

ภาคผนวกที่ 4

เอกสารสอบเทียบความถูกต้องของเครื่องมือ

**ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง
และเครื่องมือตรวจวิเคราะห์คุณภาพสิ่งแวดล้อม**

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
1. คุณภาพอากาศจากปล่อง		
Styrene	Personal Pump SKC No. B07, B08, B10, B24, B33, B35, B52, B70, B71, B89, R12, R15, R21, R24, R25, R38, R39, R40, R42, R44, R45 Rotameter No. L-R02, R03, R04	GC/FID
Acrylonitrile	Personal Pump SKC No. B08, B09, B10, B24, B33, B37, B52, B70, B71, B77, B89, R12, R15, R21, R24, R25, R38, R39, R40, R42, R44, R45, B70, Rotameter No. L-R02, R03, R04	GC/FID
Sulfur Dioxide	Personal Pump SKC No. B07, B10, B24, B35, B55, B57, B70, B77, B78, R03, R12, R16, R18, R21, R24, R26, R34, R36, R42, B78 Rotameter No. H-R02, R03, R04	-
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. 1170530044, 213, 769, 212	Serial No. 1170530044, 213, 769, 212
Sulfur Dioxide	Serial No. CM06280010, 3489, 066, TRS1064	Serial No. CM06280010, 3489, 066, TRS1064
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-B02, R12, R36	-
5. ระดับเสียงในพื้นที่โรงงาน L_{eq} 8 hr และ L_{max}	Acoustic Calibrator Sound Level Meter No. ACO-B18, B29, R40, R41, R50	-
6. คุณภาพอากาศในสถานประกอบการ Styrene	Personal Pump	GC/FID
Acrylonitrile	Personal Pump	GC/FID
1,3-Butadiene	Personal Pump	GC/MS

คุณภาพอากาศจากปล่อง



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

Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Environmental Conditions

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

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (mL/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R ²
B01	SKC	224-PCXR4	262101	01/07/2025	1,000	1,500	2,000	997	1,501	2,003	1.003x - 4.236	1.000
B02	SKC	224-PCXR4	626166	02/07/2025	1,000	1,500	2,000	1,005	1,506	2,007	1.001x + 1.555	1.000
B03	SKC	224-PCXR4	612968	04/07/2025	1,000	1,500	2,000	1,004	1,499	2,002	1.004x - 11.638	0.999
B04	SKC	224-PCXR4	602804	01/07/2025	1,000	1,500	2,000	999	1,502	1,998	1.002x - 3.373	1.000
B05	SKC	224-PCXR4	612693	03/07/2025	1,000	1,500	2,000	1,002	1,504	2,008	1.008x - 9.160	1.000
B06	SKC	224-PCXR4	262188	01/07/2025	1,000	1,500	2,000	1,001	1,505	2,003	1.001x - 3.965	1.000
B07	SKC	224-PCXR4	626262	02/07/2025	1,000	1,500	2,000	999	1,494	2,000	0.997x + 3.261	1.000
B08	SKC	224-PCXR4	626100	04/07/2025	1,000	1,500	2,000	1,003	1,502	2,004	1.009x - 15.922	0.999
B09	SKC	224-PCXR4	626479	01/07/2025	1,000	1,500	2,000	997	1,499	2,005	1.005x - 9.935	1.000
B10	SKC	224-PCXR4	091950	01/07/2025	1,000	1,500	2,000	995	1,507	2,001	1.008x - 15.634	1.000
B11	SKC	224-PCXR8	564315	04/07/2025	1,000	1,500	2,000	997	1,495	2,002	1.004x - 7.274	1.000
B12	SKC	224-PCXR4	034656	01/07/2025	1,000	1,500	2,000	1,001	1,507	2,005	1.007x - 13.608	0.999
B13	SKC	224-PCXR4	602073	01/07/2025	1,000	1,500	2,000	1,002	1,504	2,007	1.006x - 6.161	1.000
B14	SKC	224-PCXR4	626313	04/07/2025	1,000	1,500	2,000	999	1,503	2,004	1.001x - 3.361	1.000
B15	SKC	224-PCXR4	626474	04/07/2025	1,000	1,500	2,000	1,005	1,506	2,005	1.008x - 12.821	0.999
B16	SKC	224-PCXR4	626477	04/07/2025	1,000	1,500	2,000	997	1,509	1,995	0.999x - 0.595	1.000
B17	SKC	224-PCXR4	626860	02/07/2025	1,000	1,500	2,000	999	1,497	1,996	1.000x - 1.613	1.000
B18	SKC	224-PCXR4	691484	04/07/2025	1,000	1,500	2,000	1,003	1,499	1,995	1.003x - 9.955	0.999
B19	SKC	224-PCXR4	691599	01/07/2025	1,000	1,500	2,000	996	1,508	1,994	1.001x - 1.127	1.000
B20	SKC	224-PCXR4	691587	02/07/2025	1,000	1,500	2,000	997	1,505	1,997	1.004x - 9.596	1.000
B21	SKC	224-PCXR4	691531	03/07/2025	1,000	1,500	2,000	998	1,504	1,999	1.002x - 3.125	1.000
B22	SKC	224-PCXR4	691654	04/07/2025	1,000	1,500	2,000	1,002	1,505	1,992	1.003x - 9.240	0.999
B23	SKC	224-PCXR4	798393	01/07/2025	1,000	1,500	2,000	992	1,498	1,993	0.999x - 3.941	1.000
B24	SKC	224-PCXR4	626363	02/07/2025	1,000	1,500	2,000	1,004	1,506	1,994	1.003x - 9.084	0.999
B25	SKC	224-PCXR4	798489	03/07/2025	1,000	1,500	2,000	1,005	1,497	2,004	0.998x + 5.100	1.000
B26	SKC	224-PCXR4	798479	03/07/2025	1,000	1,500	2,000	1,004	1,504	1,998	0.997x + 5.575	1.000
B27	SKC	224-PCXR4	691673	04/07/2025	1,000	1,500	2,000	997	1,508	1,991	1.002x - 8.556	0.999
B28	SKC	224-PCXR4	691570	03/07/2025	1,000	1,500	2,000	1,005	1,504	2,001	1.000x + 2.897	1.000
B29	SKC	224-PCXR4	626472	02/07/2025	1,000	1,500	2,000	1,003	1,502	2,004	1.001x - 1.675	1.000
B30	SKC	224-PCXR4	691489	03/07/2025	1,000	1,500	2,000	1,004	1,510	2,007	1.010x - 13.764	0.999
B31	SKC	224-PCXR4	691509	02/07/2025	1,000	1,500	2,000	996	1,499	1,991	0.997x + 0.891	1.000
B32	SKC	224-PCXR4	091567	03/07/2025	1,000	1,500	2,000	998	1,497	1,996	0.996x + 3.273	1.000
B33	SKC	224-PCXR4	091756	02/07/2025	1,000	1,500	2,000	1,004	1,505	1,992	1.000x - 4.228	0.999
B34	SKC	224-PCXR4	612962	04/07/2025	1,000	1,500	2,000	1,005	1,508	2,011	1.007x - 5.447	1.000
B35	SKC	224-PCXR4	602682	02/07/2025	1,000	1,500	2,000	1,004	1,506	1,991	0.997x + 1.603	0.999
B36	SKC	224-PCXR4	626164	01/07/2025	1,000	1,500	2,000	999	1,498	2,002	1.004x - 8.113	1.000
B37	SKC	224-PCXR4	626256	02/07/2025	1,000	1,500	2,000	995	1,508	2,001	1.005x - 10.431	1.000
B38	SKC	224-PCXR4	626167	02/07/2025	1,000	1,500	2,000	1,000	1,497	1,993	0.999x - 0.639	1.000
B39	SKC	224-PCXR4	034637	04/07/2025	1,000	1,500	2,000	1,005	1,503	1,991	1.002x - 7.186	0.999
B40	SKC	224-PCXR4	798349	03/07/2025	1,000	1,500	2,000	995	1,494	1,990	1.000x - 7.405	1.000

