SKC	224-PCXR4	691484	01/04/2026	1,000	1,500	2,000	995	1,499	1,997	1.006x - 12.384	1.000
B19	SKC	224-PCXR4	691599	01/04/2026	1,000	1,500	2,000	998	1,501	1,991	1.004x - 10.506	0.999
B20	SKC	224-PCXR4	691587	01/04/2026	1,000	1,500	2,000	997	1,495	1,998	1.003x - 7.247	1.000
B21	SKC	224-PCXR4	691531	03/04/2026	1,000	1,500	2,000	998	1,496	1,996	1.000x - 3.454	1.000
B22	SKC	224-PCXR4	691654	03/04/2026	1,000	1,500	2,000	996	1,494	1,997	0.998x - 2.784	1.000
B23	SKC	224-PCXR4	798393	02/04/2026	1,000	1,500	2,000	1,000	1,503	1,999	0.999x - 1.308	1.000
B24	SKC	224-PCXR4	626363	03/04/2026	1,000	1,500	2,000	1,001	1,509	1,995	1.002x - 6.940	0.999
B25	SKC	224-PCXR4	798489	03/04/2026	1,000	1,500	2,000	1,002	1,502	2,004	1.004x - 7.267	1.000
B26	SKC	224-PCXR4	798479	03/04/2026	1,000	1,500	2,000	996	1,503	2,003	1.006x - 12.675	1.000
B27	SKC	224-PCXR4	691673	02/04/2026	1,000	1,500	2,000	1,000	1,504	2,000	0.999x + 0.483	1.000
B28	SKC	224-PCXR4	691570	03/04/2026	1,000	1,500	2,000	997	1,510	2,001	0.998x - 0.455	0.999
B29	SKC	224-PCXR4	626472	03/04/2026	1,000	1,500	2,000	998	1,494	1,992	1.000x - 5.221	1.000
B30	SKC	224-PCXR4	691489	03/04/2026	1,000	1,500	2,000	1,008	1,504	2,006	1.003x - 2.114	1.000
B31	SKC	224-PCXR4	691509	03/04/2026	1,000	1,500	2,000	1,003	1,503	2,002	0.997x + 0.610	0.999
B32	SKC	224-PCXR4	091567	03/04/2026	1,000	1,500	2,000	1,002	1,502	1,996	0.996x + 7.008	1.000
B33	SKC	224-PCXR4	091756	03/04/2026	1,000	1,500	2,000	998	1,501	1,992	1.006x - 12.101	0.999
B34	SKC	224-PCXR4	612962	03/04/2026	1,000	1,500	2,000	1,001	1,494	2,004	1.004x - 8.196	1.000
B35	SKC	224-PCXR4	602682	03/04/2026	1,000	1,500	2,000	997	1,504	1,998	1.000x - 2.804	1.000
B36	SKC	224-PCXR4	626164	03/04/2026	1,000	1,500	2,000	996	1,512	1,996	1.001x - 5.867	0.999
B37	SKC	224-PCXR4	626256	03/04/2026	1,000	1,500	2,000	999	1,496	2,005	1.007x - 11.487	1.000
B38	SKC	224-PCXR4	626167	03/04/2026	1,000	1,500	2,000	1,002	1,500	2,003	1.008x - 16.377	0.999
B39	SKC	224-PCXR4	034637	03/04/2026	1,000	1,500	2,000	998	1,490	1,994	0.996x - 0.044	1.000
B40	SKC	224-PCXR4	798349	03/04/2026	1,000	1,500	2,000	1,001	1,501	2,000	0.995x + 0.921	0.999

Calibrated by :

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	03/04/2026	1,000	1,500	2,000	996	1,498	1,991	1.006x - 15.132	0.999
B42	SKC	224-PCXR4	626041	03/04/2026	1,000	1,500	2,000	998	1,495	1,998	1.001x - 5.029	1.000
B43	SKC	224-PCXR4	034636	03/04/2026	1,000	1,500	2,000	996	1,512	1,995	1.000x - 4.272	0.999
B44	SKC	224-PCXR8	529341	03/04/2026	1,000	1,500	2,000	1,000	1,501	2,000	0.999x + 0.802	1.000
B45	SKC	224-PCXR8	529594	03/04/2026	1,000	1,500	2,000	996	1,495	1,999	1.003x - 8.918	1.000
B46	SKC	224-PCXR8	566743	03/04/2026	1,000	1,500	2,000	998	1,501	1,992	1.006x - 12.300	0.999
B47	SKC	224-PCXR8	566747	03/04/2026	1,000	1,500	2,000	996	1,505	2,000	1.004x - 8.392	1.000
B48	SKC	224-PCXR8	566753	03/04/2026	1,000	1,500	2,000	1,011	1,508	2,008	0.998x + 4.726	0.999
B49	SKC	224-PCXR8	566780	03/04/2026	1,000	1,500	2,000	997	1,495	1,999	1.003x - 8.045	1.000
B50	SKC	224-PCXR8	500400	03/04/2026	1,000	1,500	2,000	1,000	1,499	1,994	0.996x + 3.406	1.000
B51	SKC	224-PCXR8	500363	03/04/2026	1,000	1,500	2,000	997	1,505	1,997	1.005x - 14.055	0.999
B52	SKC	224-PCXR8	093186	03/04/2026	1,000	1,500	2,000	996	1,506	2,000	1.002x - 5.484	1.000
B53	SKC	224-PCXR8	707670	03/04/2026	1,000	1,500	2,000	993	1,505	2,001	1.009x - 20.477	0.999
B54	SKC	224-PCXR3	509821	06/04/2026	1,000	1,500	2,000	1,005	1,500	2,008	1.007x - 10.015	1.000
B55	SKC	224-PCXR3	510710	06/04/2026	1,000	1,500	2,000	1,013	1,502	2,007	1.002x - 2.573	0.999
B56	SKC	224-PCXR3	511450	06/04/2026	1,000	1,500	2,000	992	1,492	1,999	1.004x - 10.669	1.000
B57	SKC	224-PCXR3	510798	06/04/2026	1,000	1,500	2,000	999	1,496	1,996	0.998x - 0.463	1.000
B58	SKC	224-PCXR3	509852	06/04/2026	1,000	1,500	2,000	1,003	1,499	1,999	0.996x + 4.204	1.000
B59	SKC	224-PCXR3	509862	06/04/2026	1,000	1,500	2,000	1,000	1,500	1,998	0.998x + 0.850	1.000
B60	SKC	224-PCXR3	512655	06/04/2026	1,000	1,500	2,000	997	1,506	2,002	1.003x - 8.264	0.999
B61	SKC	224-PCXR3	503915	06/04/2026	1,000	1,500	2,000	999	1,505	2,006	1.004x - 6.792	1.000
B62	SKC	224-PCXR3	505975	06/04/2026	1,000	1,500	2,000	998	1,504	2,004	1.005x - 10.095	1.000
B63	SKC	224-PCXR3	511432	09/04/2026	1,000	1,500	2,000	999	1,500	1,997	0.999x - 2.345	1.000
B64	SKC	224-PCXR3	508302	09/04/2026	1,000	1,500	2,000	1,001	1,491	1,996	0.997x + 0.511	1.000
B65	SKC	224-PCXR3	508310	09/04/2026	1,000	1,500	2,000	1,002	1,509	1,994	1.000x - 4.906	0.999
B66	SKC	224-PCXR3	509861	09/04/2026	1,000	1,500	2,000	995	1,501	2,004	1.008x - 15.001	1.000
B67	SKC	224-PCXR3	506295	09/04/2026	1,000	1,500	2,000	1,002	1,500	1,999	0.998x + 1.468	1.000
B68	SKC	224-PCXR3	505872	09/04/2026	1,000	1,500	2,000	1,005	1,494	1,994	0.996x - 1.783	0.999
B69	SKC	224-PCXR3	508375	09/04/2026	1,000	1,500	2,000	997	1,505	2,005	1.009x - 17.840	0.999
B70	SKC	224-PCXR3	510623	09/04/2026	1,000	1,500	2,000	998	1,499	1,999	1.000x - 2.573	1.000
B71	SKC	224-PCXR3	508367	09/04/2026	1,000	1,500	2,000	1,002	1,503	1,989	0.997x - 0.594	0.999
B72	SKC	224-PCXR3	505977	09/04/2026	1,000	1,500	2,000	999	1,504	2,001	1.002x - 4.551	1.000
B73	SKC	224-PCXR3	512606	09/04/2026	1,000	1,500	2,000	1,001	1,502	2,002	1.000x - 1.555	1.000
B74	SKC	224-PCXR3	505993	09/04/2026	1,000	1,500	2,000	1,003	1,504	2,008	1.006x - 6.832	1.000
B75	SKC	224-PCXR3	509820	09/04/2026	1,000	1,500	2,000	1,002	1,503	1,990	1.002x - 9.465	0.999
B76	SKC	224-PCXR3	509811	09/04/2026	1,000	1,500	2,000	1,001	1,500	2,002	1.001x - 2.688	1.000
B77	SKC	224-PCXR3	508301	09/04/2026	1,000	1,500	2,000	999	1,501	1,996	0.998x + 0.550	1.000
B78	SKC	224-PCXR3	510677	09/04/2026	1,000	1,500	2,000	1,000	1,496	1,997	1.000x - 3.151	1.000
B79	SKC	224-PCXR3	510920	09/04/2026	1,000	1,500	2,000	1,002	1,502	1,986	0.997x - 2.026	0.999

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

Environmental Conditions

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

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

Calibrated by :

Adul Dangklorn
(Mr. Adul Dangklorn)

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
R40	SKC	224-PCXR4	612753	05/01/2026	1,000	1,500	2,000	997	1,506	1,998	1.000x - 0.556	1.000
R41	SKC	224-PCXR4	626140	05/01/2026	1,000	1,500	2,000	995	1,504	1,992	0.996x - 3.574	0.999
R42	SKC	224-PCXR4	626463	05/01/2026	1,000	1,500	2,000	1,006	1,505	1,984	0.988x + 15.108	0.999
R43	SKC	224-PCXR4	626129	05/01/2026	1,000	1,500	2,000	993	1,504	1,972	0.982.x + 17.902	0.999
R44	SKC	224-PCXR4	602753	06/01/2026	1,000	1,500	2,000	1,001	1,495	2,000	1.001x - 3.434	1.000
R45	SKC	224-PCXR4	626137	06/01/2026	1,000	1,500	2,000	998	1,494	1,997	0.996x + 1.827	1.000

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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

Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

Environmental Conditions

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

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

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

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

7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900

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

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
R40	SKC	224-PCXR4	612753	05/04/2026	1,000	1,500	2,000	1,004	1,497	2,000	0.998x + 1.430	1.000
R41	SKC	224-PCXR4	626140	03/04/2026	1,000	1,500	2,000	998	1,498	1,997	0.999x + 0.943	1.000
R42	SKC	224-PCXR4	626463	05/04/2026	1,000	1,500	2,000	1,005	1,513	1,998	0.997x + 4.138	0.999
R43	SKC	224-PCXR4	626129	03/04/2026	1,000	1,500	2,000	1,003	1,498	2,000	0.998x + 2.029	1.000
R44	SKC	224-PCXR4	602753	03/04/2026	1,000	1,500	2,000	996	1,509	1,997	1.003x - 8.036	1.000
R45	SKC	224-PCXR4	626137	05/04/2026	1,000	1,500	2,000	1,011	1,514	2,005	0.995x + 8.367	0.999

Calibrated by :

Adul Dangklom

(Mr. Adul Dangklom)

Approved by :

Peera Detudom

(Mr. Peera Detudom)



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Rotameter Calibration Report (For Personal Pump Low Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

Calibration Data

Rotameter Data			Calibration Data								
No.	Brand	Model	Date	Flow Rate (mL/min)						Value From Calibration Curve	
				Flow Rate (Reading)			Actual (Q std.)				
				1	2	3	1	2	3	y	R ²
L-R01	Dwyer	VFA-21	05/01/2026	50	100	200	50.2	102.0	203.9	0.991x + 2.329	1.000
L-R02	Dwyer	VFA-21	05/01/2026	50	100	200	50.4	101.3	200.5	1.006x - 0.627	0.999
L-R03	Dwyer	VFA-21	06/01/2026	50	100	200	50.1	99.4	202.7	1.017x - 1.144	1.000
L-R04	Dwyer	VFA-21	06/01/2026	50	100	200	49.8	100.5	201.0	1.010x - 1.541	0.999
L-R05	Dwyer	VFA-21	05/01/2026	50	100	200	50.2	101.4	203.8	0.990x + 2.384	1.000
L-R06	Dwyer	VFA-21	06/01/2026	50	100	200	50.4	99.1	201.5	1.003x - 0.197	1.000

Calibrated by :

Adul Dangklom
 (Mr.Adul Dangklom)

Approved by :

Peera Detudom
 (Mr. Peera Detudom)



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Rotameter Calibration Report (For Personal Pump Low Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

Calibration Data

Rotameter Data			Calibration Data								
No.	Brand	Model	Date	Flow Rate (mL/min)						Value From Calibration Curve	
				Flow Rate (Reading)			Actual (Q std.)				
				1	2	3	1	2	3	y	R ²
L-R01	Dwyer	VFA-21	01/04/2026	50	100	200	50.3	101.1	201.9	0.998x + 0.955	1.000
L-R02	Dwyer	VFA-21	01/04/2026	50	100	200	50.2	101.7	201.0	0.999x + 0.367	0.999
L-R03	Dwyer	VFA-21	03/04/2026	50	100	200	50.3	101.2	201.0	1.001x + 0.605	1.000
L-R04	Dwyer	VFA-21	05/04/2026	50	100	200	50.7	100.8	200.2	1.000x + 0.719	1.000
L-R05	Dwyer	VFA-21	05/04/2026	50	100	200	50.1	101.2	200.5	1.001x - 0.213	0.999
L-R06	Dwyer	VFA-21	03/04/2026	50	100	200	50.3	100.8	200.1	0.999x + 0.639	1.000

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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

Rotameter Calibration Report (For Personal Pump High Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

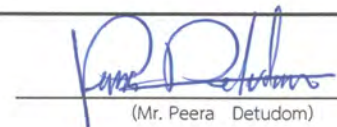
Calibration Data

Rotameter Data			Calibration Data								
No.	Brand	Model	Date	Flow Rate (mL/min)						Value From Calibration Curve	
				Flow Rate (Reading)			Actual (Q std.)				
				1	2	3	1	2	3	y	R ²
H-R01	Dwyer	VFB-65	05/01/2026	500	1,000	2,000	503.6	992.4	1980.9	0.999x - 3.140	0.999
H-R02	Dwyer	VFB-65	06/01/2026	500	1,000	2,000	500.8	995.8	1986.2	1.002x - 5.343	1.000
H-R03	Dwyer	VFB-65	05/01/2026	500	1,000	2,000	495.3	992.1	1982.9	1.004x - 17.510	0.999
H-R04	Dwyer	VFB-65	05/01/2026	500	1,000	2,000	496.4	994.6	2019.5	1.007x - 11.385	1.000
H-R05	Dwyer	VFB-65	06/01/2026	500	1,000	2,000	497.2	991.5	1987.3	1.003x - 7.563	1.000
H-R06	Dwyer	VFB-65	06/01/2026	500	1,000	2,000	501.1	992.4	1982.9	1.001x - 6.139	0.999

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :


(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

Calibration Data											
Rotameter Data			Calibration Data								
No.	Brand	Model	Date	Flow Rate (mL/min)						Value From Calibration Curve	
				Flow Rate (Reading)			Actual (Q std.)				
				1	2	3	1	2	3	y	R ²
H-B01	Dwyer	VFB-65	01/04/2026	500	1,000	2,000	500.8	997.7	1994.6	0.997x + 1.368	1.000
H-B02	Dwyer	VFB-65	01/04/2026	500	1,000	2,000	500.9	997.0	1994.3	0.998x + 0.689	1.000
H-B03	Dwyer	VFB-65	01/04/2026	500	1,000	2,000	499.5	999.8	1997.2	0.999x - 0.227	1.000
H-B04	Dwyer	VFB-65	02/04/2026	500	1,000	2,000	499.4	1000.9	2000.3	1.000x - 1.929	0.999
H-B05	Dwyer	VFB-65	02/04/2026	500	1,000	2,000	499.0	999.6	1998.7	1.001x + 0.053	1.000
H-B06	Dwyer	VFB-65	02/04/2026	500	1,000	2,000	499.8	998.0	1996.5	0.998x + 0.698	1.000
H-B07	Dwyer	VFB-65	01/04/2026	500	1,000	2,000	500.1	1000.8	1996.2	0.999x + 2.423	0.999
H-B08	Dwyer	VFB-65	01/04/2026	500	1,000	2,000	499.8	1000.1	1997.6	0.999x - 0.675	1.000
H-B09	Dwyer	VFB-65	06/04/2026	500	1,000	2,000	499.6	1002.1	2002.4	1.001x - 6.068	0.999
H-B10	Dwyer	VFB-65	06/04/2026	500	1,000	2,000	500.4	1001.6	1999.6	0.999x + 1.475	1.000

Calibrated by :

Adul Dangklom
(Mr.Adul Dangklom)

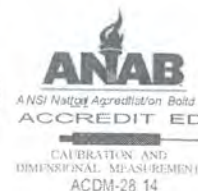
Approved by :

Peera Detudom
(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[64-220088-1]
CLID.NO.	212301422
JOB CONTROL NO.	240720076546

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. Q24076546

F3-011-05/12-23

page 1 of 3



CALIBRATION LABORATORY Co., LTD.

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CALIBRATION AND
DIMENSIONAL MEASUREMENT
ACDM-2814

REPORT OF CALIBRATION

FOR

NOMENCLATURE	VACUUM GAUGE
MANUFACTURER	HI-LIGHT
MODEL/TYPE	N/A
SERIAL NO.	N/A [64-220088-1]
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. Q24076546

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	-15.07	-15.10	-4.5	-4.5	+0.5	+0.5
-10	-32.50	-32.84	-9.6	-9.7	+0.4	+0.3
-15	-49.44	-49.77	-14.6	-14.7	+0.4	+0.3
-20	-66.70	-66.70	-19.7	-19.7	+0.3	+0.3
-25	-83.63	-83.97	-24.7	-24.8	+0.3	+0.2
-30	-100.39	-100.39	-29.6	-29.6	+0.4	+0.4

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. Q24076546

F3-011-05/ 12-23



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

RUN CHROMATOGRAM TEST

DETECTOR : Flame Ionization Detectors (FID Channel-Front)

INJECTOR : 1079 Injector

GC CONDITION:

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

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

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

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



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

Results Integrated System Testing

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

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

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

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

Compliance	☒ Pass	☐ Fail
Performance by	<i>Sachin P.</i>	
Date	02/08/2025	



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



VARIAN



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THAI UNIQUE CO., LTD.

80-82 ถนนประชาธิปไตย แขวงบางขุนพรหม เขตพระนคร กรุงเทพฯ 10200

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

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

Results Integrated System Testing

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

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

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

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

Compliance	☒ Pass	☐ Fail
Performance by	<i>Sanchul P.</i>	
Date	02/08/2025	



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



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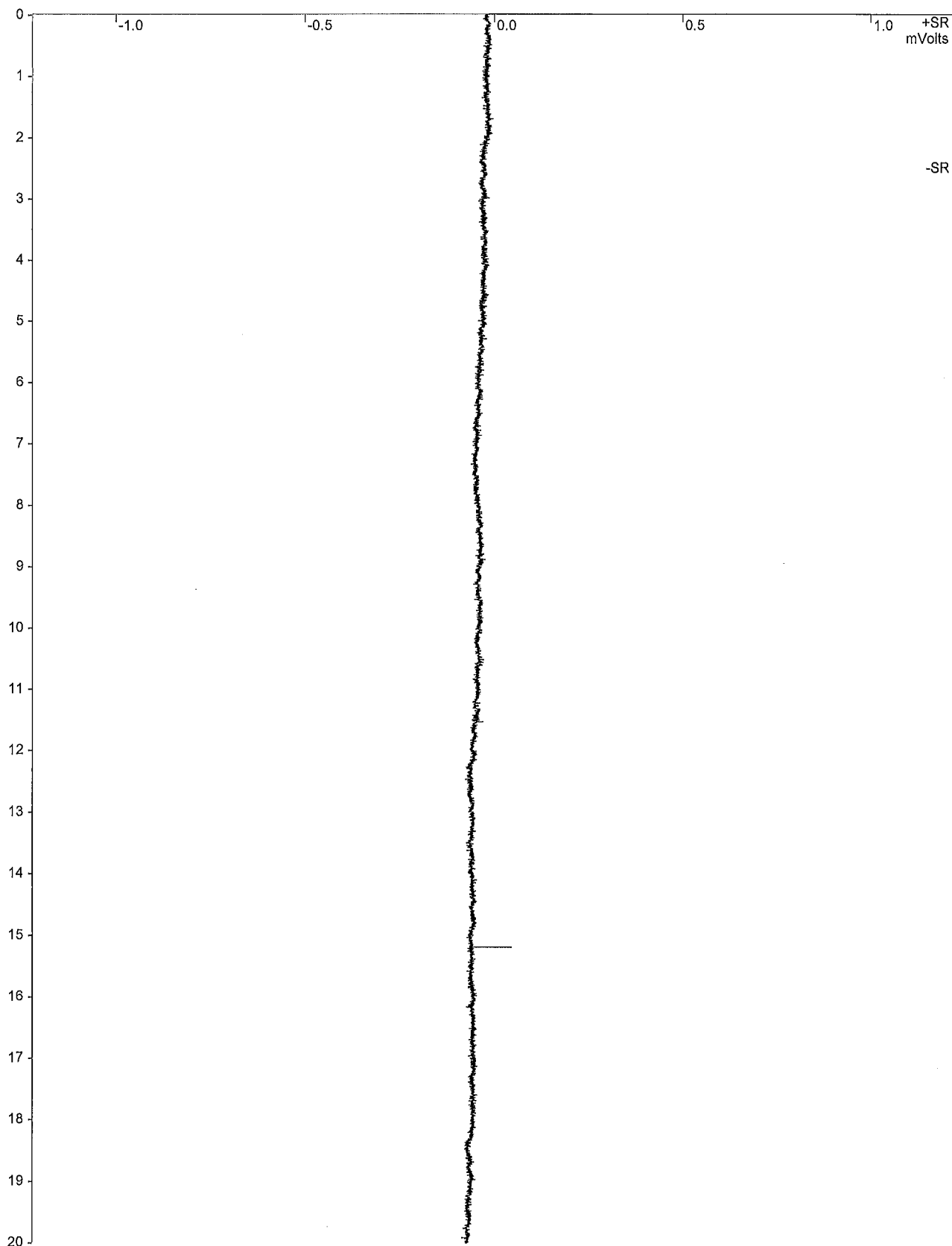
Title :
Run File : e:\sps2025\blk001.run
Method File : c:\star\data\tu\2025\cal fid.mth
Sample ID : blk

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

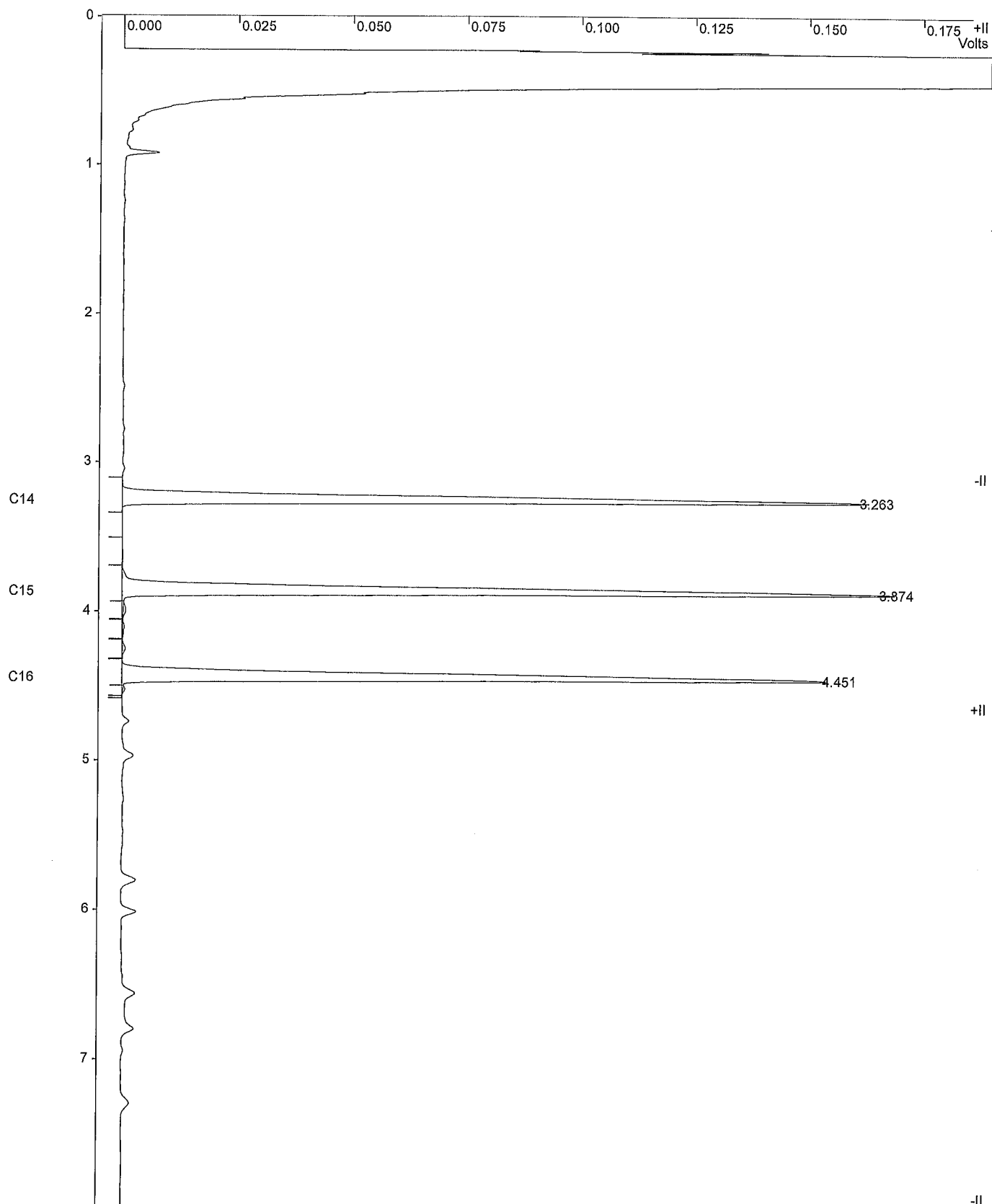
Title :
Run File : e:\sps2025\fidstd001.run
Method File : c:\star\data\tu\2025\cal fid.mth
Sample ID : fidstd

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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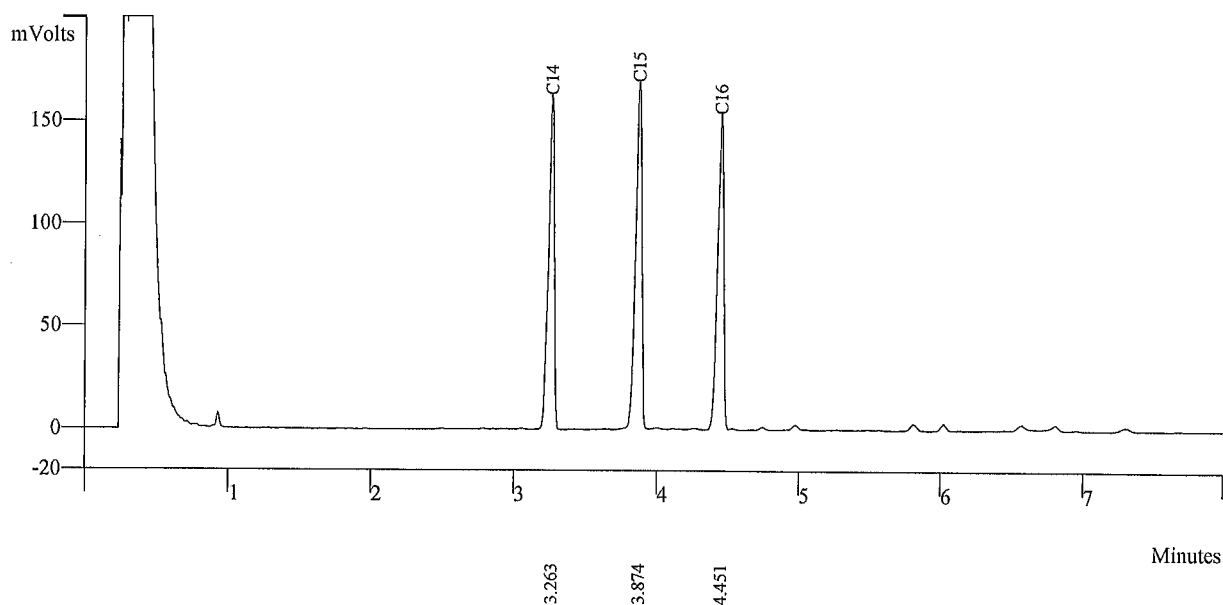
Run Mode: **Calibration**

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):

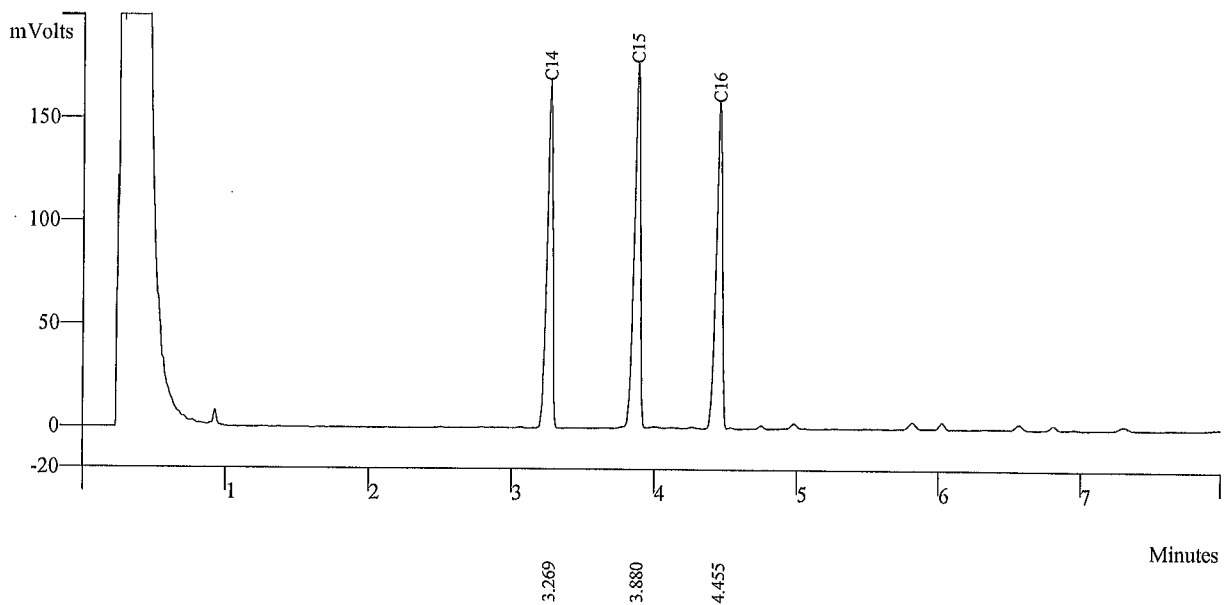
Run Mode: Calibration

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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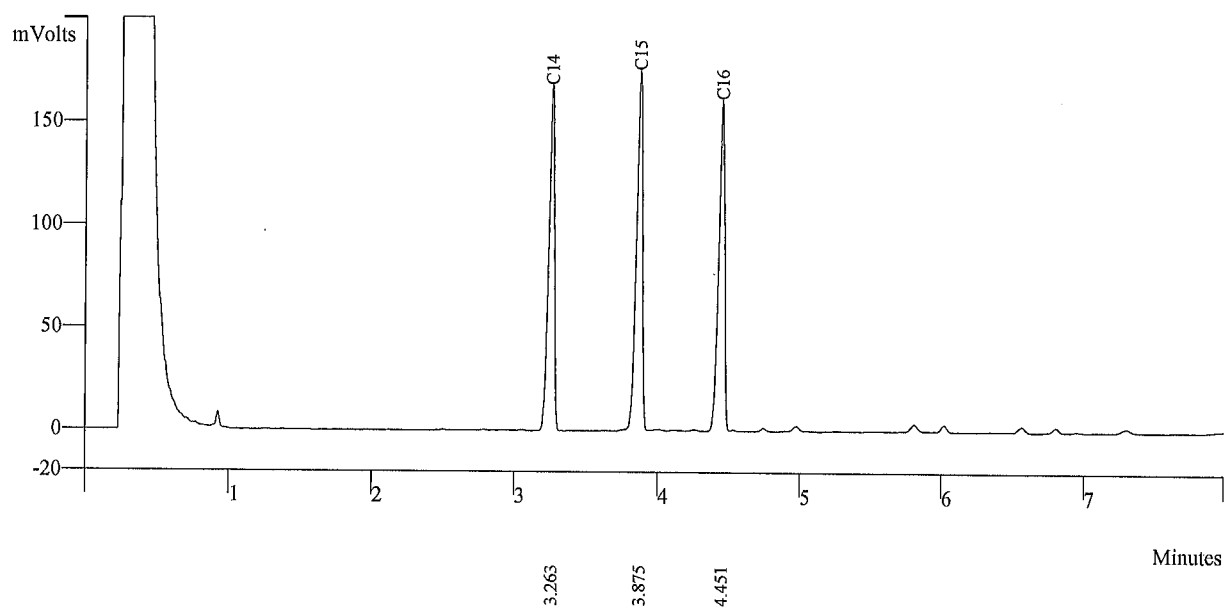
Run Mode: **Calibration**

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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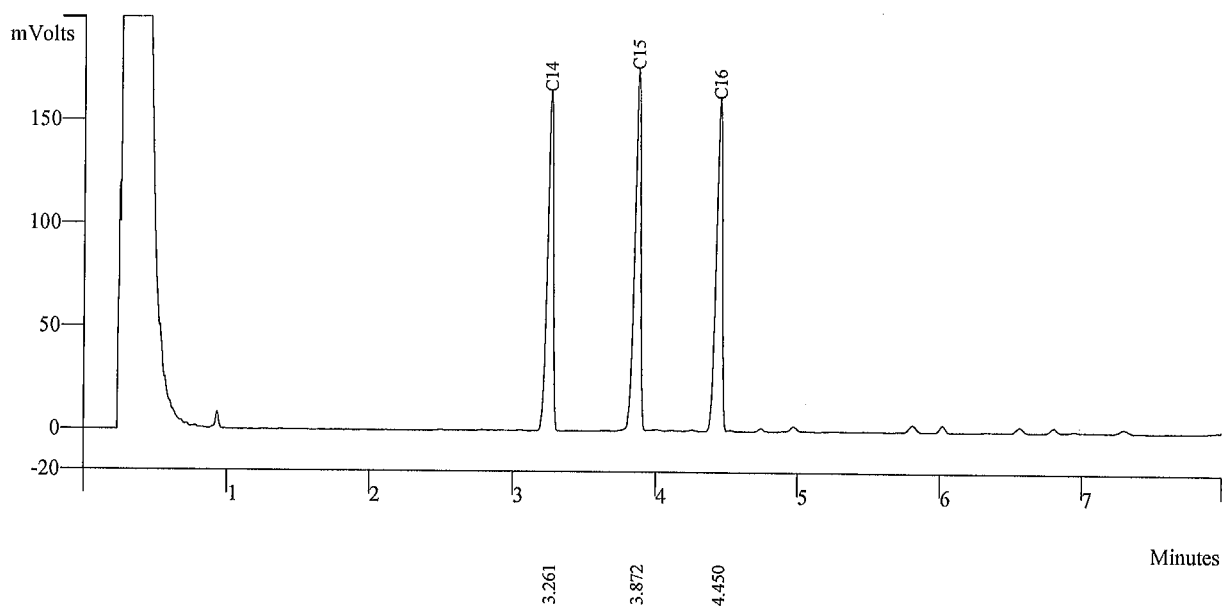
Run Mode: **Calibration**

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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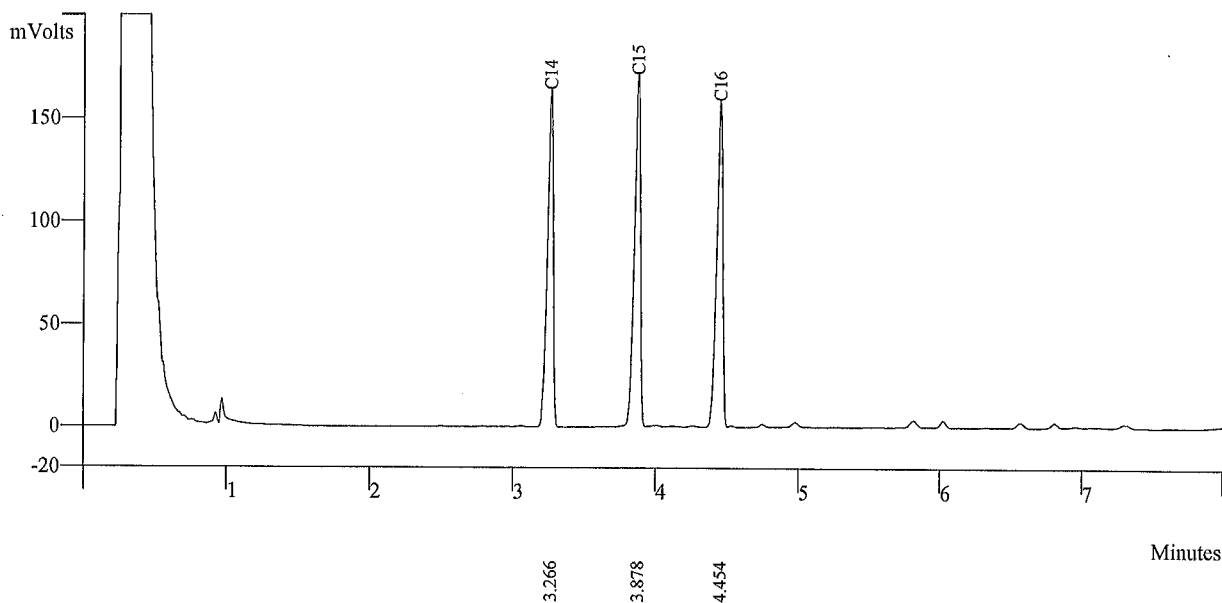
Run Mode: **Calibration**