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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S/N : 136164

Environmental Conditions

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

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

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 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
B80	SKC	224-PCXR3	504569	01/07/2025	1,000	1,500	2,000	1,005	1,501	2,007	1.014x - 22.484	0.999
B81	SKC	224-PCXR3	503480	02/07/2025	1,000	1,500	2,000	997	1,494	1,995	1.005x - 14.583	1.000
B82	SKC	224-PCXR3	505673	04/07/2025	1,000	1,500	2,000	998	1,497	2,001	1.004 - 6.075	1.000
B83	SKC	224-PCXR3	510785	04/07/2025	1,000	1,500	2,000	1,009	1,501	1,998	1.003x - 7.370	0.999
B84	SKC	224-PCXR3	508333	02/07/2025	1,000	1,500	2,000	997	1,502	1,997	1.000x - 1.894	1.000
B85	SKC	224-PCXR3	505757	02/07/2025	1,000	1,500	2,000	1,002	1,503	2,004	1.004x - 7.222	1.000
B86	SKC	224-PCXR3	512625	01/07/2025	1,000	1,500	2,000	999	1,493	1,997	0.996x + 1.139	1.000
B87	SKC	224-PCXR3	504324	01/07/2025	1,000	1,500	2,000	1,001	1,498	2,002	1.001x + 0.607	1.000
B88	SKC	224-PCXR3	508307	02/07/2025	1,000	1,500	2,000	999	1,497	1,995	0.995x + 5.331	1.000
B89	SKC	224-PCXR3	509860	02/07/2025	1,000	1,500	2,000	1,003	1,494	1,998	1.007x - 15.027	0.999
B90	SKC	224-PCXR3	508366	04/07/2025	1,000	1,500	2,000	997	1,510	1,992	0.998x + 0.332	1.000
B91	SKC	224-PCXR3	510919	03/07/2025	1,000	1,500	2,000	1,005	1,503	1,999	0.990x + 13.532	1.000
B92	SKC	224-PCXR3	510987	03/07/2025	1,000	1,500	2,000	1,004	1,506	2,002	0.999x + 3.737	1.000
B93	SKC	224-PCXR3	509845	03/07/2025	1,000	1,500	2,000	997	1,501	2,004	1.008x - 12.857	1.000

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Mr. Peera Detudom
(Mr. Peera Detudom)



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

Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

Environmental Conditions

Temperature 25 ± 3 °C
Pressure 1010 ± 15 mmbar

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

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

Environmental Conditions

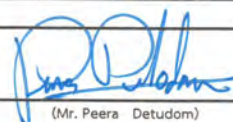
Temperature : 25 \pm 3 $^{\circ}$ C
Pressure : 1010 \pm 15 mmbar

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (mL/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R ²
R40	SKC	224-PCXR4	612753	02/07/2025	1,000	1,500	2,000	1,003	1,503	1,994	1.004x - 11.618	0.999
R41	SKC	224-PCXR4	626140	02/07/2025	1,000	1,500	2,000	995	1,495	1,993	1.008x - 22.708	0.999
R42	SKC	224-PCXR4	626463	02/07/2025	1,000	1,500	2,000	1,001	1,497	1,991	0.994x + 7.539	1.000
R43	SKC	224-PCXR4	626129	01/07/2025	1,000	1,500	2,000	1,007	1,507	2,001	1.005x - 8.869	0.999
R44	SKC	224-PCXR4	602753	01/07/2025	1,000	1,500	2,000	1,002	1,499	1,997	0.999x - 0.384	1.000
R45	SKC	224-PCXR4	626137	02/07/2025	1,000	1,500	2,000	995	1,508	2,007	1.008x - 11.542	1.000

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :


(Mr. Peera Detudom)



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Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Environmental Conditions