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

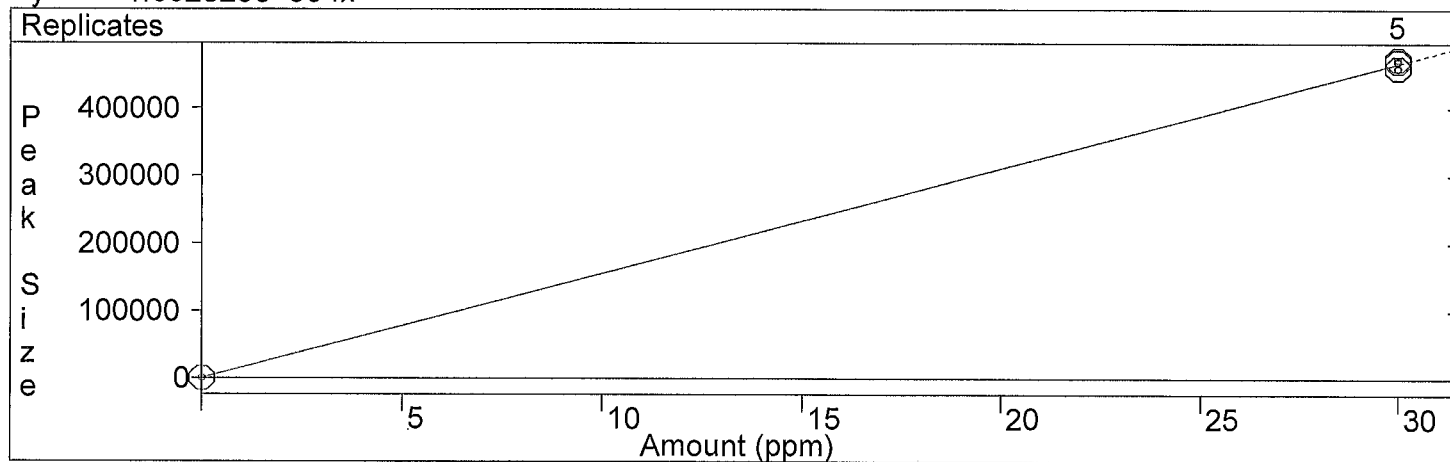
Curve Type: Linear

Origin: Force

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

Resp. Fact. RSD: 1.347%

Coeff. Det.(r²): 0.999130



C15

External Standard Analysis

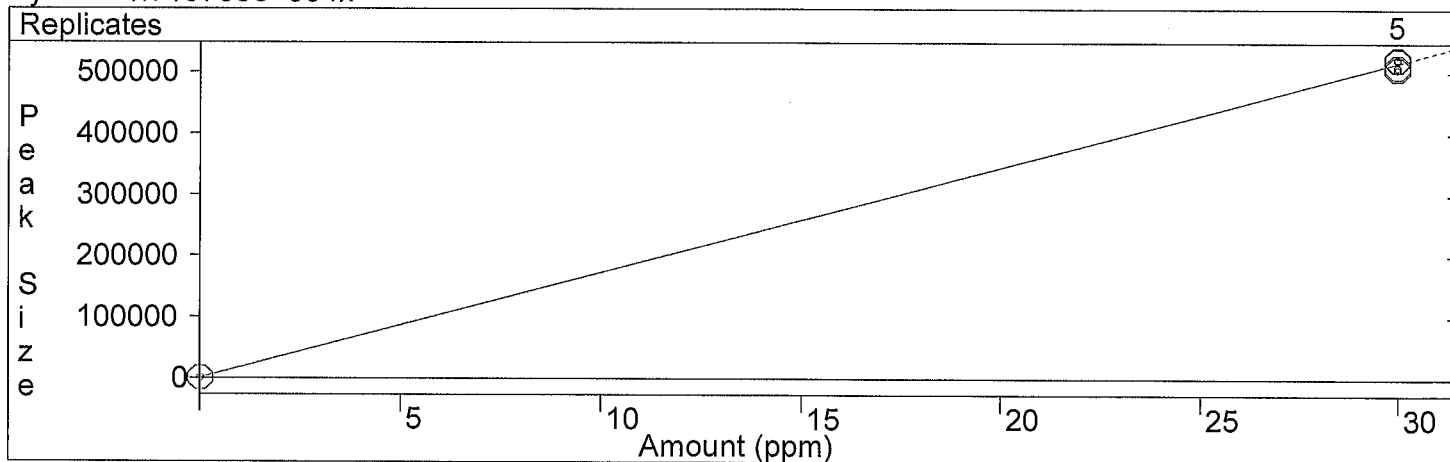
Curve Type: Linear

Origin: Force

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

Resp. Fact. RSD: 1.481%

Coeff. Det.(r²): 0.998948



C16

External Standard Analysis

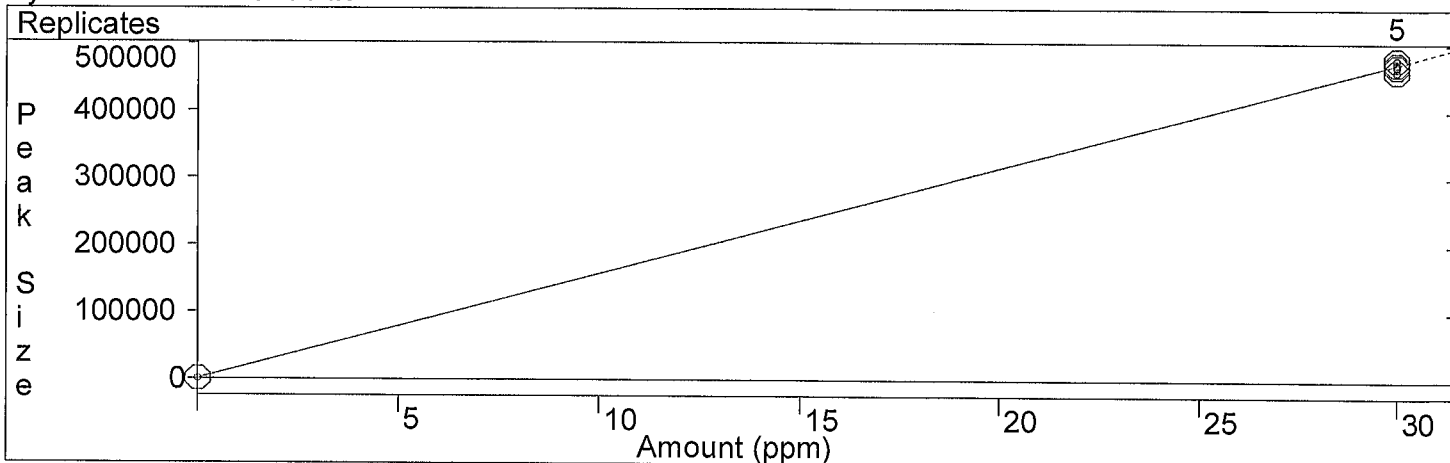
Curve Type: Linear

Origin: Force

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

Resp. Fact. RSD: 1.611%

Coeff. Det.(r²): 0.998756



CERTIFICATE

This is to certify, that

Somchai Pohthongkham

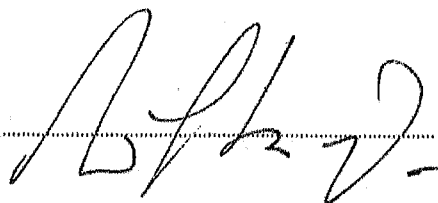
has participated the course

Basic GC and Sampler training

Date: ***24 – 27 May 2004***

Location: ***Middelburg***

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

Signature instructor: 



VARIAN

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

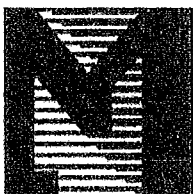
Calibrated by : Mr.Thippatai Mungpungklang

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

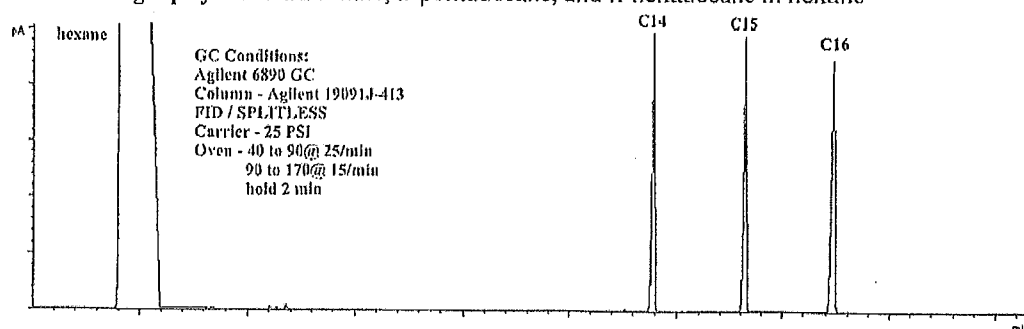
Calibrated Class A glassware and clean bottles were used in the manufacture of this standard. Balances used in the manufacture of this standard are calibrated with weights traceable to NIST in compliance with ANSI/NCSL Z-540-1 and ISO 9001.

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
Monica Bourgeois
QMS Representative

คุณภาพอากาศในบรรยากาศ



MIRACLE INTERNATIONAL TECHNOLOGY CO.,LTD

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



CALIBRATION CERTIFICATE

Page 1 of 3

Certificate No. : L202511307-0001

Date Issued : 01-Dec-25

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

Equipment : Mass Flow meter

Manufacturer : Dwyer

Model : GMF-2101

Serial No. : -

ID No./Tag No. : MF01/51

Date Received : 27-Nov-25

Date Calibrated : 30-Nov-25

Calibrated by : Nattawat Laochai

Calibration Method or Calibration Procedure Used

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

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

Result of Calibration

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

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

Approved by:

K. Nathong
(Nathapong Krudaum)



Certificate No. : L202511307-0001

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

Capacity Range : 17 ml/min

Calibration Media : Nitrogen

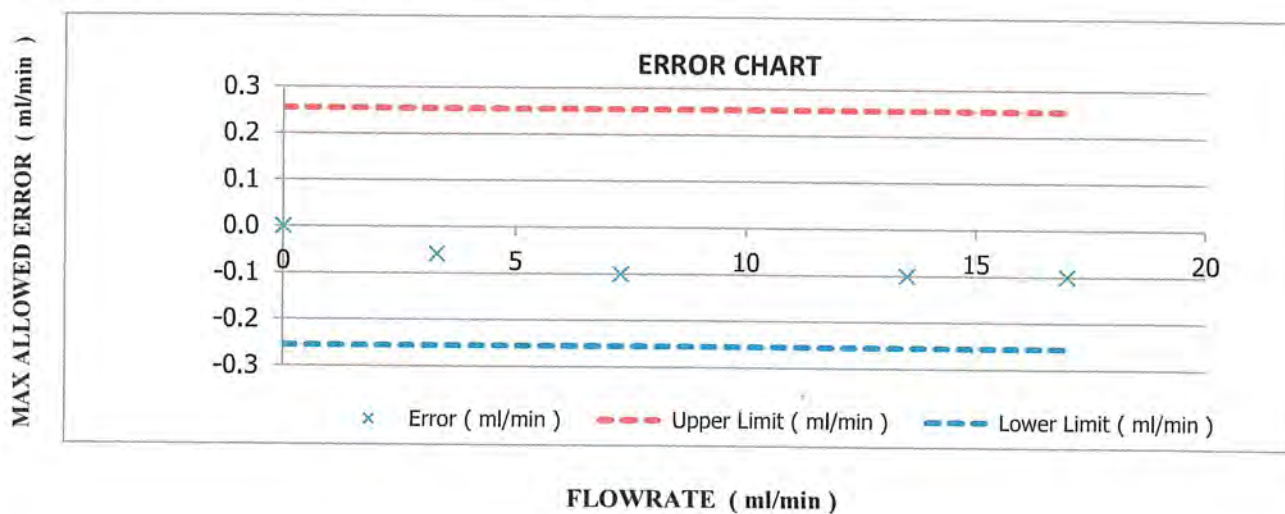
Type : Mass Flowmeter

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

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

Error = Unit Under Calibration - Standard

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



Certificate No. : L202511307-0001

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

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

; Q = Flow rate

; P = Absolute pressure

; T = Absolute temperature

; Subscript "Meas" = Measurement condition

; Subscript "Ref" = Reference condition

Condition As-Received : Used Item

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

Traceability of Certificate :

The International System of Units (SI) through

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

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

End of Certificate



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7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจตุจักร เขตจตุจักร กรุงเทพฯ 10900

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

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

CALIBRATION REPORT						
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER						
DATE :	11 March 2026	BRAND :	API	MODEL :	200E	
NO.	NOX-R01	SERIAL NO.	769			
Calibrator (Dilution System)						
Brand	: Teledyne			Model	: 700	
Last Cal. Date	: 24 October 2025			Serial No.	: 421	
Reference Standard Gas						
Standard Gas	: Nitric Oxide (NO)			Cylinder No.	: A00674SV	
Certified Date	: 12 March 2025	Expired Date	: 12 March 2028	Cylinder Conc.	: 48.7 ppm	
CALIBRATING CONDITION						
Pressure	1010	mmbar	Temp.	24.5	°C	
% RH						49
CALIBRATION SETTING						
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB		
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope	
Zero	0	-0.10	-	0	-	
NO Span	400	400.1	0.025	400.0	1.002	
NO _x Span	400	400.3	0.075	400.0	1.005	
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	505	cc/min	500 ± 50			
OZONE FLOW	78	cc/min	80 ± 15			
PMT	103.5	mV	-20 - 150			
AZERO	94.1	mV	-20 - 150			
HVPS	772	V	420 - 900 constant			
RCELL TEMP	50.0	°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	1.002	-	1.0 ± 0.3			
NO _x Slope	1.005	-	1.0 ± 0.3			
NO Offset	0.8	mV	-20 to +150			
NO _x Offset	0.4	mV	-20 to 150			
Stability at Zero	0.1	PPB	< 0.2			
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas			

Calibrated by : Heeson L.
(Mr.Heeson Lormae)

Approved by : Yutthana J.
(Mr.Yutthana Tanatharanit)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

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CALIBRATION REPORT						
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER						
DATE :	11 March 2026	BRAND :	API	MODEL :	200E	
NO.	NOX-R06	SERIAL NO.	4466			
Calibrator (Dilution System)						
Brand	: Teledyne			Model	: 700	
Last Cal. Date	: 24 October 2025			Serial No.	: 421	
Reference Standard Gas						
Standard Gas	: Nitric Oxide (NO)			Cylinder No.	: A00674SV	
Certified Date	: 12 March 2025	Expired Date	: 12 March 2028	Cylinder Conc.	: 48.7 ppm	
CALIBRATING CONDITION						
Pressure	1010	mmbar	Temp.	24.5	°C	
% RH						49
CALIBRATION SETTING						
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB		
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope	
Zero	0	-0.10	-	0	-	
NO Span	400	399.9	-0.025	400.0	1.004	
NO _x Span	400	400.2	0.050	400.0	1.006	
API Model 200E NO _x Analyzer Check List						
Test Values	Observed Value	Units	Nominal Range			
RANGE	500	PPB	500 standard			
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air			
SAMPLE FLOW	506	cc/min	500 ± 50			
OZONE FLOW	80	cc/min	80 ± 15			
PMT	103.3	mV	-20 - 150			
AZERO	94.1	mV	-20 - 150			
HVPS	672	V	420 - 900 constant			
RCELL TEMP	50.2	°C	50 ± 1			
BOX TEMP	28.9	°C	8 - 48			
PMT TEMP	7.1	°C	7 ± 2			
MOLY TEMP	314.8	°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	1.004	-	1.0 ± 0.3			
NO _x Slope	1.006	-	1.0 ± 0.3			
NO Offset	0.9	mV	-20 to +150			
NO _x Offset	0.5	mV	-20 to 150			
Stability at Zero	0.1	PPB	< 0.2			
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas			

Calibrated by :

Heeson L.

(Mr.Heeson Lormae)

Approved by :

Yutthana S.

(Mr.Yutthana Tanatharanit)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

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CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER					
DATE :	11 March 2026	BRAND :	API	MODEL :	200E
NO.	NOX-R08	SERIAL NO.	243		
Calibrator (Dilution System)					
Brand	: Teledyne			Model	: 700
Last Cal. Date	: 24 October 2025			Serial No.	: 421
Reference Standard Gas					
Standard Gas	: Nitric Oxide (NO)			Cylinder No.	: A006745V
Certified Date	: 12 March 2025		Expired Date	: 12 March 2028	
			Cylinder Conc.	: 48.7 ppm	
CALIBRATING CONDITION					
Pressure	1010	mmbar	Temp.	24.5	°C
			% RH	49	
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
NO Span	400	399.8	-0.050	400.0	1.004
NO _x Span	400	400.2	0.050	400.0	1.006
API Model 200E NO _x Analyzer Check List					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	500 standard		
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air		
SAMPLE FLOW	507	cc/min	500 ± 50		
OZONE FLOW	78	cc/min	80 ± 15		
PMT	103.2	mV	-20 - 150		
AZERO	94.2	mV	-20 - 150		
HVPS	674	V	420 - 900 constant		
RCELL TEMP	50.3	°C	50 ± 1		
BOX TEMP	28.6	°C	8 - 48		
PMT TEMP	7.4	°C	7 ± 2		
MOLY TEMP	315.2	°C	315 ± 5		
RCELL PRESS	8.5	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.3	IN-Hg-A	25 - 30 constant		
NO Span Conc	400	PPB	20 - 20,000		
NO _x Span Conc	400	PPB	20 - 20,000		
NO Slope	1.004	-	1.0 ± 0.3		
NO _x Slope	1.006	-	1.0 ± 0.3		
NO Offset	1.0	mV	-20 to +150		
NO _x Offset	0.6	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by :

Heeson L.

(Mr.Heeson Lormae)

Approved by :

Yutthana S.

(Mr.Yutthana Tanatharanit)



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CALIBRATION REPORT					
SO ₂ FLUORESCENT ANALYZER					
DATE :	11 March 2026	BRAND :	API	MODEL :	100E
NO.	SO ₂ -R02	SERIAL NO.	3431		
Calibrator (Dilution System)					
Brand : Teledyne			Model : 700		
Last Cal. Date : 24 October 2025			Serial No. : 421		
Reference Standard Gas					
Standard Gas : Sulphur Dioxide (SO ₂)			Cylinder No. : A00814SK		
Certified Date : 21 June 2021		Expired Date : 21 June 2029		Cylinder Conc. : 49.8 ppm	
CALIBRATING CONDITION					
Pressure	1010	mmbar	Temp.	24.5	°C
			% RH	49	
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
SO ₂ Span	400.0	400.1	0.025	400.0	1.003
API Model 100E SO ₂ Analyzer Check list					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	0-500		
SAMPLE PRESS	28.5	in-Hg	25-35		
SAMPLE FLOW	655	cc/min	650 ± 10%		
PMT	103.2	mV	-20-150 with Zero Air		
UV LAMP	2892.3	mV	1000-4900		
STR. LGT	60.7	PPB	<100		
DRK PMT	62.6	mV	-50 - 200		
DRK LMP	57.5	mV	-50 - 200		
HVPS	672	V	550-900 constant		
DCPS	2517	mV	2500 ± 200		
RCELL TEMP	50.0	°C	50 ± 1		
BOX TEMP	29.3	°C	5-40		
PMT TEMP	7.2	°C	7 ± 2.0		
SO ₂ Span Conc	400	PPB	20-20,000		
SO ₂ Slope	1.003	-	1.0 ± 0.3		
SO ₂ Offset	21.8	mV	<250		
Stability at Zero	0.1	PPB	<0.2		
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)		

Calibrated by :

Heeson L.
(Mr.Heeson Lormae)

Approved by :

Yuthana J.
(Mr.Yuthana Tanatharanit)



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

CALIBRATION REPORT					
SO ₂ FLUORESCENT ANALYZER					
DATE :	11 March 2026	BRAND :	API	MODEL :	100E
NO.	SO ₂ -R04	SERIAL NO.	3489		
Calibrator (Dilution System)					
Brand	: Teledyne		Model	: 700	
Last Cal. Date	: 24 October 2025		Serial No.	: 421	
Reference Standard Gas					
Standard Gas	: Sulphur Dioxide (SO ₂)		Cylinder No.	: A00814SK	
Certified Date	: 21 June 2021		Expired Date	: 21 June 2029	
			Cylinder Conc.	: 49.8 ppm	
CALIBRATING CONDITION					
Pressure	1010	mmbar	Temp.	24.5	°C
			% RH	49	
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.10	-	0	-
SO ₂ Span	400.0	400.1	0.025	400.0	1.004
API Model 100E SO ₂ Analyzer Check list					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	0-500		
SAMPLE PRESS	28.2	in-Hg	25-35		
SAMPLE FLOW	654	cc/min	650 ± 10%		
PMT	102.7	mV	-20-150 with Zero Air		
UV LAMP	3015.5	mV	1000-4900		
STR. LGT	61.3	PPB	<100		
DRK PMT	63.4	mV	-50 - 200		
DRK LMP	57.5	mV	-50 - 200		
HVPS	675	V	550-900 constant		
DCPS	2514	mV	2500 ± 200		
RCELL TEMP	50.2	°C	50 ± 1		
BOX TEMP	29.3	°C	5-40		
PMT TEMP	7.1	°C	7 ± 2.0		
SO ₂ Span Conc	400	PPB	20-20,000		
SO ₂ Slope	1.004	-	1.0 ± 0.3		
SO ₂ Offset	22.0	mV	<250		
Stability at Zero	0.1	PPB	<0.2		
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)		

Calibrated by :

Heeson L.

(Mr.Heeson Lormae)

Approved by :

Yutthana S.

(Mr.Yutthana Tanatharanit)



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CALIBRATION REPORT					
SO ₂ FLUORESCENT ANALYZER					
DATE :	11 March 2026	BRAND :	API	MODEL :	100E
NO.	SO ₂ -R06			SERIAL NO.	066
Calibrator (Dilution System)					
Brand	: Teledyne			Model	: 700
Last Cal. Date	: 24 October 2025			Serial No.	: 421
Reference Standard Gas					
Standard Gas	: Sulphur Dioxide (SO ₂)			Cylinder No.	: A00814SK
Certified Date	: 21 June 2021	Expired Date	: 21 June 2029	Cylinder Conc.	: 49.8 ppm
CALIBRATING CONDITION					
Pressure	1010	mmbar	Temp.	24.5	°C
			% RH	49	
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.11	-	0	-
SO ₂ Span	400.0	400.1	0.025	400.0	1.003
API Model 100E SO ₂ Analyzer Check list					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	0-500		
SAMPLE PRESS	28.2	in-Hg	25-35		
SAMPLE FLOW	652	cc/min	650 ± 10%		
PMT	103.2	mV	-20-150 with Zero Air		
UV LAMP	3075.5	mV	1000-4900		
STR. LGT	60.7	PPB	<100		
DRK PMT	62.6	mV	-50 - 200		
DRK LMP	57.4	mV	-50 - 200		
HVPS	671	V	550-900 constant		
DCPS	2515	mV	2500 ± 200		
RCELL TEMP	50.3	°C	50 ± 1		
BOX TEMP	29.2	°C	5-40		
PMT TEMP	7.1	°C	7 ± 2.0		
SO ₂ Span Conc	400	PPB	20-20,000		
SO ₂ Slope	1.003	-	1.0 ± 0.3		
SO ₂ Offset	21.6	mV	<250		
Stability at Zero	0.1	PPB	<0.2		
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)		

Calibrated by :

Heeson L.
(Mr.Heeson Lormae)

Approved by :

Yutthana J.
(Mr.Yutthana Tanatharanit)

Job Number :	J092500024-003	Customer Name :	IRPC
Equipment :	Micro Mobile AQMs	Contact Name :	Khun Wirasak Khumsuk
Model :	Micro Mobile AQMs	Telephone Number :	081-803-0475
Serial Number :	Micro Mobile3	E-mail address/Fax. :	wirasak.k@irpc.co.th
Working Date :	27 February 2026	Working Hour :	4 Hours

Service Report

Working Scope:

รถเคลื่อนที่ AQMs micro#3 หยุดตรวจวัดอากาศ ปิดสถานี อยู่ที่ หมู่บ้านระยองซีตี้ปาร์ค จึงได้เข้าทำการตรวจเช็ค

Physical Checking:

- ตรวจเช็ค Data logger พบว่าทำงานได้ปกติ
- ตรวจเช็ค Diagnostic of all analyzers อยู่ในเกณฑ์ปกติ
- ตรวจเช็ค Reading of all analyzers และ Met sensor พบว่าปกติ
- ตรวจเช็ค เครื่องวัดฝุ่น PM-10 พบว่าทำงานได้ปกติ
- ตรวจเช็ค เครื่อง THC analyzer พบว่าทำงานได้ปกติ
- ตรวจเช็ค การทำงานของระบบไฟฟ้า และ UPS พบว่าทำงานได้ปกติ
- ทำความสะอาดภายในสถานี และ บริเวณรอบสถานี

Correction working:

Part Replacement:Addition Recommended:

-- End --

Serviced by :	ชินรส มุขโรจน์	Serviced Date :	27 February 2026
Approved by:		Approved Date :	27 February 2026



บริษัท คิว-ซี โซลูชั่นส์ จำกัด

7/409 ซอยวิภาวดีรังสิต 36 ถนนวิภาวดีรังสิต แขวงจตุจักร เขตจตุจักร กรุงเทพฯ 10900

โทรศัพท์ : (662) 939-5711 (12 Lines) โทรสาร : (662) 939-4207-8

Website <http://www.qshe.co.th> E-mail-address: info@qshe.co.th

General Checking

Equipment : Micro Mobile AQMS

Model : -

Serial Number : -

Manufacturer : -

Item	Description	Set-Point Value	Status & Value	Remark
	<u>On Mobile</u>			
1	Air conditioner operation	OK	OK	
2	Mobile temperature	25-27 °C	25-27 °C	
3	Lighting system	OK	OK	
4	Lamp in sampling box	OK	OK	
5	Sampling probe	Clean	Clean	
6	Blower	OK	OK	
7	Drain liquid in tank	Drain	Drain	
8	Compressor tank set pressure	80 psi	80 psi	
9	Zero air compressor operation	OK	OK	
10	Silica gel for dry air of NO _x analyzer	OK	OK	
11	UPS 6 KVA	Bypass	Bypass	
12	Data logger	OK	OK	
13	Ventilation fan	OK	OK	
14	Power cable	OK	OK	
15	Hydrogen Gas	>500 psi	300/50 psi	
16	Standard gas#1 (NO,SO ₂ ,HC,CO)	>500 psi	300/22 psi	

Note :



บริษัท คิว-ชี โซลูชั่นส์ จำกัด

7/409 ซอยวิภาวดีรังสิต 36 ถนนวิภาวดีรังสิต แขวงจตุจักร เขตจตุจักร กรุงเทพฯ 10900

โทรศัพท์ : (662) 939-5711 (12 Lines) โทรสาร : (662) 939-4207-8

Website <http://www.qshe.co.th> E-mail-address: info@qshe.co.th

NO-NO₂-NO_x AnalyzerEquipment : NO-NO₂-NO_x analyzer.

Model : 42i

Serial Number : CM13090047

Manufacturer : Thermo

Diagnostic test value

Parameter	Observed value		Unit	Nominal range
	Before	After		
Sample reading				
NO reading			ppb	
NO _x reading			ppb	
Range			ppb	50 to 1000 ppb
Averaging Time			Sec	10 to 300 Sec
Calibration Factors				
NO BKG. ppb			ppb	0 to 60
NO _x BKG. ppb			ppb	0 to 60
NO COEF.			-	1.0 ± 0.3
NO _x COEF.			-	1.0 ± 0.3
NO ₂ COEF.			-	1.0 ± 0.3
Instrument Controls				
Ozonator				On/Off
PMT Supply				On/Off
Auto/Manual Mode				NO/NO _x , NO, NO _x
Baud Rate			bps	1200 to 9600
Temp Compensation			-	On/Off
Pressure Compensation			-	On/Off
Screen Contrast			%	0 to 100
Service Mode			-	On/Off, Up to used
Diagnostics				
Voltages				
Motherboard voltages:				
3.3 Supply			Vdc	3.3 ± 1 Vdc
5.0 Supply			Vdc	5.0 ± 1 Vdc
15.0 Supply			Vdc	15.0 ± 1 Vdc
24.0 Supply			Vdc	24.0 ± 1 Vdc
-3.3 Supply			Vdc	-3.3 ± 1 Vdc
Interface board voltages:				
PMT Supply			Vdc	-400 to -1200 Vdc
3.3 Supply			Vdc	3.3 ± 1 Vdc
5.0 Supply			Vdc	5.0 ± 1 Vdc
15.0 Supply			Vdc	15.0 ± 1 Vdc
P15.0 Supply			Vdc	15.0 ± 1 Vdc
24.0 Supply			Vdc	24.0 ± 1 Vdc
-15.0 Supply			Vdc	-15.0 ± 1 Vdc
Temperatures				
Internal			°C	15 °C to 45 °C
Chamber			°C	50°C ± 2 °C
Cooler			°C	(-)3 °C ± 2 °C
Converter			°C	325 °C ± 5 °C
Converter Set			°C	325 °C
Pressure			mmHg	250 ± 100 mmHg
Flow			L/min	0.5 to 1.00 L/min

Note :



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โทรศัพท์ : (662) 939-5711 (12 Lines) โทรสาร : (662) 939-4207-8

Website <http://www.qshe.co.th> E-mail-address: info@qshe.co.th

SO₂ Analyzer

Equipment : Sulfur Dioxide analyzer.

Model : 43i

Serial Number : 1310957747

Manufacturer : Thermo

Diagnostic test value				
Parameter	Observed value		Unit	Nominal range
	Before	After		
Sample reading			ppb	
Range			ppb	50 to 1000 ppb
Averaging Time			Sec	10 to 300 Sec
Calibration Factors				
SO ₂ BKG. ppb			ppb	0 to 60
SO ₂ COEF			-	1.0 ± 0.3
Instrument Controls				
Temp Compensation			On/Off	On
Pressure Compensation			On/Off	On
Flash Lamp			On/Off	On
Communication setting				
Baud Rate			bps	9600 to 115000
Instrument ID			-	0 to 99
Screen Contrast			%	0 to 100
Service Mode			On/Off	Up to used
Diagnostics				
Voltages				
Motherboard voltages:				
3.3 Supply			Vdc	3.3 +/- 1 Vdc
5.0 Supply			Vdc	5.0 +/- 1 Vdc
15.0 Supply			Vdc	15.0 +/- 1 Vdc
24.0 Supply			Vdc	24.0 +/- 1 Vdc
-3.3 Supply			Vdc	- 3.3 +/- 1 Vdc
Interface board voltages:				
PMT Supply				
Flash Supply				
3.3 Supply			Vdc	3.3 +/- 1 Vd
5.0 Supply			Vdc	5.0 +/- 1 Vdc
15.0 Supply			Vdc	15.0 +/- 1 Vdc
-15.0 Supply			Vdc	-15.0 +/- 1 Vdc
24.0 Supply			Vdc	24.0 +/- 1 Vdc
Temperatures				
Internal			°C	15°C to 45°C
Chamber			°C	45°C ± 2°C
Pressure			mmHg	750 ± 100 mmHg
Flow			L/min	0.5 to 1.00 L/min
Lamp intensity			%	40 – 100 %

Note : หน้าจอมีด มองไม่ชัดเจน



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Website <http://www.qshe.co.th> E-mail-address: info@qshe.co.th

SINGLE-POINT GAS CALIBRATION

NO_x, SO₂, CO Analyzer.

Equipment :	All analyzer.	Model :	42i, 43i,THC
Serial Number :	--	Manufacturer :	Thermo, Horiba

Standard gas concentration			Dilutor detail	
Sulfur Dioxide (SO ₂)	44.44	ppm	Manufacturer :	Thermo
Nitric Oxide (NO)	45.84	ppm	Model :	146i
Methane (CH ₄)	506.7	ppm	Serial number :	1201351404
Carbon Monoxide (CO)	4513	ppm		
Cylinder NO. :	CC507818			
Expiration Date :	13 Aug 2023			

BEFORE CALIBRATION RESULT

PARAMETER	ZERO			SPAN			JUDGEMENT
	IDEAL	ACTUAL	ERROR	IDEAL	ACTUAL	%ERROR	
NO (ppb)	0.00			400			
NO _x (ppb)	0.00			400			
SO ₂ (ppb)	0.00			400			
CH ₄ (ppm)	0.00			4.43			
THC(ppm)	0.00			4.43			

AFTER CALIBRATION RESULT

PARAMETER	ZERO			SPAN			JUDGEMENT
	IDEAL	ACTUAL	ERROR	IDEAL	ACTUAL	%ERROR	
NO (ppb)	0.00			400			
NO _x (ppb)	0.00			400			
SO ₂ (ppb)	0.00			400			
CH ₄ (ppm)	0.00			4.00			
THC(ppm)	0.00			4.00			

Remark:



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Website <http://www.qshe.co.th> E-mail-address: info@qshe.co.th

Job Number :		Customer Name :	IRPC
Equipment :	Micro Mobile AQMs	Contact Name :	Khun Wirasak Khumsuk
Model :	Micro Mobile AQMs	Telephone Number :	081-803-0475
Serial Number :	Micro Mobile3	E-mail address/Fax. :	wirasak.k@irpc.co.th
Working Date :	27 March 2026	Working Hour :	4 Hours

Service Report

Working Scope:

รถเคลื่อนที่ AQMs micro#3 ตรวจวัดอากาศ อยู่ที่ ACB Boundary จึงได้เข้าทำการตรวจเช็ค

Physical Checking:

- ตรวจเช็ค Data logger พบว่าทำงานได้ปกติ
- ตรวจเช็ค Diagnostic of all analyzers อยู่ในเกณฑ์ปกติ
- ตรวจเช็ค Reading of all analyzers และ Met sensor พบว่าปกติ
- ตรวจเช็ค เครื่องวัดฝุ่น PM-10 พบว่าทำงานได้ปกติ
- ตรวจเช็ค เครื่อง THC analyzer พบว่าทำงานได้ปกติ
- ตรวจเช็ค การทำงานของระบบไฟฟ้า และ UPS พบว่าทำงานได้ปกติ
- ทำความสะอาดภายในสถานี และ บริเวณรอบสถานี

Correction working:

Replace silica gel for dryer NO _x Analyzer.	Drain water for pump of Zero Air.
Replace sample filter 47 mm.	

Part Replacement:

- | | | |
|-------------------------|-------------|------------------------|
| - Sample filter 47 mm. | 3 ea. | (Part Support by IRPC) |
| - Silica gel. P/N: 6998 | 1/2 Bottle. | (Part Support by IRPC) |

Addition Recommended:

-- End --

Serviced by :	ชินโรส มุขโรจน์	Serviced Date :	27 March 2026
Approved by:		Approved Date :	27 March 2026



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โทรศัพท์ : (662) 939-5711 (12 Lines) โทรสาร : (662) 939-4207-8

Website <http://www.qshe.co.th> E-mail-address: info@qshe.co.th

General Checking

Equipment : Micro Mobile AQMS

Model : -

Serial Number : -

Manufacturer : -

Item	Description	Set-Point Value	Status & Value	Remark
	<u>On Mobile</u>			
1	Air conditioner operation	OK	OK	
2	Mobile temperature	25-27 °C	25-27 °C	
3	Lighting system	OK	OK	
4	Lamp in sampling box	OK	OK	
5	Sampling probe	Clean	Clean	
6	Blower	OK	OK	
7	Drain liquid in tank	Drain	-	
8	Compressor tank set pressure	80 psi	Fail	
9	Zero air compressor operation	OK	Fail	
10	Silica gel for dry air of NO _x analyzer	OK	OK	
11	UPS 6 KVA	Bypass	Bypass	
12	Data logger	OK	OK	
13	Ventilation fan	OK	OK	
14	Power cable	OK	OK	
15	Hydrogen Gas	>500 psi	300/50 psi	
16	Standard gas#1 (NO,SO ₂ ,HC,CO)	>500 psi	300/22 psi	

Note :



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โทรศัพท์ : (662) 939-5711 (12 Lines) โทรสาร : (662) 939-4207-8

Website <http://www.qshe.co.th> E-mail-address: info@qshe.co.th

NO-NO₂-NO_x AnalyzerEquipment : NO-NO₂-NO_x analyzer.