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

Personal Pump Data					Calibration Data							
No.	Brand	Model	Serial No.	Date	Flow Rate (mL/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)			y	R ²
					1	2	3	1	2	3		
B01	SKC	224-PCXR4	262101	03/10/2025	1,000	1,500	2,000	998	1,490	1,997	1.000x - 7.191	1.000
B02	SKC	224-PCXR4	626166	03/10/2025	1,000	1,500	2,000	1,007	1,500	2,008	0.999x + 2.537	1.000
B03	SKC	224-PCXR4	612968	03/10/2025	1,000	1,500	2,000	1,003	1,503	2,001	0.997x + 0.810	0.999
B04	SKC	224-PCXR4	602804	02/10/2025	1,000	1,500	2,000	998	1,494	1,993	1.001x - 6.035	1.000
B05	SKC	224-PCXR4	612693	02/10/2025	1,000	1,500	2,000	999	1,495	2,001	0.999x - 2.481	1.000
B06	SKC	224-PCXR4	262188	02/10/2025	1,000	1,500	2,000	997	1,510	2,000	0.998x + 0.064	0.999
B07	SKC	224-PCXR4	626262	01/10/2025	1,000	1,500	2,000	1,004	1,492	2,007	1.002x - 4.778	1.000
B08	SKC	224-PCXR4	626100	02/10/2025	1,000	1,500	2,000	1,005	1,500	2,005	1.004x - 7.223	1.000
B09	SKC	224-PCXR4	626479	01/10/2025	1,000	1,500	2,000	1,001	1,501	1,986	0.996x + 3.462	0.999
B10	SKC	224-PCXR4	091950	01/10/2025	1,000	1,500	2,000	997	1,504	2,000	1.003x - 8.822	1.000
B11	SKC	224-PCXR8	564315	03/10/2025	1,000	1,500	2,000	1,001	1,503	1,995	0.995x + 2.449	1.000
B12	SKC	224-PCXR4	034656	03/10/2025	1,000	1,500	2,000	997	1,506	2,003	1.003x - 9.062	0.999
B13	SKC	224-PCXR4	602073	03/10/2025	1,000	1,500	2,000	1,003	1,497	2,006	1.002x - 5.013	1.000
B14	SKC	224-PCXR4	626313	03/10/2025	1,000	1,500	2,000	998	1,501	1,992	1.005x - 11.702	0.999
B15	SKC	224-PCXR4	626474	03/10/2025	1,000	1,500	2,000	1,001	1,502	2,004	1.006x - 11.694	1.000
B16	SKC	224-PCXR4	626477	03/10/2025	1,000	1,500	2,000	996	1,498	1,992	1.007x - 16.329	0.999
B17	SKC	224-PCXR4	626860	02/10/2025	1,000	1,500	2,000	1,001	1,503	1,998	1.001x - 4.838	1.000
B18	SKC	224-PCXR4	691484	01/10/2025	1,000	1,500	2,000	997	1,514	1,996	0.996x + 5.360	1.000
B19	SKC	224-PCXR4	691599	01/10/2025	1,000	1,500	2,000	998	1,499	2,003	0.998x + 0.399	1.000
B20	SKC	224-PCXR4	691587	01/10/2025	1,000	1,500	2,000	1,001	1,501	1,999	0.995x + 1.520	0.999
B21	SKC	224-PCXR4	691531	03/10/2025	1,000	1,500	2,000	996	1,502	2,001	1.003x - 7.151	1.000
B22	SKC	224-PCXR4	691654	03/10/2025	1,000	1,500	2,000	1,001	1,500	1,998	0.997x - 0.666	1.000
B23	SKC	224-PCXR4	798393	03/10/2025	1,000	1,500	2,000	993	1,507	1,999	1.007x - 17.505	0.999
B24	SKC	224-PCXR4	626363	03/10/2025	1,000	1,500	2,000	994	1,498	1,995	1.000x - 3.941	1.000
B25	SKC	224-PCXR4	798489	01/10/2025	1,000	1,500	2,000	1,003	1,490	2,001	0.997x + 1.703	1.000
B26	SKC	224-PCXR4	798479	01/10/2025	1,000	1,500	2,000	1,001	1,509	1,995	1.002x - 8.057	0.999
B27	SKC	224-PCXR4	691673	01/10/2025	1,000	1,500	2,000	998	1,510	2,002	1.005x - 9.656	1.000
B28	SKC	224-PCXR4	691570	01/10/2025	1,000	1,500	2,000	1,011	1,508	2,009	0.999x + 3.729	0.999
B29	SKC	224-PCXR4	626472	01/10/2025	1,000	1,500	2,000	1,002	1,503	1,998	1.002x - 6.066	1.000
B30	SKC	224-PCXR4	691489	01/10/2025	1,000	1,500	2,000	997	1,506	2,001	1.004x - 8.049	1.000
B31	SKC	224-PCXR4	691509	02/10/2025	1,000	1,500	2,000	995	1,497	1,992	0.998x - 2.293	1.000
B32	SKC	224-PCXR4	091567	01/10/2025	1,000	1,500	2,000	1,002	1,500	2,003	1.008x - 15.778	0.999
B33	SKC	224-PCXR4	091756	02/10/2025	1,000	1,500	2,000	1,003	1,501	1,997	1.003x - 6.509	1.000
B34	SKC	224-PCXR4	612962	01/10/2025	1,000	1,500	2,000	996	1,512	1,996	1.001x - 5.867	0.999
B35	SKC	224-PCXR4	602682	01/10/2025	1,000	1,500	2,000	1,008	1,494	1,999	0.993x + 6.992	1.000
B36	SKC	224-PCXR4	626164	01/10/2025	1,000	1,500	2,000	997	1,502	1,992	0.999x - 3.235	1.000
B37	SKC	224-PCXR4	626256	01/10/2025	1,000	1,500	2,000	1,003	1,490	1,997	0.994x + 5.093	1.000
B38	SKC	224-PCXR4	626167	02/10/2025	1,000	1,500	2,000	998	1,513	1,995	1.000x - 5.277	0.999
B39	SKC	224-PCXR4	034637	03/10/2025	1,000	1,500	2,000	1,007	1,504	2,004	0.996x + 8.240	1.000
B40	SKC	224-PCXR4	798349	03/10/2025	1,000	1,500	2,000	998	1,510	2,002	0.998x + 3.905	1.000