Model : 42i

Serial Number : CM13090047

Manufacturer : Thermo

Diagnostic test value

Parameter	Observed value		Unit	Nominal range
	Before	After		
Sample reading				
NO reading	7.5	5.8	ppb	
NO _x reading	9.5	7.9	ppb	
Range	500	500	ppb	50 to 1000 ppb
Averaging Time	60	60	Sec	10 to 300 Sec
Calibration Factors				
NO BKG. ppb	49.8	49.8	ppb	0 to 60
NO _x BKG. ppb	44.8	44.8	ppb	0 to 60
NO COEF.	0.948	0.948	-	1.0 ± 0.3
NO _x COEF.	1.000	1.000	-	1.0 ± 0.3
NO ₂ COEF.	1.000	1.000	-	1.0 ± 0.3
Instrument Controls				
Ozonator	On	On		On/Off
PMT Supply	On	On		On/Off
Auto/Manual Mode	NO/NO _x	NO/NO _x		NO/NO _x , NO, NO _x
Baud Rate	9600	9600	bps	1200 to 9600
Temp Compensation	On	On	-	On/Off
Pressure Compensation	On	On	-	On/Off
Screen Contrast	55	55	%	0 to 100
Service Mode	Off	Off	-	On/Off, Up to used
Diagnostics				
Voltages				
Motherboard voltages:				
3.3 Supply	3.3	3.3	Vdc	3.3 ± 1 Vdc
5.0 Supply	5.0	5.0	Vdc	5.0 ± 1 Vdc
15.0 Supply	14.9	14.9	Vdc	15.0 ± 1 Vdc
24.0 Supply	24.1	24.1	Vdc	24.0 ± 1 Vdc
-3.3 Supply	-3.2	-3.2	Vdc	-3.3 ± 1 Vdc
Interface board voltages:				
PMT Supply	-906.5	-906.5	Vdc	-400 to -1200 Vdc
3.3 Supply	3.3	3.3	Vdc	3.3 ± 1 Vdc
5.0 Supply	5.0	5.0	Vdc	5.0 ± 1 Vdc
15.0 Supply	14.9	14.9	Vdc	15.0 ± 1 Vdc
P15.0 Supply	15.2	15.2	Vdc	15.0 ± 1 Vdc
24.0 Supply	23.3	23.3	Vdc	24.0 ± 1 Vdc
-15.0 Supply	-15.2	-15.2	Vdc	-15.0 ± 1 Vdc
Temperatures				
Internal	27.8	28.0	°C	15 °C to 45 °C
Chamber	49.6	49.7	°C	50°C ± 2 °C
Cooler	-2.7	-2.7	°C	(-)3 °C ± 2 °C
Converter	323.4	325.1	°C	325 °C ± 5 °C
Converter Set	325.0	325.0	°C	325 °C
Pressure	315.8	318.8	mmHg	250 ± 100 mmHg
Flow	0.548	0.548	L/min	0.5 to 1.00 L/min

Note :



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Website <http://www.qshe.co.th> E-mail-address: info@qshe.co.th

SO₂ Analyzer

Equipment : Sulfur Dioxide analyzer.

Model : 43i

Serial Number : 1310957747

Manufacturer : Thermo

Diagnostic test value				
Parameter	Observed value		Unit	Nominal range
	Before	After		
Sample reading	7.6	7.1	ppb	
Range	500	500	ppb	50 to 1000 ppb
Averaging Time	30	30	Sec	10 to 300 Sec
Calibration Factors				
SO ₂ BKG. ppb	110.0	109.7	ppb	0 to 60
SO ₂ COEF	0.977	0.977	-	1.0 ± 0.3
Instrument Controls				
Temp Compensation	On	On	On/Off	On
Pressure Compensation	On	On	On/Off	On
Flash Lamp	On	On	On/Off	On
Communication setting				
Baud Rate	9600	9600	bps	9600 to 115000
Instrument ID	43	43	-	0 to 99
Screen Contrast	50	50	%	0 to 100
Service Mode	Off	Off	On/Off	Up to used
Diagnostics				
Voltages				
Motherboard voltages:				
3.3 Supply	3.3	3.3	Vdc	3.3 +/- 1 Vdc
5.0 Supply	5.0	5.0	Vdc	5.0 +/- 1 Vdc
15.0 Supply	15.1	15.1	Vdc	15.0 +/- 1 Vdc
24.0 Supply	23.7	23.7	Vdc	24.0 +/- 1 Vdc
-3.3 Supply	-3.1	-3.1	Vdc	- 3.3 +/- 1 Vdc
Interface board voltages:				
PMT Supply	-685.2	-685.2		
Flash Supply	842	845		
3.3 Supply	3.2	3.2	Vdc	3.3 +/- 1 Vd
5.0 Supply	5.0	5.0	Vdc	5.0 +/- 1 Vdc
15.0 Supply	14.7	14.7	Vdc	15.0 +/- 1 Vdc
-15.0 Supply	-15.0	-15.0	Vdc	-15.0 +/- 1 Vdc
24.0 Supply	23.2	23.2	Vdc	24.0 +/- 1 Vdc
Temperatures				
Internal	31.8	32.0	°C	15°C to 45°C
Chamber	44.9	45.0	°C	45°C ± 2°C
Pressure	760.0	760.0	mmHg	750 ± 100 mmHg
Flow	0.513	0.513	L/min	0.5 to 1.00 L/min
Lamp intensity	88	89	%	40 – 100 %

Note : หน้าจอมีด มองไม่ชัดเจน



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Website <http://www.qshe.co.th> E-mail-address: info@qshe.co.th

SINGLE-POINT GAS CALIBRATION

NO_x, SO₂, CO Analyzer.

Equipment :	All analyzer.	Model :	42i, 43i,THC
Serial Number :	--	Manufacturer :	Thermo, Horiba

Standard gas concentration			Dilutor detail	
Sulfur Dioxide (SO ₂)	44.44	ppm	Manufacturer :	Thermo
Nitric Oxide (NO)	45.84	ppm	Model :	146i
Methane (CH ₄)	506.7	ppm	Serial number :	1201351404
Carbon Monoxide (CO)	4513	ppm		
Cylinder NO. :	CC507818			
Expiration Date :	13 Aug 2023			

BEFORE CALIBRATION RESULT

PARAMETER	ZERO			SPAN			JUDGEMENT
	IDEAL	ACTUAL	ERROR	IDEAL	ACTUAL	%ERROR	
NO (ppb)	0.00			400			
NO _x (ppb)	0.00			400			
SO ₂ (ppb)	0.00			400			
CH ₄ (ppm)	0.00			4.43			
THC(ppm)	0.00			4.43			

AFTER CALIBRATION RESULT

PARAMETER	ZERO			SPAN			JUDGEMENT
	IDEAL	ACTUAL	ERROR	IDEAL	ACTUAL	%ERROR	
NO (ppb)	0.00			400			
NO _x (ppb)	0.00			400			
SO ₂ (ppb)	0.00			400			
CH ₄ (ppm)	0.00			4.00			
THC(ppm)	0.00			4.00			

Remark:



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โทรศัพท์ : (662) 939-5711 (12 Lines) โทรสาร : (662) 939-4207-8

Website <http://www.qshe.co.th> E-mail-address: info@qshe.co.th

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:	N68APSSFxMP
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.

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

☒ BRAM	Pass
☒ EPROM	Pass

4. Review:

- ☒ Review with the customer PM work performed.
- ☒ Review with the customer routine maintenance procedures.
- ☒ Discuss recommended customer-supplied materials to have on hand
- ☒ Attach PM sticker.
- ☒ Update Logbook.

Additional Comments

Additional Comments Regarding the PM

Review

<i>The preventive maintenance checks and if applicable performance tests for Clarus600/680 GC have been completed.</i>	
<i>This Clarus600/680 GC Pass the preventive maintenance.</i>	
Review of Preventive Maintenance:	
Authorized PerkinElmer Representative: Monchai Kitcharoenkeat <i>Monchai</i>	Date: 13-Aug-2025 (DD-MMM-YYYY)
Authorized Customer Representative: Ms.Naruecha <i>Naruecha</i>	Date: 13-Aug-2025 (DD-MMM-YYYY)

GC Clarus 600/680 Preventive Maintenance (PM)

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

Part Number	Release	Publication Date	
TH09370070	C	August 2016	

Scope

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

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Component List

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

Parts Lists

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

Procedure Checklist

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

1. General:

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

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

L-N 220 Volt

L-G 220 Volt

N-G 0.46 Volt

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

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

Carrier gas ☒ Helium ☐ Nitrogen ☐ Hydrogen

Moisture level ☒ Good ☐ Need to replace ☐ Other _____

Detector gas ☒ Air Zero ☒ Hydrogen ☐ Nitrogen ☐ Helium

Moisture level ☒ Good ☐ Need to replace ☐ Other _____

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

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

Gas leakage ☒ Pass ☐ Fail Comment _____

- ☒ Perform general inspection of system for cleanliness.

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

Electronic cooling fan ☒ Yes ☐ No

Oven cooling fan ☒ Yes ☐ No

2. Electronic :

- ☒ Check oven temperature. Calibrate if necessary.

Oven temperature set point 150 °C ☒ Pass ☐ Fail

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

Oven temperature set point 5 °C ☐ Pass ☐ Fail

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

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

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

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

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

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

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

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

3. Diagnostics Tests:

- ☒ Run instrument diagnostics.

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

☒ BRAM	Pass
☒ EPROM	Pass

4. Review:

- ☒ Review with the customer PM work performed.
- ☒ Review with the customer routine maintenance procedures.
- ☒ Discuss recommended customer-supplied materials to have on hand
- ☒ Attach PM sticker.
- ☒ Update Logbook.

Additional Comments

Additional Comments Regarding the PM

Review

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

คุณภาพน้ำ

Certificate of Calibration

Certificate No. : 68-400046-2

Page : 1 of 2

Submitted by : S. P. S Consulting Service Co., Ltd.
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900

Equipment : Liquid in Glass Thermometer
Manufacturer : SK Model : N/A
Range : 0 °C to 100 °C Resolution : 1 °C
Serial No. : N/A Immersion : Total
ID No. : TM21/59

Environment : Ambient Temperature : (23 ± 2) °C
Relative Humidity : (50 ± 15) %
Line Voltage : (220 ± 22) VAC

Date of Received : 21 January 2025

Date of Calibration : 24 January 2025

Date of Issue : 24 January 2025

Calibrated by : Chortip Samchusri

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

The temperature scale used was based on ITS-90

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

1. Platinum Resistance Thermometer (PRT)

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

2. Standard Digital Thermometer

ID No.	Cert. No.	Due Date	Traceability
400003	23E1866	01 Jun 2025	National Institute of Metrology Thailand (NIMT)
400004	23E1866	01 Jun 2025	National Institute of Metrology Thailand (NIMT)

Approved by :



(Permpoon Chanpu)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 68-400046-2

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

Ice point check : UUC* reading 0 °C Standard reading 0.4429 °C

Standard Reading (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (± °C)
20.4801	20	0.5	0.31

Remark

UUC : Unit Under Calibration

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

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

- ๐0๐ -



Certificate of Calibration

Certificate No. : 69-400023-2

Page : 1 of 2

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

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

Equipment : Liquid in Glass Thermometer

Manufacturer : SK

Model : N/A

Range : 0 °C to 100 °C

Resolution : 1 °C

Serial No. : N/A

Immersion : Total

ID No. : TM21/59

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

Relative Humidity : (50 ± 15) %

Line Voltage : (220 ± 22) VAC

Date of Received : 13 January 2026

Date of Calibration : 16 January 2026

Date of Issue : 16 January 2026

Calibrated by : Chortip Samchusri

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

The temperature scale used was based on ITS-90

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

1. Platinum Resistance Thermometer (PRT)

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

2. Standard Digital Thermometer

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

Approved by :



(Permpon Chanpu)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 69-400023-2

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

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

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

Remark

UUC : Unit Under Calibration

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

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

- o()o -





Accredited
ISO/IEC 17025

CALIBRATION LABORATORY Co., LTD.

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

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



CERTIFICATE OF CALIBRATION FOR

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

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

DATE OF RECEIVED : 17 June 2025

DATE OF ISSUED : 20 June 2025

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

Calibrated By : Sukgasem Seehanart
Wenick Inchaisri
Calibration Engineer

Approved By : Mongkol Yotsoontorn
Authorized Signatory
20 June 2025



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

Certificate No. Q25070523

F3-011-05/12-23

page 1 of 4

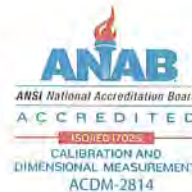


@clccalibration



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



REPORT OF CALIBRATION

FOR

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

ENVIRONMENT CONDITIONS :

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

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

PROCEDURE USED :

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

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

REFERENCE STANDARD USED :

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

Certificate No. **Q25070523**

F3-011-05/12-23

page 2 of 4



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TRACEABILITY :

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

UNCERTAINTY :

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

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

Certificate No. Q25070523

F3-011-05/12-23

page 3 of 4



@clccalibration



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CALIBRATION LABORATORY Co., LTD.

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



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

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

CALIBRATION DATA

1. pH METER RESULT @ 25 °C

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

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

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

2. TEMPERATURE RESULT

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

Technical Note. Type of sensor : Thermistor

Probe $\varnothing$ 3 mm

Materials : Metal Sheath.

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

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

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

End of Certificate

Certificate No. Q25070523

F3-011-05/12-23

page 4 of 4



@clccalibration

**QUALITY CALIBRATION CO., LTD.**

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



CERTIFICATE No : 26E3363
REFERENCE No : 80514-1

PAGE : 1 OF 3

Certificate of Calibration

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

CALIBRATED BY : ATSAWIN Y.

CALIBRATION DATE : 02-Apr-26

APPROVED BY : 
PONGSAK J.

ISSUED DATE : 02-Apr-26

RECEIVED DATE : 01-Apr-26

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





QUALITY CALIBRATION CO., LTD.

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

CERTIFICATE No : 26E3363

PAGE : 2 OF 3

Calibration Report

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

CONDITION OF THIS RESULTS OF CALIBRATION

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

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

3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
5. THIS CERTIFICATE IS TRACEABLE TO SI UNIT MAINTAINED AT :-
 - NATIONAL INSTITUTE OF STANDARD AND TECHNOLOGY, USA.
 - NATIONAL INSTUTITE OF METROLOGY (THAILAND)

RESULT OF CALIBRATION : ADJUSTMENT

1. DISPLAY UNIT ONLY

SLOPE FACTOR $k = 2.303 RT/F = 59 \text{ mV/pH}$

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

END OF CALIBRATION REPORT PAGE 2 OF 3





QUALITY CALIBRATION CO., LTD.

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

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

CERTIFICATE No : 26E3363

PAGE : 3 OF 3

Calibration Report

RESULT OF CALIBRATION (CONTINUE) :

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

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

3. DISPLAY UNIT WITH TEMPERATURE

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

4. PERCENT SLOPE 91%

UUC : UNIT UNDER CALIBRATION

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

END OF CALIBRATION REPORT





CERTIFICATE No : 25M2256
REFERENCE No : 76365-3

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE

MANUFACTURER : SARTORIUS

MODEL : BSA224S-CW

SERIAL No : 36591843

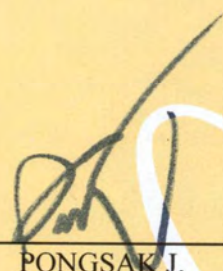
ID No : BA09/61

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 :-

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

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

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

5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND)

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

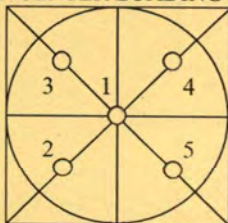
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0.000071 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

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

5. OFF CENTER LOADING ERROR



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

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

END OF CALIBRATION REPORT





CERTIFICATE No : 26M2268

REFERENCE No : 80204-3

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE

MANUFACTURER : SARTORIUS

MODEL : BSA224S-CW

SERIAL No : 36591843

ID No : BA 09/61

CONDITION AS RECEIVED : USED ITEM

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

CALIBRATED BY : SUCHAT S.

CALIBRATION DATE : 05-Mar-26

APPROVED BY : 
PONGSAK J.

ISSUED DATE : 06-Mar-26

RECEIVED DATE : 05-Mar-26





CERTIFICATE No : 26M2268

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : BSA224S-CW
MANUFACTURER : SARTORIUS S/N : 36591843
ID No : BA 09/61 RECEIVED DATE : 05-Mar-26
AIR PRESSURE : 1004mbar $\pm$ 1mbar CALIBRATION DATE : 05-Mar-26
AMBIENT TEMPERATURE : 25° C $\pm$ 1° C RELATIVE HUMIDITY : 50 %RH $\pm$ 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

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

2. REFERENCE STANDARD INSTRUMENTS :-

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

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

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

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

- NATIONAL INSTITUTE OF METROLOGY (THAILAND)

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

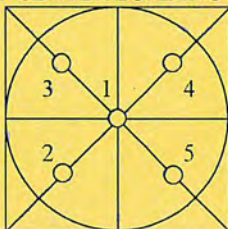
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0.000055 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

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

5. OFF CENTER LOADING ERROR



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

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

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

END OF CALIBRATION REPORT



CERT.No.: HS-W015C

Certificate of Calibration

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)

CERT.No.: HS-X014C

Harikul Science Co.,Ltd.

694 Soi Ratchadanivet 24, Pracharatbamphen,

Samsaennok, Huaikhwang, Bangkok 10310

Tel: 0-2274-2456 Fax: 0-2274-2443

Email: info@harikul.com www.harikul.com

Certificate of Calibration

Calibration Date : 16 March 2026

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

7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol,

Chatuchak, Bangkok, Thailand 10900

Avg Room Temp : 20 °C

Avg Water Temp : 20 °C

Air Pressure : 760.00 mmHg

Salinity : 0 ppt

Model : YSI 5000

S/N : 15B100751

Probe : YSI 5010

S/N : 22D100097

ID NO. :

Air Temp ref : S/N. F8065C26

Barometric ref : S/N. F8065C26

Water Temp ref : -

ID NO. HS001

Technician : Kittipong M.

Calibration Details

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

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

Overall Status (PASS)

Manufacturer Specification

Accuracy = +/- 0.02 mg/l

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



Technician Signature
(Kittipong Maekwong)



Laboratory Manager
(Natenapha Pisatkunchon)

**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





QUALITY CALIBRATION CO., LTD.

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

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

CERTIFICATE No : 25T0520

PAGE : 2 OF 2

Calibration Report

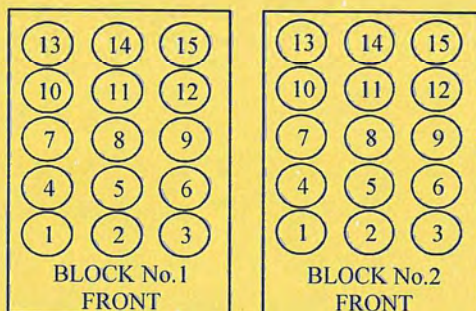
EQUIPMENT : COD REACTOR
MANUFACTURER : HACH
ID NUMBER : DRB 05/59
RECEIVED DATE : 15-Jan-25
AMBIENT TEMPERATURE : 23° C ± 1° C
MODEL : DRB 200
SERIAL NUMBER : 15110C0497
CALIBRATION DATE : 27-Jan-25
RELATIVE HUMIDITY : 53 %RH ± 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

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

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

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



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

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





QUALITY CALIBRATION CO., LTD.