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(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.)				
					1	2	3	1	2	3	y	R ²
B41	SKC	224-PCXR4	612669	01/10/2025	1,000	1,500	2,000	1,010	1,508	2,009	1.000x + 2.612	0.999
B42	SKC	224-PCXR4	626041	02/10/2025	1,000	1,500	2,000	1,004	1,494	1,994	0.997x + 1.344	1.000
B43	SKC	224-PCXR4	034636	01/10/2025	1,000	1,500	2,000	998	1,505	2,002	1.001x - 5.177	1.000
B44	SKC	224-PCXR8	529341	01/10/2025	1,000	1,500	2,000	999	1,496	1,998	0.996x + 0.909	1.000
B45	SKC	224-PCXR8	529594	01/10/2025	1,000	1,500	2,000	996	1,510	1,992	1.005x - 11.543	1.000
B46	SKC	224-PCXR8	566743	01/10/2025	1,000	1,500	2,000	1,003	1,488	1,997	0.994x + 3.717	1.000
B47	SKC	224-PCXR8	566747	01/10/2025	1,000	1,500	2,000	1,004	1,500	1,993	0.996x + 2.230	1.000
B48	SKC	224-PCXR8	566753	01/10/2025	1,000	1,500	2,000	1,002	1,501	1,991	1.000x - 4.116	0.999
B49	SKC	224-PCXR8	566780	01/10/2025	1,000	1,500	2,000	995	1,502	1,990	0.997x - 1.978	1.000
B50	SKC	224-PCXR8	500400	02/10/2025	1,000	1,500	2,000	997	1,503	2,001	1.004x - 10.178	1.000
B51	SKC	224-PCXR8	500363	01/10/2025	1,000	1,500	2,000	1,001	1,502	1,993	0.995x + 2.848	1.000
B52	SKC	224-PCXR8	093186	03/10/2025	1,000	1,500	2,000	996	1,510	1,999	1.005x - 12.252	0.999
B53	SKC	224-PCXR8	707670	03/10/2025	1,000	1,500	2,000	1,002	1,496	2,004	1.003x - 8.791	1.000
B54	SKC	224-PCXR3	509821	03/10/2025	1,000	1,500	2,000	999	1,501	1,995	0.999x - 2.090	1.000
B55	SKC	224-PCXR3	510710	02/10/2025	1,000	1,500	2,000	1,002	1,503	2,006	1.007x - 13.250	0.999
B56	SKC	224-PCXR3	511450	01/10/2025	1,000	1,500	2,000	995	1,505	1,997	1.002x - 7.594	1.000
B57	SKC	224-PCXR3	510798	02/10/2025	1,000	1,500	2,000	998	1,500	1,994	0.999x - 7.163	0.999
B58	SKC	224-PCXR3	509852	03/10/2025	1,000	1,500	2,000	1,002	1,494	1,996	0.993x + 6.485	1.000
B59	SKC	224-PCXR3	509862	01/10/2025	1,000	1,500	2,000	1,006	1,505	1,998	0.996x + 5.117	1.000
B60	SKC	224-PCXR3	512655	02/10/2025	1,000	1,500	2,000	1,004	1,501	2,003	1.010x - 14.223	0.999
B61	SKC	224-PCXR3	503915	03/10/2025	1,000	1,500	2,000	993	1,495	1,994	0.999x - 4.942	1.000
B62	SKC	224-PCXR3	505975	03/10/2025	1,000	1,500	2,000	995	1,500	2,005	1.009x - 16.396	1.000
B63	SKC	224-PCXR3	511432	03/10/2025	1,000	1,500	2,000	996	1,497	1,991	0.998x - 3.171	1.000
B64	SKC	224-PCXR3	508302	03/10/2025	1,000	1,500	2,000	1,008	1,506	1,998	0.992x + 8.667	0.999
B65	SKC	224-PCXR3	508310	03/10/2025	1,000	1,500	2,000	1,006	1,492	2,003	1.000x - 4.355	1.000
B66	SKC	224-PCXR3	509861	03/10/2025	1,000	1,500	2,000	994	1,496	1,994	0.997x - 0.275	1.000
B67	SKC	224-PCXR3	506295	01/10/2025	1,000	1,500	2,000	997	1,505	2,001	1.004x - 10.258	1.000
B68	SKC	224-PCXR3	505872	03/10/2025	1,000	1,500	2,000	998	1,512	1,992	0.999x - 3.554	0.999
B69	SKC	224-PCXR3	508375	01/10/2025	1,000	1,500	2,000	997	1,489	1,996	0.997x - 2.309	1.000
B70	SKC	224-PCXR3	510623	03/10/2025	1,000	1,500	2,000	1,001	1,496	1,991	0.992x + 7.131	1.000
B71	SKC	224-PCXR3	508367	03/10/2025	1,000	1,500	2,000	999	1,498	1,995	0.994x + 6.433	1.000
B72	SKC	224-PCXR3	505977	03/10/2025	1,000	1,500	2,000	996	1,507	1,999	1.003x - 7.490	1.000
B73	SKC	224-PCXR3	512606	03/10/2025	1,000	1,500	2,000	1,004	1,503	2,003	1.001x - 5.285	0.999
B74	SKC	224-PCXR3	505993	01/10/2025	1,000	1,500	2,000	1,006	1,501	1,997	0.993x + 8.232	1.000
B75	SKC	224-PCXR3	509820	02/10/2025	1,000	1,500	2,000	1,005	1,494	1,995	0.997x - 2.979	0.999
B76	SKC	224-PCXR3	509811	02/10/2025	1,000	1,500	2,000	996	1,503	1,999	1.005x - 10.613	1.000
B77	SKC	224-PCXR3	508301	01/10/2025	1,000	1,500	2,000	1,003	1,490	1,998	0.994x + 4.694	1.000
B78	SKC	224-PCXR3	510677	01/10/2025	1,000	1,500	2,000	1,004	1,492	1,997	0.995x + 4.036	1.000
B79	SKC	224-PCXR3	510920	01/10/2025	1,000	1,500	2,000	1,008	1,504	2,006	1.006x - 9.588	0.999