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

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

www.qcalibration.com

CERTIFICATE No : 26T0464

REFERENCE No : 79659-1

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : COD REACTOR

MANUFACTURER : HACH

MODEL : DRB 200

SERIAL No : 15110C0497

ID No : DRB 04/59

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

CALIBRATED BY : SOMCHAI S.

CALIBRATION DATE : 30-Jan-26

APPROVED BY : 
PONGSAK J.

ISSUED DATE : 30-Jan-26

RECEIVED DATE : 30-Jan-26

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





CERTIFICATE No : 26T0464

PAGE : 2 OF 2

Calibration Report

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

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

CONDITION OF THIS RESULTS OF CALIBRATION

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

2. REFERENCE STANDARD INSTRUMENTS :-

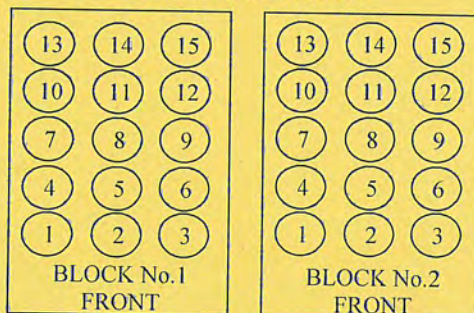
INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) DATA LOGGER WITH TC TYPE K	HYDRA 2635A	6849323	25T5342	18-Jun-26

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

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

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

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



TEMPERATURE MEASUREMENT ACCURACY TEST

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

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

NOTE 2 : LOCATION 10 WAS REFERENCE LOCATION.

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

END OF CALIBRATION REPORT



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)

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

UUC* = Unit Under Calibration

Cert. No. : SP25026

Job No. : VC68SP0019

Pages : 3 of 4

Result of calibration : Photometric Accuracy

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

UUC* = Unit Under Calibration

Cert. No. : SP25026

Job No. : VC68SP0019

Pages : 4 of 4

Result of calibration : Photometric Accuracy

(Without adjustment)

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

UUC* = Unit Under Calibration

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

Resolution of Wavelength Mode 0.1 nm

Resolution of Photometric Mode 0.001 A

Parameter Setting

Measurement Mode Wavelength, Absorbance

Wavelength Scan 190 nm - 1100 nm

Scanning Speed 7.5 nm/min

Band width(Wavelength) 1.0

Band width(Vis) 1.0

Band width(Uv) 1.0

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

**Specific Acceptance :

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

**Stray light not TISI Accredited

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

End of Calibration Certificate

GC Clarus 600/680 Preventive Maintenance (PM)

Company Name:	S.P.S. Consulting Service Co.,Ltd		
Address (Instrument Location):	7 Soi Phaholyothin24 Phaholyothin Road, Jompol, Chatuchak, Bangkok, 10900.		
Serial Number:	680S14042502	Service Tag:	N68APSSFxMP
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.

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

☒ BRAM	Pass
☒ EPROM	Pass

4. Review:

- ☒ Review with the customer PM work performed.
- ☒ Review with the customer routine maintenance procedures.
- ☒ Discuss recommended customer-supplied materials to have on hand
- ☒ Attach PM sticker.
- ☒ Update Logbook.

Additional Comments

Additional Comments Regarding the PM

Review

<i>The preventive maintenance checks and if applicable performance tests for Clarus600/680 GC have been completed.</i>	
<i>This Clarus600/680 GC Pass the preventive maintenance.</i>	
Review of Preventive Maintenance:	
Authorized PerkinElmer Representative: Monchai Kitcharoenkeat <i>Monchai</i>	Date: 13-Aug-2025 (DD-MMM-YYYY)
Authorized Customer Representative: Ms.Naruecha <i>Naruecha</i>	Date: 13-Aug-2025 (DD-MMM-YYYY)

GC Clarus 600/680 Preventive Maintenance (PM)

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

Part Number	Release	Publication Date	
TH09370070	C	August 2016	

Scope

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

General Instructions:

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

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Component List

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

Parts Lists

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

Procedure Checklist

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

1. General:

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

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

L-N 220 Volt

L-G 220 Volt

N-G 0.46 Volt

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

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

Carrier gas ☒ Helium ☐ Nitrogen ☐ Hydrogen

Moisture level ☒ Good ☐ Need to replace ☐ Other _____

Detector gas ☒ Air Zero ☒ Hydrogen ☐ Nitrogen ☐ Helium

Moisture level ☒ Good ☐ Need to replace ☐ Other _____

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

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

Gas leakage ☒ Pass ☐ Fail Comment _____

- ☒ Perform general inspection of system for cleanliness.

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

Electronic cooling fan ☒ Yes ☐ No

Oven cooling fan ☒ Yes ☐ No

2. Electronic :

- ☒ Check oven temperature. Calibrate if necessary.

Oven temperature set point 150 °C ☒ Pass ☐ Fail

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

Oven temperature set point 5 °C ☐ Pass ☐ Fail

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

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

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

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

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

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

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

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

3. Diagnostics Tests:

- ☒ Run instrument diagnostics.

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

☒ BRAM	Pass
☒ EPROM	Pass

4. Review:

- ☒ Review with the customer PM work performed.
- ☒ Review with the customer routine maintenance procedures.
- ☒ Discuss recommended customer-supplied materials to have on hand
- ☒ Attach PM sticker.
- ☒ Update Logbook.

Additional Comments

Additional Comments Regarding the PM

Review

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



MIRACLE INTERNATIONAL TECHNOLOGY CO.,LTD

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



CALIBRATION CERTIFICATE

Page 1 of 2

Certificate No. : S2025070410-0002

Date Issued : 24-Jul-25

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

Equipment : Incubator

Manufacturer : BINDER

Model : BD 240

Serial No. : 12-17739

ID No./Tag No. : IN 04/56

Date Received : 22-Jul-25

Date Calibrated : 22-Jul-25

Calibrated by : Auttapol Kunaumpal

Calibration Method or Calibration Procedure Used

Standard method : CP-05 TLAS G-20.

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

Result of Calibration

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

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

Approved by:

K. Nathong
(Nathapong Krudaum)



Certificate No. : S2025070410-0002

Environment : Ambient Temperature : Start record 25.1 °C, Stop record 25.1 °C
Relative Humidity : Start record 48.9 %RH, Stop record 49.3 %RH

Calibration Temperature (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Stability ¹ (°C)	Measured Uniformity ² (°C)	Overall Variation ³ (°C)
35	35.0	35.0	0.12	0.35	0.40

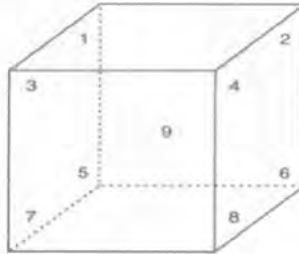
Without adjustment

Calibration Temperature (°C)	STD No. 1 (°C)	STD No. 2 (°C)	STD No. 3 (°C)	STD No. 4 (°C)	STD No. 5 (°C)	STD No. 6 (°C)	STD No. 7 (°C)	STD No. 8 (°C)	STD No. 9 (°C)	Uncertainty ⁴ (±°C)
35	34.91	34.82	34.86	34.88	34.75	34.74	34.89	34.87	34.91	0.23

STD = Standard

Note : Probe No. 9 is Reference Probe

Setting Air Fresh No. OFF



Condition As-Received : Used Item

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

Measurement Standards Used & Traceability :

The International System of Units (SI) through

MIT Certificate No. L202412300-0027 for Temperature Indicator with Sensor Serial No. US37020317, Due 09-Sep-25

Notes : 1. The temperature stability is the one-half of greatest maximum difference of measured temperatures at any one probe.

2. The temperature uniformity is the maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time.

3. Overall variation is the difference of maximum and minimum measured temperatures throughout observation time.

4. The uncertainty of measurement is included temperature stability.

5. The temperature uniformity, stability, overall variation and indicating temperature is applicable to all air or gas filled temperature controlled enclosures at atmospheric pressure.

End of Certificate



CERTIFICATE No : 25T2261

REFERENCE No : 76365-8

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : WATER BATH

MANUFACTURER : MEMMERT

MODEL : WNB29

SERIAL No : L614.0123

ID No : WB 05/58

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 : SUCHART S.

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 : 25T2261

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : WATER BATH
MANUFACTURER : MEMMERT
ID NUMBER : WB 05/58
RECEIVED DATE : 07-Mar-25
AMBIENT TEMPERATURE : 24 °C ± 1 °C

MODEL : WNB29
SERIAL NUMBER : L614.0123
CALIBRATION DATE : 07-Mar-25
RELATIVE HUMIDITY : 51 %RH ± 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

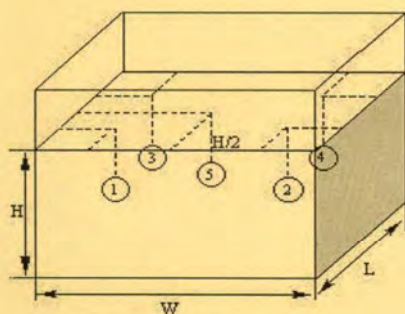
1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO ASTM E715-80 (REAPPROVED 2001) BY COMPARISON WITH CALIBRATED RTD. THE PROBES WERE PLACED ON FIVE POINTS AND LOCATED ONE PROBE IN EACH OF THE FOUR CORNERS OF THE BATH AND PLACED THE FIFTH RTD WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE WATER VOLUME (REFERENCE LOCATION) UNDER NO LOAD CONDITION.

2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) DATA LOGGER WITH RTD	2625A	6603614	24T6473	01-Jul-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



PROBE INSTALLATION
POSITION IN THE BATH

GENERAL INFORMATION

Overall Variation of Ambient Temperature around the Bath (°C) : 0.6
Overall Variation of Line Voltage (V) : 12
Instrument Condition : Normal
Bath Inner Size (W*L*H) : 60*40*10 cm

BATH PERFORMANCE

Calibration Point (°C)	Controller Temperature (°C)	Temperature Stability (±°C)	Radius Uniformity (°C)	Axial Uniformity (°C)	Overall Variation (°C)
50.0	50.2	0.06	0.05	0.03	0.16
60.0	60.2	0.06	0.08	0.04	0.17

TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Indicating Temp (°C)	Measured Temperature (°C) at Spread Locations					Uncertainty (± °C)
		#1	#2	#3	#4	Ref. 5	
50.2	50.2	49.84	49.88	49.86	49.88	49.89	0.15
60.2	60.2	59.83	59.84	59.85	59.86	59.91	0.16

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

NOTE 2 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.

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

END OF CALIBRATION REPORT





CERTIFICATE No : 26T2274

REFERENCE No : 80205-1

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : WATER BATH

MANUFACTURER : MEMMERT

MODEL : WNB29

SERIAL No : L614.0123

ID No : WB 05/58

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 : CHARUKIT L.

CALIBRATION DATE : 05-Mar-26

APPROVED BY : 
PONGSAK J.

ISSUED DATE : 09-Mar-26

RECEIVED DATE : 05-Mar-26





Calibration Report

EQUIPMENT : WATER BATH
MANUFACTURER : MEMMERT
ID NUMBER : WB 05/58
RECEIVED DATE : 05-Mar-26
AMBIENT TEMPERATURE : 26 °C ± 1 °C
MODEL : WNB29
SERIAL NUMBER : L614.0123
CALIBRATION DATE : 05-Mar-26
RELATIVE HUMIDITY : 53 %RH ± 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

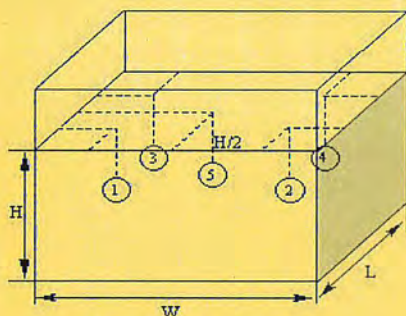
1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO ASTM E715-80 (REAPPROVED 2001) BY COMPARISON WITH CALIBRATED RTD. THE PROBES WERE PLACED ON FIVE POINTS AND LOCATED ONE PROBE IN EACH OF THE FOUR CORNERS OF THE BATH AND PLACED THE FIFTH RTD WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE WATER VOLUME (REFERENCE LOCATION) UNDER NO LOAD CONDITION.

2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) DATA LOGGER WITH RTD	2625A	6603614	25T5341	04-Jun-26

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

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



PROBE INSTALLATION
POSITION IN THE BATH

GENERAL INFORMATION

Overall Variation of Ambient Temperature around the Bath (°C) : 0.8

Overall Variation of Line Voltage (V) : 6

Instrument Condition : Normal

Bath Inner Size (W*L*H) : 60*40*10 cm

BATH PERFORMANCE

Calibration Point (°C)	Controller Temperature (°C)	Temperature Stability (±°C)	Radius Uniformity (°C)	Axial Uniformity (°C)	Overall Variation (°C)
50.0	50.3	0.03	0.05	0.04	0.08
60.0	60.3	0.03	0.07	0.05	0.13

TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Indicating Temp (°C)	Measured Temperature (°C) at Spread Locations					Uncertainty (± °C)
		#1	#2	#3	#4	Ref. 5	
50.3	50.3	49.88	49.89	49.94	49.93	49.92	0.14
60.3	60.3	59.94	59.93	60.01	60.00	59.99	0.15

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

NOTE 2 : 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



ระดับเสียงในบริเวณชุมชน



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-69/0204

MTC No. EEL. BP. 152/0169

CALIBRATION CERTIFICATE

Submitted by : S.P.S.CONSULTING SERVICE CO.,LTD.
Address : 7 Soi Phaholyothin 24, Phaholyothin Road, Jompol, Chatuchak, Bangkok 10900.
Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.
Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Sound Calibrator
Manufacturer : ACO
Model : 2127
Serial No. : 130006

Ambient Environment

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

Standards used :

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

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

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

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

Date of Receipt : 29 Jan. 2026

Date of Calibration : 11 Feb. 2026

1 / 2

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

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

FM.BL.MTC.002 Rev.5

Head Office

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

Office/Laboratory

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

Office

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

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-69/0204

MTC No. EEL. BP. 152/0169

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

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

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

1. Sound Pressure Level

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

2. Frequency

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

3. Total Distortion

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

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :


(Mr. Weerachai Deechaiyae)

Approved by :


(Mr. Prawate Kluaypa)
Director

Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Date of Calibration : 11 Feb. 2026

Date of Issue : 12 Feb. 2026

Ref : 2011269012900497001

End of Certificate

2 / 2

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

FM.BL.MTC.002 Rev.5

Head Office

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

Office/Laboratory

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

Office

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



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

Noise R_128/26

Sound Level Meter Calibration Report

Acoustic Calibrator Data

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

Calibration Data

Sound Level Meter Data

Calibration Data

SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-R15	ACO	6236	00172062	12 March 2026	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.81 ± 0.10 dB	

Calibrated by :

Heeson L.

(Mr. Heeson Lormae)

Approved by :

Yutthana J.

(Mr. Yutthana Tanatharanit)



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-69/0204

MTC No. EEL. BP. 153/0169

CALIBRATION CERTIFICATE

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

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

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

Instrument Calibrated :

Description : Sound Calibrator

Manufacturer : Cirrus

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 Keithley 2015-P S/N 4106495.
 7. Condenser Microphone Bruel&Kjaer 4180 S/N 2889871.

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

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

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

Date of Receipt : 29 Jan. 2026

Date of Calibration : 11 Feb. 2026

1 / 2
W

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

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FM.BL.MTC.002 Rev.5

Head Office

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(66) 08 1889 6827

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-69/0204

MTC No. EEL. BP. 153/0169

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

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

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

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	93.95	-0.05	± 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	1000.3	0.3	± 1.5	$\pm 1.0\%$

3. Total Distortion

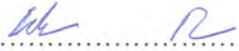
Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	1.60	± 0.50	$\pm 3.0\%$

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :


.....
(Mr. Weerachai Deechaiyae)

Approved by :


.....
(Mr. Prawate Kluaypa)


Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 11 Feb. 2026

Date of Issue : 12 Feb. 2026

Ref : 2011269012900497002

End of Certificate

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Noise R_128-1/26

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	11 February 2026
		Due Date	11 February 2027

Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
CR-B01	Cirrus	CR161B	G301393	12 March 2026	94.0	94.0
CR-B02	Cirrus	CR161B	G301157	12 March 2026	94.0	94.0
CR-B03	Cirrus	CR161B	G301155	12 March 2026	94.0	94.0
CR-B04	Cirrus	CR161B	G301404	12 March 2026	94.0	94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					94.04 ± 0.10 dB	

Calibrated by :

Heeson L.

(Mr. Heeson Lormae)

Approved by :

Yutthana S.

(Mr. Yutthana Tanatharanit)

ระดับเสียงในพื้นที่โรงงาน



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

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

Noise R_007/26

Sound Level Meter Calibration Report

Acoustic Calibrator Data

Brand	ACO	Number	AC 03/56
Model	2127	Serial No.	130006
Calibration Range	94 dB, 1000 Hz	Last Calibration	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-R52	ACO	6236	00192064	12 January 2026	94.0	93.9
ACO-B29	ACO	6236	00182011	12 January 2026	94.0	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.81 ± 0.10 dB	

Calibrated by :

Heeson L.

(Mr. Heeson Lormae)

Approved by :

Yutthana J.

(Mr. Yutthana Tanatharanit)



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Noise R_014/26

Sound Level Meter Calibration Report

Acoustic Calibrator Data

Brand	ACO	Number	AC 03/56
Model	2127	Serial No.	130006
Calibration Range	94 dB, 1000 Hz	Last Calibration	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-R40	ACO	6236	00192052	13 January 2026	93.9	93.9
ACO-R50	ACO	6236	00192062	13 January 2026	94.0	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.81 ± 0.10 dB	

Calibrated by :

Heeson L.
(Mr. Heeson Lormae)

Approved by :

Yutthana S.
(Mr. Yutthana Tanatharanit)



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Noise R_015/26

Sound Level Meter Calibration Report

Acoustic Calibrator Data

Brand	ACO	Number	AC 03/56
Model	2127	Serial No.	130006
Calibration Range	94 dB, 1000 Hz	Last Calibration	21 February 2025
		Due Date	21 February 2026

Calibration Data

Sound Level Meter Data

Calibration Data

Actual Reading [dB]

SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-R40	ACO	6236	00192052	13 January 2026	93.9	93.9
ACO-R41	ACO	6236	00192053	13 January 2026	93.9	93.9

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

93.81 ± 0.10 dB

Calibrated by :

Heeson L.

(Mr. Heeson Lormae)

Approved by :

Yutthana J.

(Mr. Yutthana Tanatharanit)



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

Noise R_027/26

Sound Level Meter Calibration Report

Acoustic Calibrator Data

Brand	ACO	Number	AC 03/56
Model	2127	Serial No.	130006
Calibration Range	94 dB, 1000 Hz	Last Calibration	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-R51	ACO	6236	00192063	14 January 2026	93.9	93.9
ACO-R52	ACO	6236	00192064	14 January 2026	93.9	93.9

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

93.81 ± 0.10 dB

Calibrated by :

Heeson L.