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

Environmental Conditions

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

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

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

(Mr. Peera Detudom)



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Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

Environmental Conditions

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

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

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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Rotameter Calibration Report (For Personal Pump High Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Calibration Data

Rotameter Data			Calibration Data								
No.	Brand	Model	Date	Flow Rate (mL/min)						Value From Calibration Curve	
				Flow Rate (Reading)			Actual (Q std.)				
				1	2	3	1	2	3	y	R ²
H-R01	Dwyer	VFB-65	04/07/2025	500	1,000	2,000	500.4	999.6	2002.7	0.999x + 1.975	1.000
H-R02	Dwyer	VFB-65	04/07/2025	500	1,000	2,000	499.3	998.9	1998.1	1.000x - 0.723	1.000
H-R03	Dwyer	VFB-65	03/07/2025	500	1,000	2,000	500.5	998.7	1996.7	0.998x + 2.184	0.999
H-R04	Dwyer	VFB-65	02/07/2025	500	1,000	2,000	501.7	998.1	1993.3	1.000x - 2.212	0.999
H-R05	Dwyer	VFB-65	02/07/2025	500	1,000	2,000	499.2	997.5	1997.1	1.002x - 3.115	1.000
H-R06	Dwyer	VFB-65	02/07/2025	500	1,000	2,000	499.8	997.4	1993.2	1.001x - 4.572	0.999

Calibrated by :

Adul Dangklom
(Mr.Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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Rotameter Calibration Report (For Personal Pump High Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

Calibration Data

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

Calibrated by :

Adul Dangklom
(Mr.Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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Rotameter Calibration Report (For Personal Pump Low Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Calibration Data

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

Calibrated by :

Adul Dangklom
(Mr.Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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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	01/10/2025	50	100	200	50.3	101.0	200.7	0.997x + 0.613	1.000
L-R02	Dwyer	VFA-21	01/10/2025	50	100	200	50.1	101.2	200.1	1.001x - 0.303	0.999
L-R03	Dwyer	VFA-21	02/10/2025	50	100	200	49.7	99.8	199.9	1.002x - 0.371	1.000
L-R04	Dwyer	VFA-21	02/10/2025	50	100	200	50.2	100.9	200.6	1.000x - 0.110	0.999
L-R05	Dwyer	VFA-21	01/10/2025	50	100	200	50.7	100.8	200.3	0.999x + 0.555	1.000
L-R06	Dwyer	VFA-21	03/10/2025	50	100	200	50.5	99.7	201.1	0.998x + 0.476	1.000

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

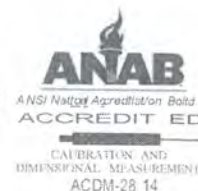
Approved by :

Peera Detudom
(Mr. Peera Detudom)



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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



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Tel. 02-578-Q353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



CALIBRATION AND
DIMENSIONAL MEASUREMENT
ACDM-2814

REPORT OF CALIBRATION

FOR

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



CALIBRATION LABORATORY Co., LTD.

2/1Q-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230

Tel. 02-578-D353-4 Fax: 02-578-2672 www.caHaboratory.com E-mail: sale@cal-laboratory.com



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



GAS CHROMATOGRAPH TEST CERTIFICATION

Certificate No. : SV0824/22063

Instrument Type : Gas Chromatography

Model : CP-3800

Serial Number : 00734

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

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

Date : 05/08/2024

ELECTRONIC TEST

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

RUN CHROMATOGRAM TEST

DETECTOR : Flame Ionization Detector (FID Channel Front)

INJECTOR : Capillary Injector Model 1079

GC CONDITION:

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

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

Sample: 1 µL Injection FID Test Sample 0.218 g/L C14, C15, C16 in hexane

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





Detector Sensitivity (FID)

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

Temperature Specification

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

Relative Standard Deviation % (% RSD)

Checkout Procedure	Result	Specification
Area C15 (%)	1.71	≤ 5
Retention Time C15(%)	0	≤ 0.5

APPROVAL :

Signature: Suwarot.

Engineer : Suwarot Trikainut

Date : 05/08/2024





บริษัท ไทยยูนิค จำกัด

THAI UNIQUE CO., LTD.

80-82 ถนนประชาธิปไตย แขวงบางขุนพรหม เขตพระนคร กรุงเทพฯ 10200

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

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

Results Integrated System Testing

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

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

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

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

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



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



VARIAN



บริษัท ไทยยูนิค จำกัด

THAI UNIQUE CO., LTD.

80-82 ถนนประชาธิปไตย แขวงบางขุนพรหม เขตพระนคร กรุงเทพฯ 10200

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

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

Results Integrated System Testing

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

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

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

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

Compliance	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail
Performance by	Samarot.	
Date	05/08/2024	



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



VARIAN

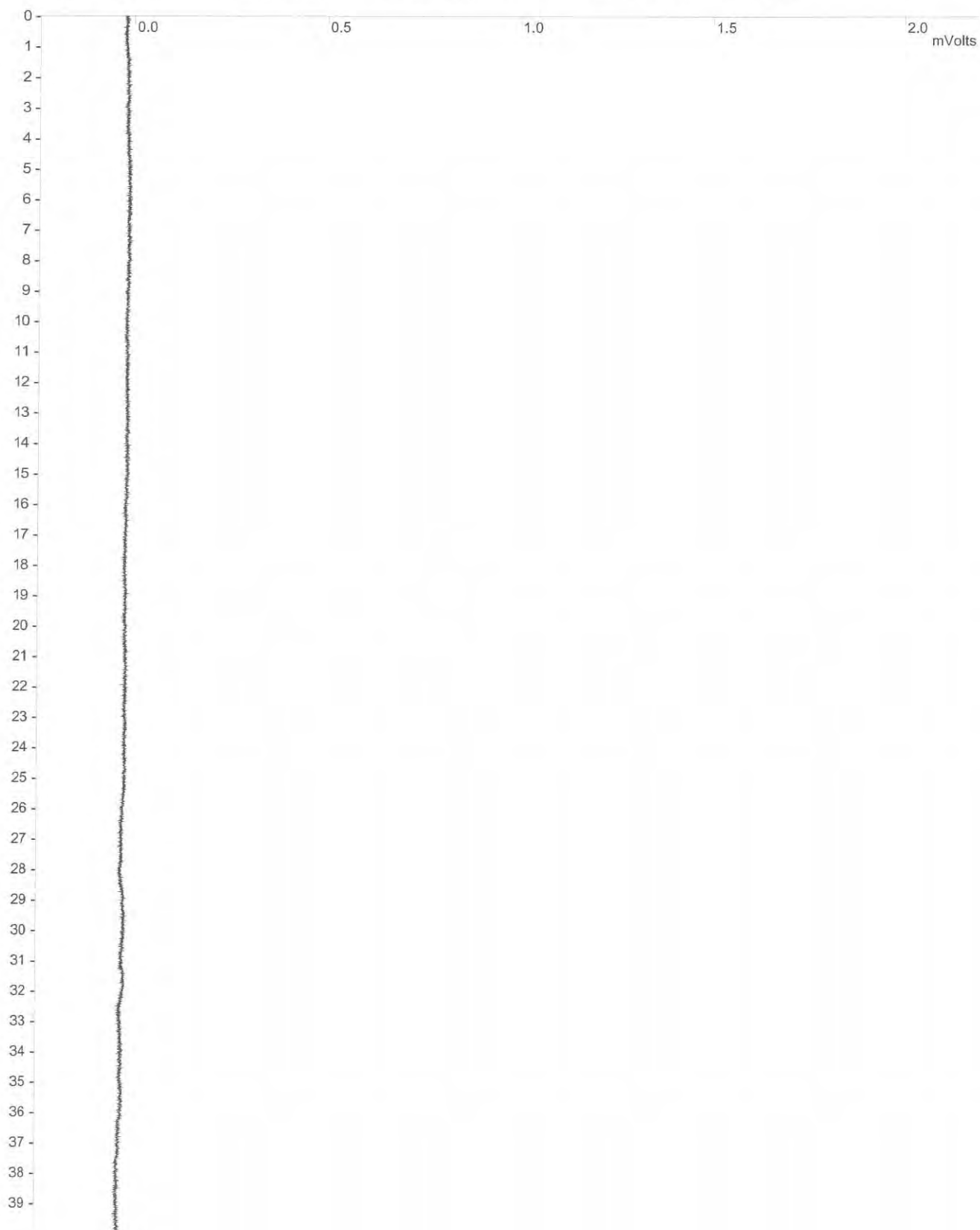
Title :
Run File : f:\ \sps2024\cal2024\baseline2024002.run
Method File : D:\Method-GC\star C\Star\TU\cal0203\baseline FID.mth
Sample ID : Baseline2024