(Mr. Heeson Lormae)

Approved by :

Yutthana J.

(Mr. Yutthana Tanatharanit)



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-69/0204

MTC No. EEL. BP. 152/0169

CALIBRATION CERTIFICATE

Submitted by : S.P.S.CONSULTING SERVICE CO.,LTD.
Address : 7 Soi Phaholyothin 24, Phaholyothin Road, Jompol, Chatuchak, Bangkok 10900.
Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.
Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Sound Calibrator
Manufacturer : ACO
Model : 2127
Serial No. : 130006

Ambient Environment

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

Standards used :

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

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

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

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

Date of Receipt : 29 Jan. 2026

Date of Calibration : 11 Feb. 2026

1 / 2

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FM.BL.MTC.002 Rev.5

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-69/0204

MTC No. EEL. BP. 152/0169

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

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

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

1. Sound Pressure Level

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

2. Frequency

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

3. Total Distortion

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

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :


(Mr. Weerachai Deechaiyae)

Approved by :


(Mr. Prawate Kluaypa)
Director

Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Date of Calibration : 11 Feb. 2026

Date of Issue : 12 Feb. 2026

Ref : 2011269012900497001

End of Certificate

2 / 2

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FM.BL.MTC.002 Rev.5

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

Noise R_107/26

Sound Level Meter Calibration Report

Acoustic Calibrator Data

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

Calibration Data

Sound Level Meter Data

Calibration Data

Actual Reading [dB]

SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-R51	ACO	6236	00192063	24 February 2026	93.9	93.9
ACO-R52	ACO	6236	00192064	24 February 2026	93.9	93.9

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

93.81 ± 0.10 dB

Calibrated by :

Heeson L.

(Mr. Heeson Lormae)

Approved by :

Yutthana J.

(Mr. Yutthana Tanatharanit)



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Noise R_187/26

Sound Level Meter Calibration Report

Acoustic Calibrator Data

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

Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-B43	ACO	6236	00192034	20 April 2026	93.9	93.9
ACO-R51	ACO	6236	00192063	20 April 2026	93.8	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.89 ± 0.10 dB	

Calibrated by :

Heeson L.
(Mr. Heeson Lormae)

Approved by :

Yutthana S.
(Mr. Yutthana Tanatharanit)



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Noise R_188/26

Sound Level Meter Calibration Report

Acoustic Calibrator Data

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

Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-B43	ACO	6236	00192034	20 April 2026	93.9	93.9
ACO-R52	ACO	6236	00192064	20 April 2026	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.89 ± 0.10 dB	

Calibrated by :

Heeson L

(Mr. Heeson Lormae)

Approved by :

Yutthana J

(Mr. Yutthana Tanatharanit)



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

Noise R_196/26

Sound Level Meter Calibration Report

Acoustic Calibrator Data

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

Calibration Data

Sound Level Meter Data

Calibration Data

Actual Reading [dB]

SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-R41	ACO	6236	00192053	21 April 2026	93.9	93.9
ACO-R50	ACO	6236	00192062	21 April 2026	93.8	93.9

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

93.89 ± 0.10 dB

Calibrated by :

Heeson L.
(Mr. Heeson Lormae)

Approved by :

Yutthana J.
(Mr. Yutthana Tanatharanit)



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Noise R_205/26

Sound Level Meter Calibration Report

Acoustic Calibrator Data

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

Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-R40	ACO	6236	00192052	22 April 2026	93.8	93.9
ACO-R41	ACO	6236	00192053	22 April 2026	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.89 ± 0.10 dB	

Calibrated by :

Heeson L.
(Mr. Heeson Lormae)

Approved by :

Yutthana J.
(Mr. Yutthana Tanatharanit)



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

Noise R_204/26

Sound Level Meter Calibration Report

Acoustic Calibrator Data

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

Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-B18	ACO	6236	00172048	22 April 2026	93.8	93.9
ACO-B29	ACO	6236	00182011	22 April 2026	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.89 ± 0.10 dB	

Calibrated by :

Heeson

(Mr. Heeson Lormae)

Approved by :

Yutthana S.

(Mr. Yutthana Tanatharanit)

คุณภาพอากาศในสถานประกอบการ



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

Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

Environmental Conditions

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

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

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peer 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	05/04/2026	1,000	1,500	2,000	1,004	1,497	2,000	0.998x + 1.430	1.000
R41	SKC	224-PCXR4	626140	03/04/2026	1,000	1,500	2,000	998	1,498	1,997	0.999x + 0.943	1.000
R42	SKC	224-PCXR4	626463	05/04/2026	1,000	1,500	2,000	1,005	1,513	1,998	0.997x + 4.138	0.999
R43	SKC	224-PCXR4	626129	03/04/2026	1,000	1,500	2,000	1,003	1,498	2,000	0.998x + 2.029	1.000
R44	SKC	224-PCXR4	602753	03/04/2026	1,000	1,500	2,000	996	1,509	1,997	1.003x - 8.036	1.000
R45	SKC	224-PCXR4	626137	05/04/2026	1,000	1,500	2,000	1,011	1,514	2,005	0.995x + 8.367	0.999

Calibrated by :

Adul Dangklom

(Mr. Adul Dangklom)

Approved by :

Peera Detudom

(Mr. Peera Detudom)



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

Rotameter Calibration Report (For Personal Pump Low Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

Calibration Data

Rotameter Data			Calibration Data								
No.	Brand	Model	Date	Flow Rate (mL/min)						Value From Calibration Curve	
				Flow Rate (Reading)			Actual (Q std.)				
				1	2	3	1	2	3	y	R ²
L-R01	Dwyer	VFA-21	01/04/2026	50	100	200	50.3	101.1	201.9	0.998x + 0.955	1.000
L-R02	Dwyer	VFA-21	01/04/2026	50	100	200	50.2	101.7	201.0	0.999x + 0.367	0.999
L-R03	Dwyer	VFA-21	03/04/2026	50	100	200	50.3	101.2	201.0	1.001x + 0.605	1.000
L-R04	Dwyer	VFA-21	05/04/2026	50	100	200	50.7	100.8	200.2	1.000x + 0.719	1.000
L-R05	Dwyer	VFA-21	05/04/2026	50	100	200	50.1	101.2	200.5	1.001x - 0.213	0.999
L-R06	Dwyer	VFA-21	03/04/2026	50	100	200	50.3	100.8	200.1	0.999x + 0.639	1.000

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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

RUN CHROMATOGRAM TEST

DETECTOR : Flame Ionization Detectors (FID Channel-Front)

INJECTOR : 1079 Injector

GC CONDITION:

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

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

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

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



VARIAN



บริษัท ไทยยูนิค จำกัด

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

Detector Sensitivity (FID)

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

Temperature Specification

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

Relative Standard Deviation % (%RSD)

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

APPROVAL :

Signature: 

Engineer : Somchai Pohtongkam

Date : 02/08/2025



VARIAN



บริษัท ไทยยูนิค จำกัด

THAI UNIQUE CO., LTD.

80-82 ถนนประชาธิปไตย แขวงบางขุนพรหม เขตพระนคร กรุงเทพฯ 10200

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

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

Results Integrated System Testing

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

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

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

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

Compliance	☒ Pass	☐ Fail
Performance by	<i>Sachin P.</i>	
Date	02/08/2025	



Comments			
Reviewed by	<i>Wattana</i>	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 RT 1	3.874
C15 RT 2	3.880
C15 RT 3	3.875
C15 RT 4	3.872
C15 RT 5	3.878
C15 RT Average	3.876
* % RSD (< 0.5 %)	0.08

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

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

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

Compliance	☒ Pass	☐ Fail
Performance by	<i>Sanchul P.</i>	
Date	02/08/2025	



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



VARIAN

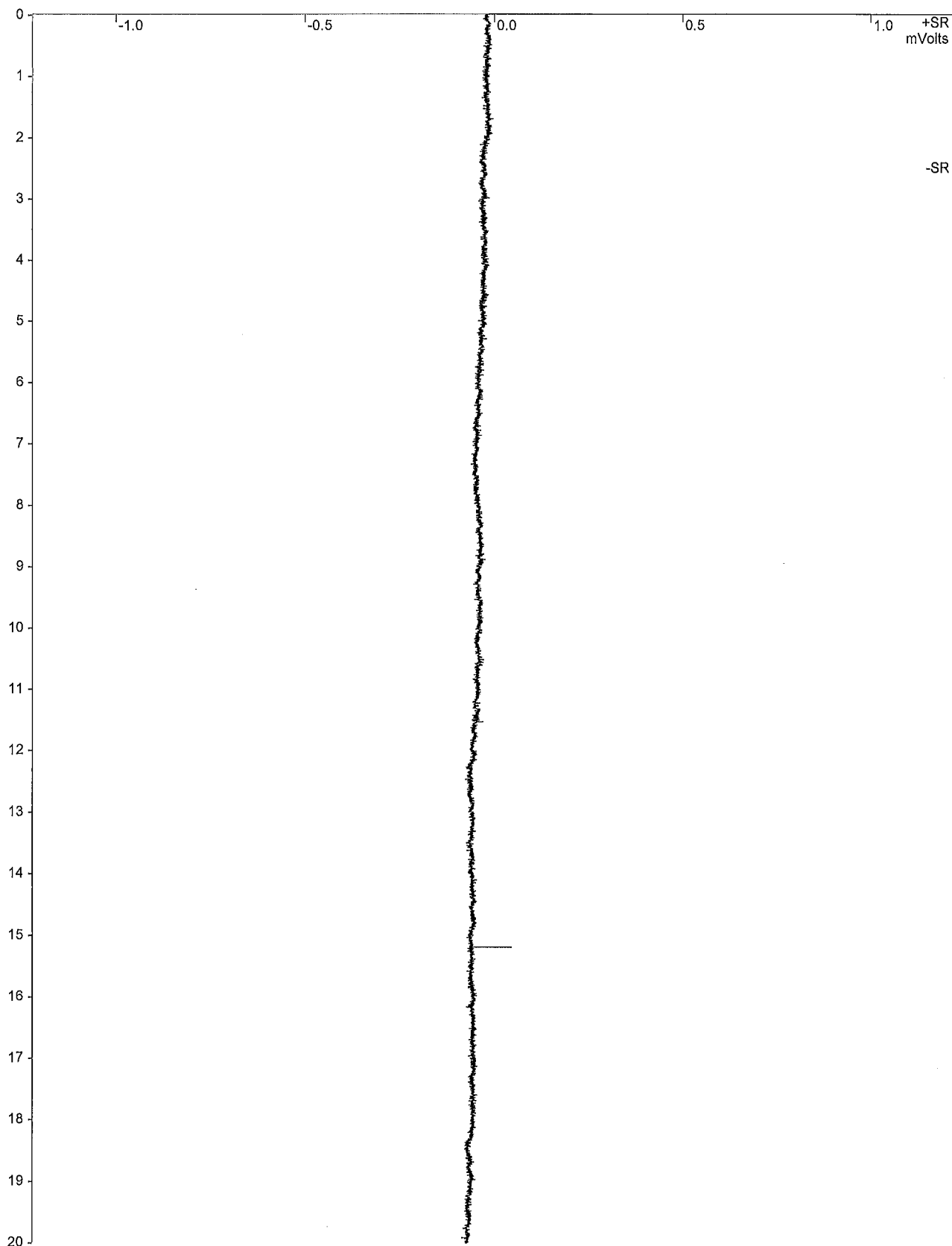
Title :
Run File : e:\sps2025\blk001.run
Method File : c:\star\data\tu\2025\cal fid.mth
Sample ID : blk

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

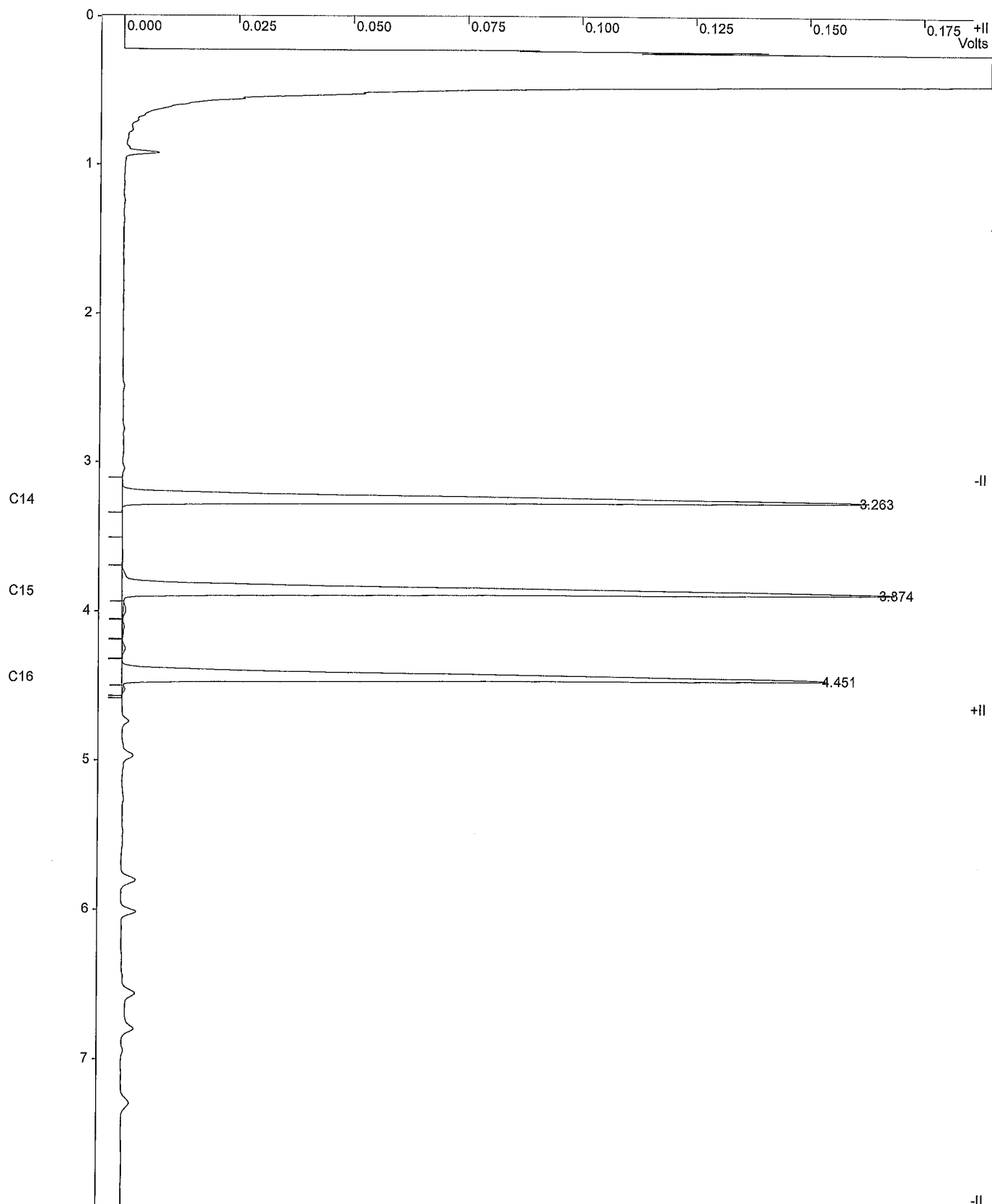
Title :
Run File : e:\sps2025\fidstd001.run
Method File : c:\star\data\tu\2025\cal fid.mth
Sample ID : fidstd

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):



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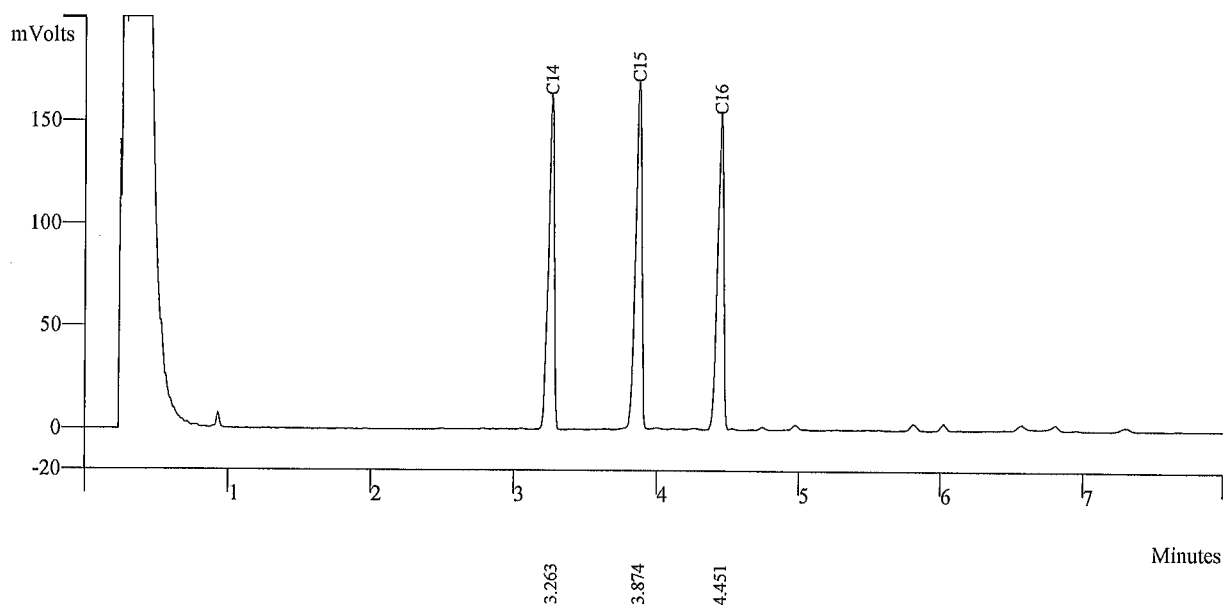
Run Mode: **Calibration**

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):