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

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

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

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



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

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

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

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

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

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

Total Unidentified Counts : 0 counts

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

Multiplier: 1 Divisor: 1 Unidentified Peak Factor: 0

Baseline Offset: -16 microVolts LSB: 1 microVolts

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

Manual injection

Data Handling: No peaks

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

Injection Date: 5/8/2567 9:16

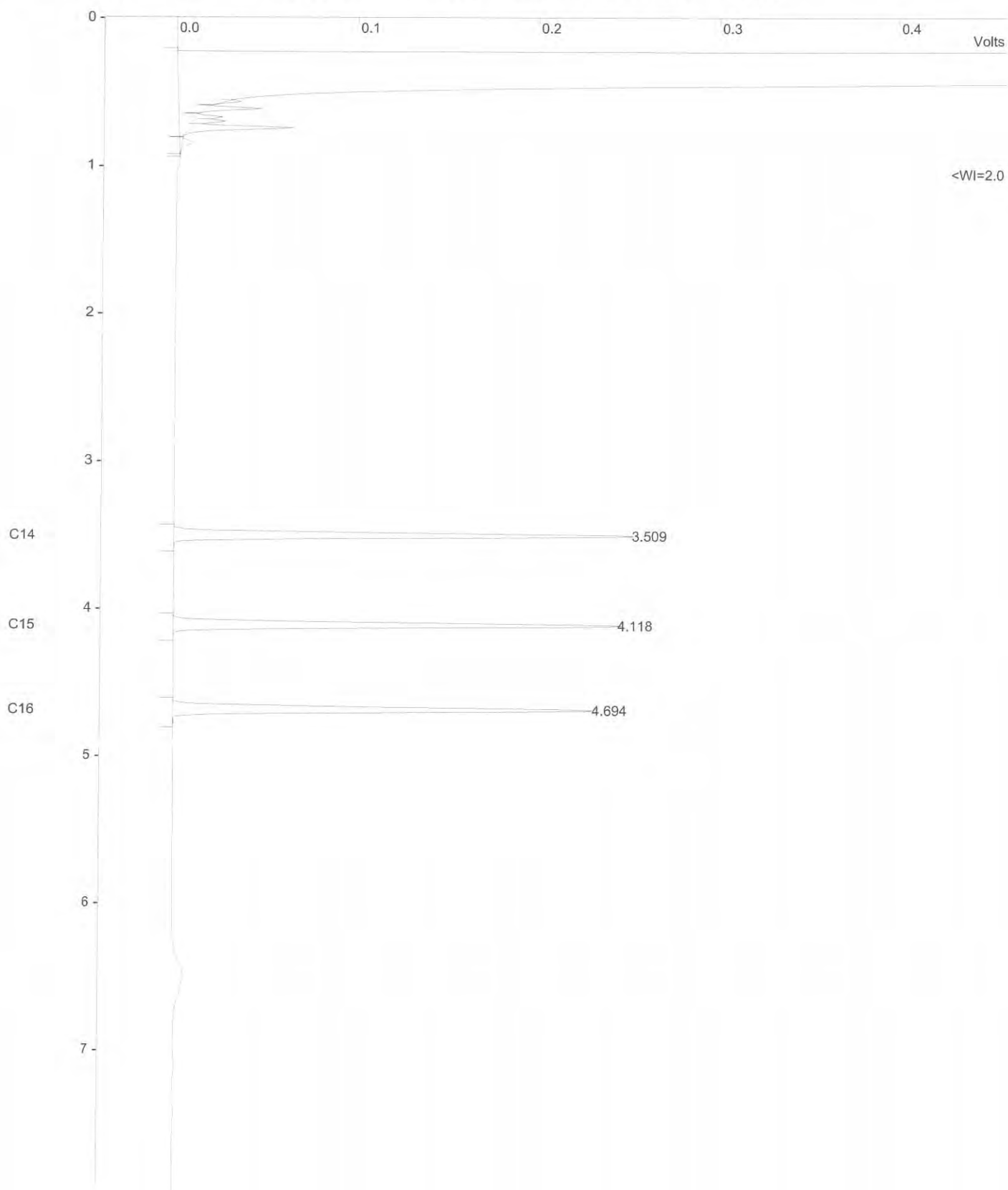
Calculation Date: 5/8/2567 9:26

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

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

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

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



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

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

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

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

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

Peak No.	Peak Name	Result ()	Ret. Time (min)	Time Offset (min)	Area (counts)	Sep. Code	Width 1/2 (sec)	Status Codes
1	C14	54.1202	3.509	-0.005	163565	BB	2.1	C
2	C15	53.5241	4.118	-0.005	157309	BB	2.2	C
3	C16	52.2361	4.694	0.001	146804	BB	2.3	C
Totals:		159.8804		-0.009	1704289			

Status Codes:

C - Out of calibration range

Total Unidentified Counts : 69332200 counts

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

Multiplier: 1 Divisor: 1 Unidentified Peak Factor: 0

Baseline Offset: -29 microVolts LSB: 1 microVolts

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

Manual injection

Calib. out of range; No Recovery Action Specified

Sample ID: **fid std**

Operator (Inj): **suwarot**

Injection Date: **05/08/2024**

Calc Date: **05/08/2024**

Run Time (min): **7.993**

Workstation: **GC-LAB**

Instrument (Inj):



VARIAN

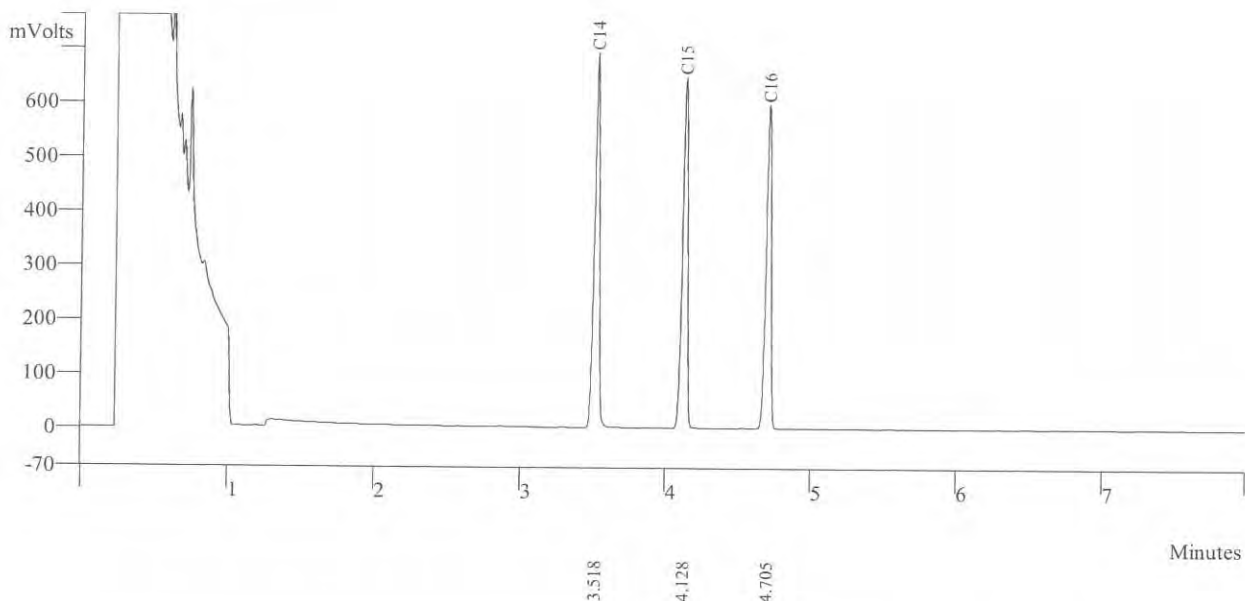
Run Mode: **Analysis**

Peak Measurement: **Peak Area**

Calculation Type: **External Std.**

c:\star\data\tu\cal2024\fid2024001.run

A = FID 10 V RESULTS



Peak No	Peak Name	Result ()	Ret Time (min)	Peak Area (counts)	Sep. Code	Width 1/2 (sec)
1	C14	152.6865	3.518	163565	BB	2.2
2	C15	147.1889	4.128	157309	BB	2.3
3	C16	138.7997	4.705	146804	BB	2.3
	Totals	438.6751		467678		

Sample ID: **fid std**

Operator (Inj): suwarot

Injection Date: 05/08/2024

Calc Date: 05/08/2024

Run Time (min): 7.993

Workstation: GC-LAB

Instrument (Inj):