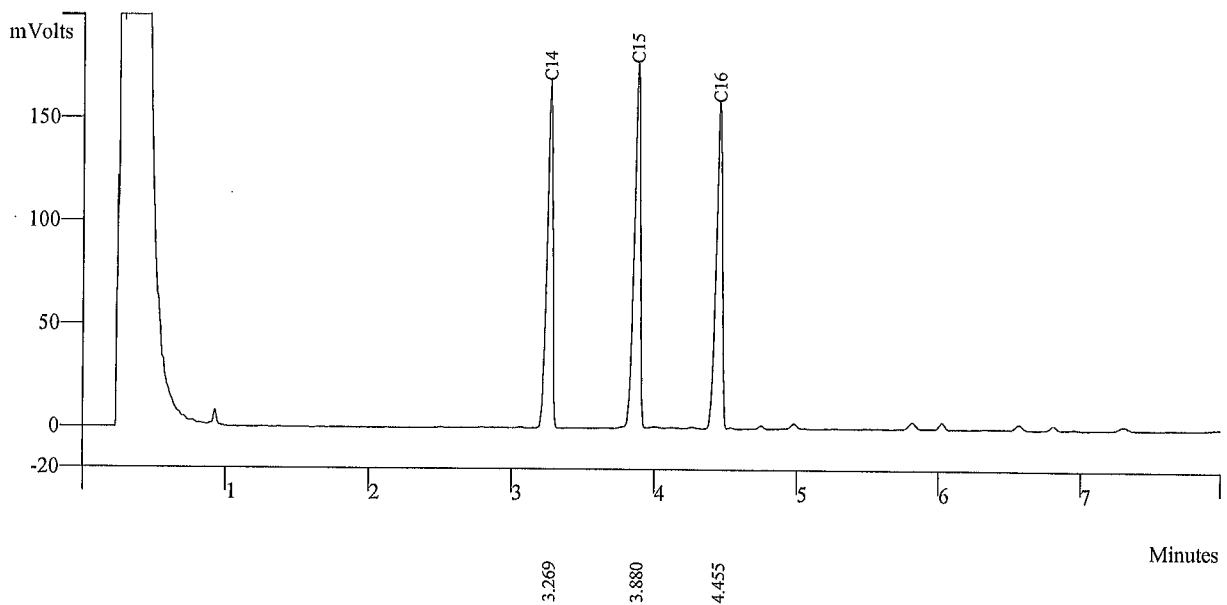
Run Mode: Calibration

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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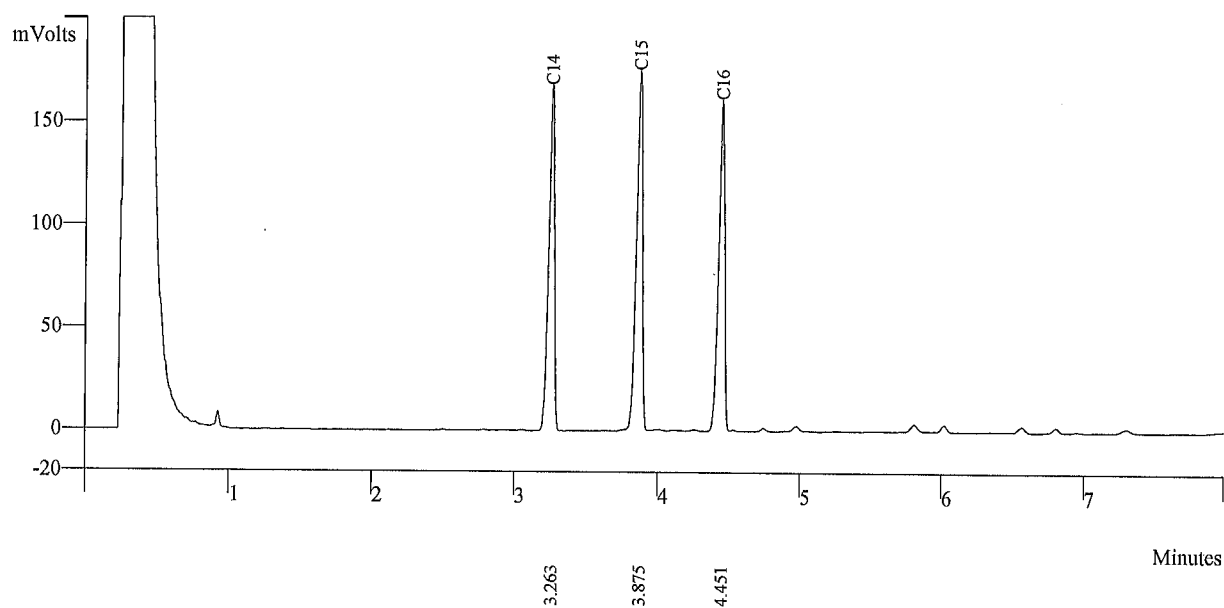
Run Mode: **Calibration**

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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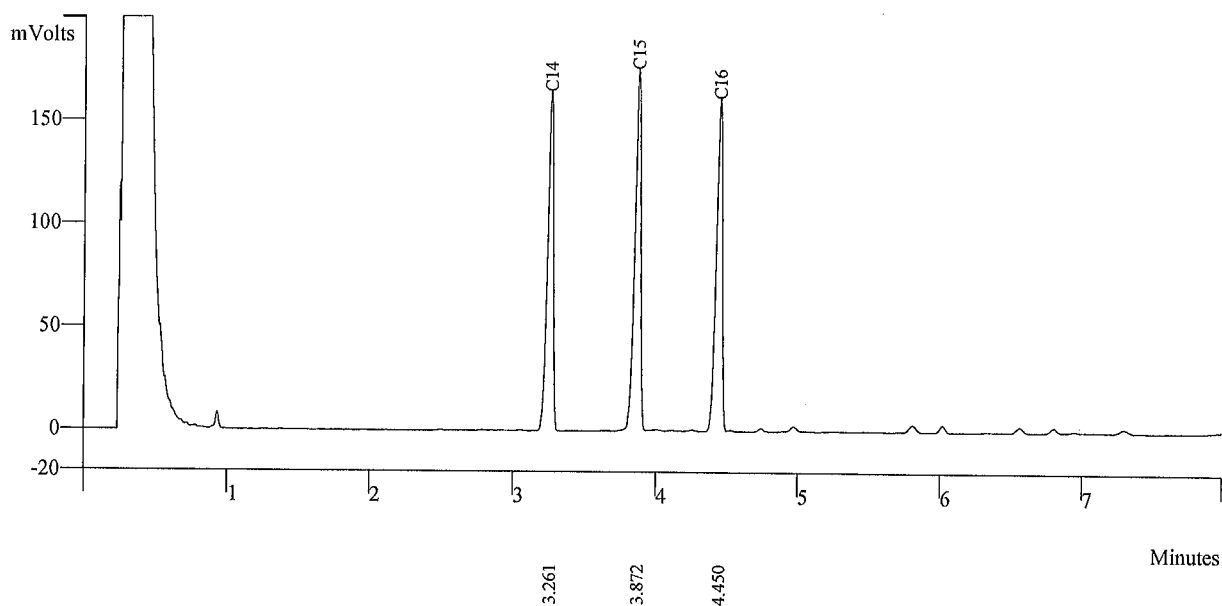
Run Mode: Calibration

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



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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):

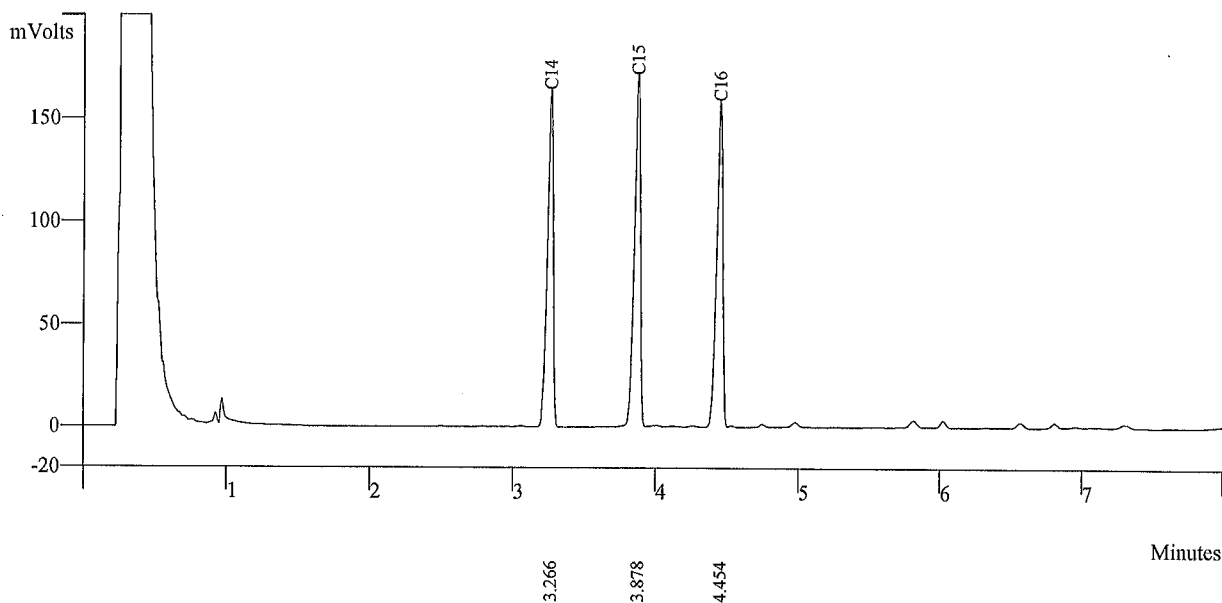
Run Mode: Calibration

Peak Measurement: Peak Area

Calculation Type: External Std.

e:\sps2025\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

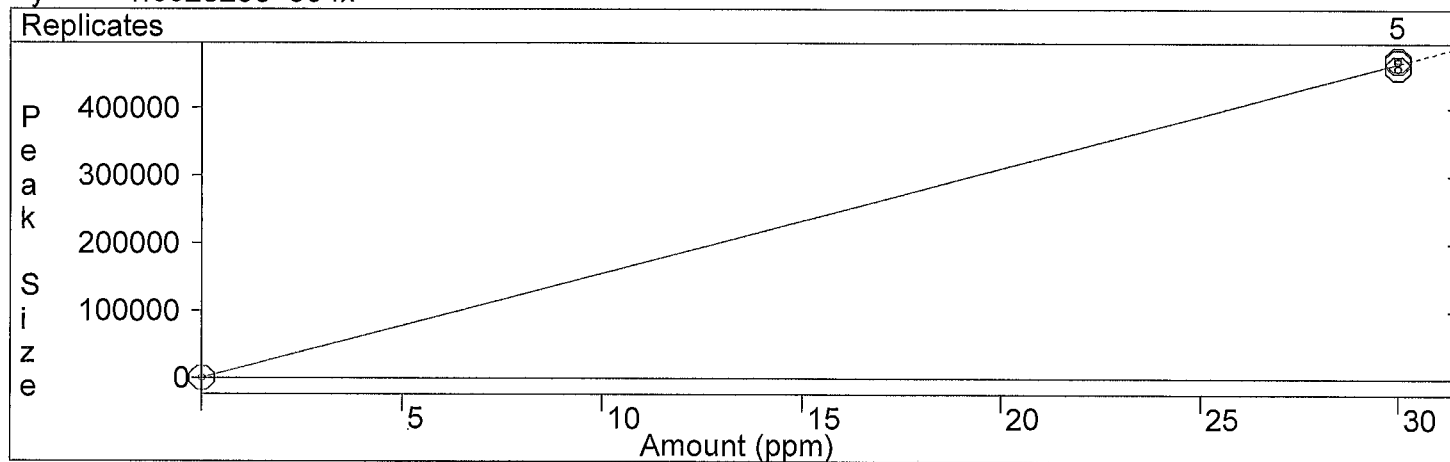
Curve Type: Linear

Origin: Force

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

Resp. Fact. RSD: 1.347%

Coeff. Det.(r²): 0.999130



C15

External Standard Analysis

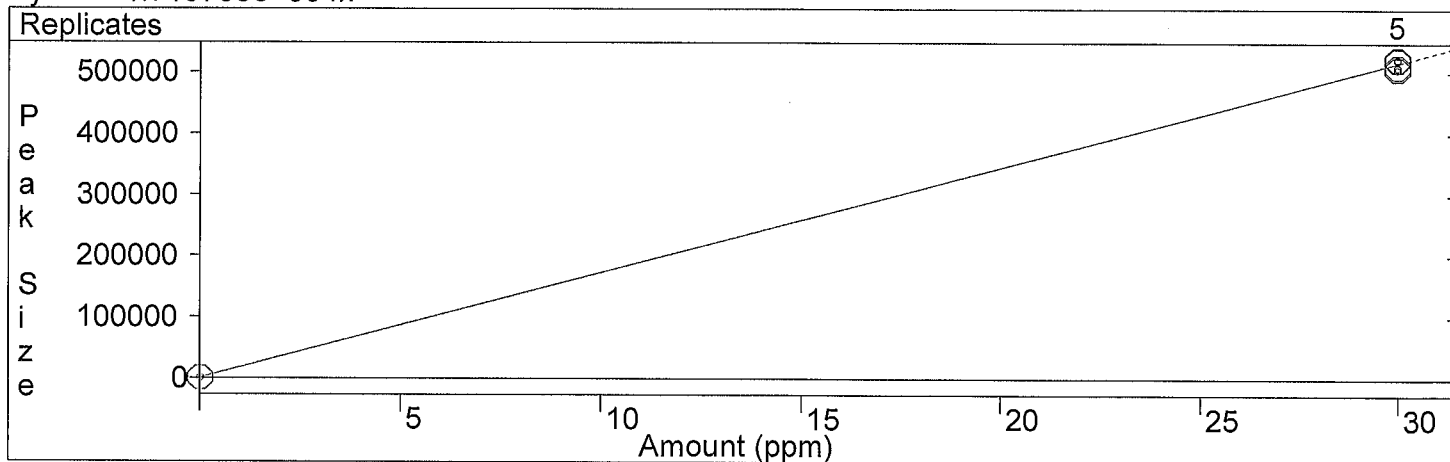
Curve Type: Linear

Origin: Force

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

Resp. Fact. RSD: 1.481%

Coeff. Det.(r²): 0.998948



C16

External Standard Analysis

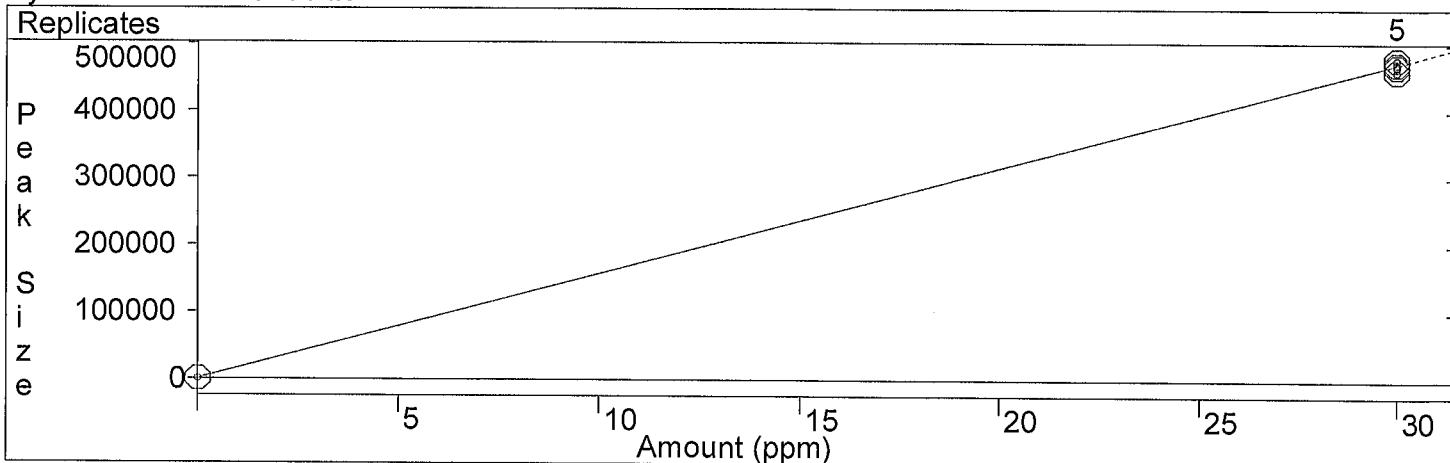
Curve Type: Linear

Origin: Force

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

Resp. Fact. RSD: 1.611%

Coeff. Det.(r²): 0.998756



CERTIFICATE

This is to certify, that

Somchai Pohthongkham

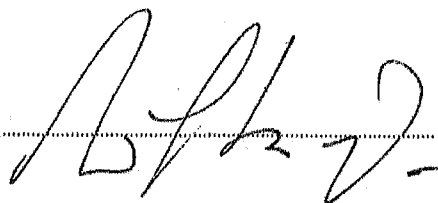
has participated the course

Basic GC and Sampler training

Date: ***24 – 27 May 2004***

Location: ***Middelburg***

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

Signature instructor: 



VARIAN

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%

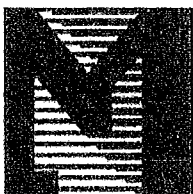
Calibrated by : Mr.Thippatai Mungpungklang

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

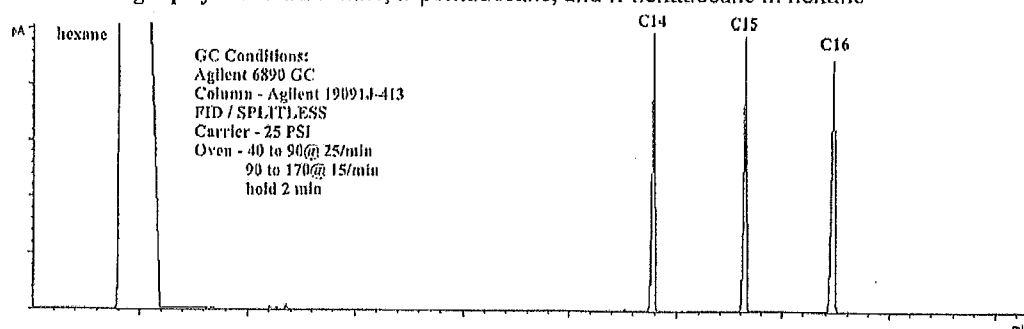
Calibrated Class A glassware and clean bottles were used in the manufacture of this standard. Balances used in the manufacture of this standard are calibrated with weights traceable to NIST in compliance with ANSI/NCSL Z-540-1 and ISO 9001.

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
QMS Representative

GC Clarus 600/680 Preventive Maintenance (PM)

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

Part Number	Release	Publication Date	
TH09370070	C	August 2016	

Scope

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

General Instructions:

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

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Component List

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

Parts Lists

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

Procedure Checklist

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

1. General:

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

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

L-N 220 Volt

L-G 220 Volt

N-G 0.46 Volt

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

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

Carrier gas ☒ Helium ☐ Nitrogen ☐ Hydrogen

Moisture level ☒ Good ☐ Need to replace ☐ Other _____

Detector gas ☒ Air Zero ☒ Hydrogen ☐ Nitrogen ☐ Helium

Moisture level ☒ Good ☐ Need to replace ☐ Other _____

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

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

Gas leakage ☒ Pass ☐ Fail Comment _____

- ☒ Perform general inspection of system for cleanliness.

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

Electronic cooling fan ☒ Yes ☐ No

Oven cooling fan ☒ Yes ☐ No

2. Electronic :

- ☒ Check oven temperature. Calibrate if necessary.

Oven temperature set point 150 °C ☒ Pass ☐ Fail

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

Oven temperature set point 5 °C ☐ Pass ☐ Fail

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

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

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

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

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

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

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

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

3. Diagnostics Tests:

- ☒ Run instrument diagnostics.

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

☒ BRAM	Pass
☒ EPROM	Pass

4. Review:

- ☒ Review with the customer PM work performed.
- ☒ Review with the customer routine maintenance procedures.
- ☒ Discuss recommended customer-supplied materials to have on hand
- ☒ Attach PM sticker.
- ☒ Update Logbook.

Additional Comments

Additional Comments Regarding the PM

Review

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