VARIAN

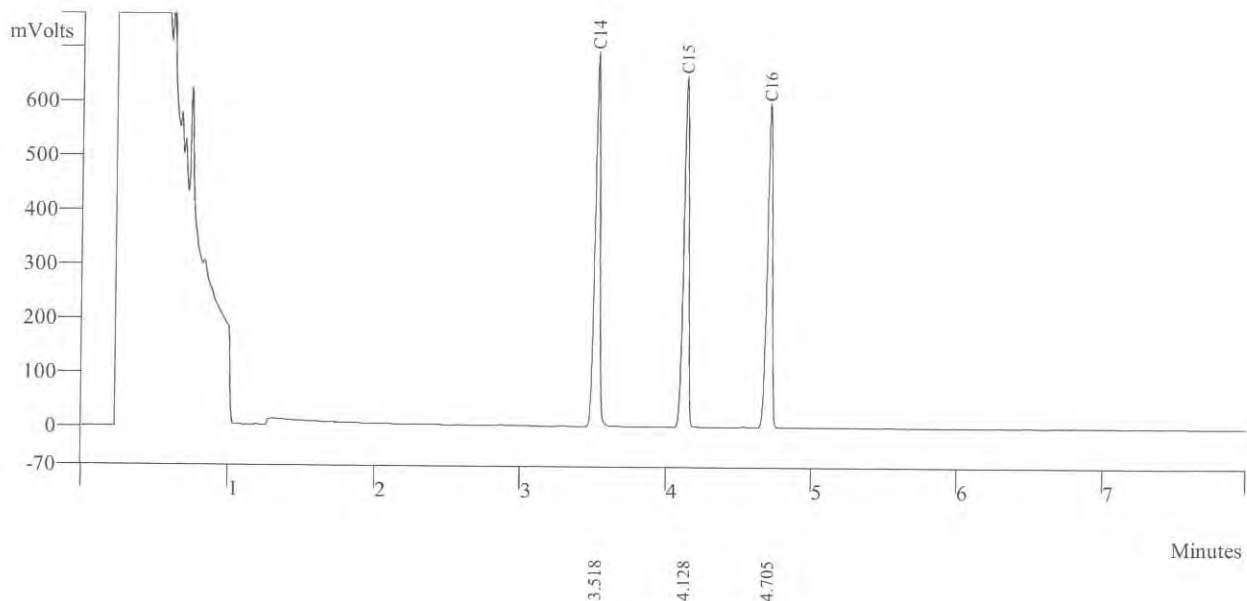
Run Mode: Analysis

Peak Measurement: Peak Area

Calculation Type: External Std.

c:\star\data\tu\cal2024\fid2024002.run

A = FID 10 V RESULTS



Peak No	Peak Name	Result ()	Ret Time (min)	Peak Area (counts)	Sep. Code	Width 1/2 (sec)
1	C14	152.6865	3.518	168565	BB	2.2
2	C15	137.1189	4.128	159359	BB	2.3
3	C16	128.7997	4.705	147834	BB	2.3
Totals		418.6042		475758		

Sample ID: **fid std**

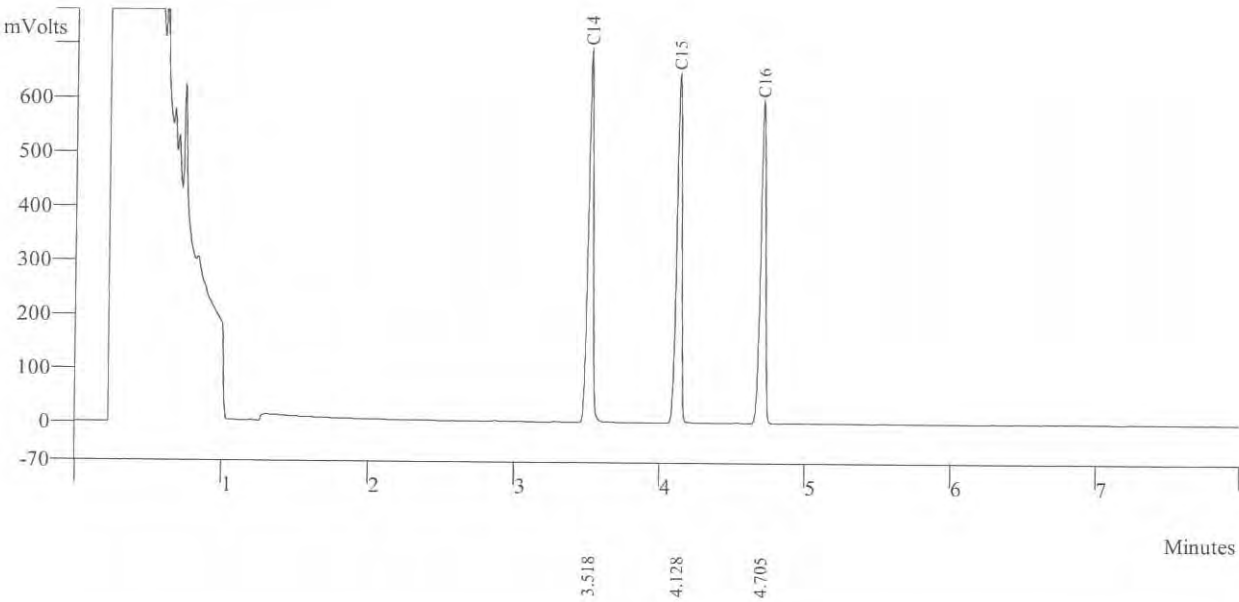
Operator (Inj): suwarot
Injection Date: 05/08/2024
Calc Date: 05/08/2024
Run Time (min): 7.993
Workstation: GC-LAB
Instrument (Inj):



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

c:\star\data\tu\cal2024\fid2024003.run

A = FID 10 V RESULTS



Peak No	Peak Name	Result ()	Ret Time (min)	Peak Area (counts)	Sep. Code	Width 1/2 (sec)
1	C14	152.7865	3.518	169535	BB	2.2
2	C15	197.1159	4.128	157349	BB	2.3
3	C16	128.5997	4.705	149834	BB	2.3
	Totals	478.5021		476718		



Sample ID: **fid std**

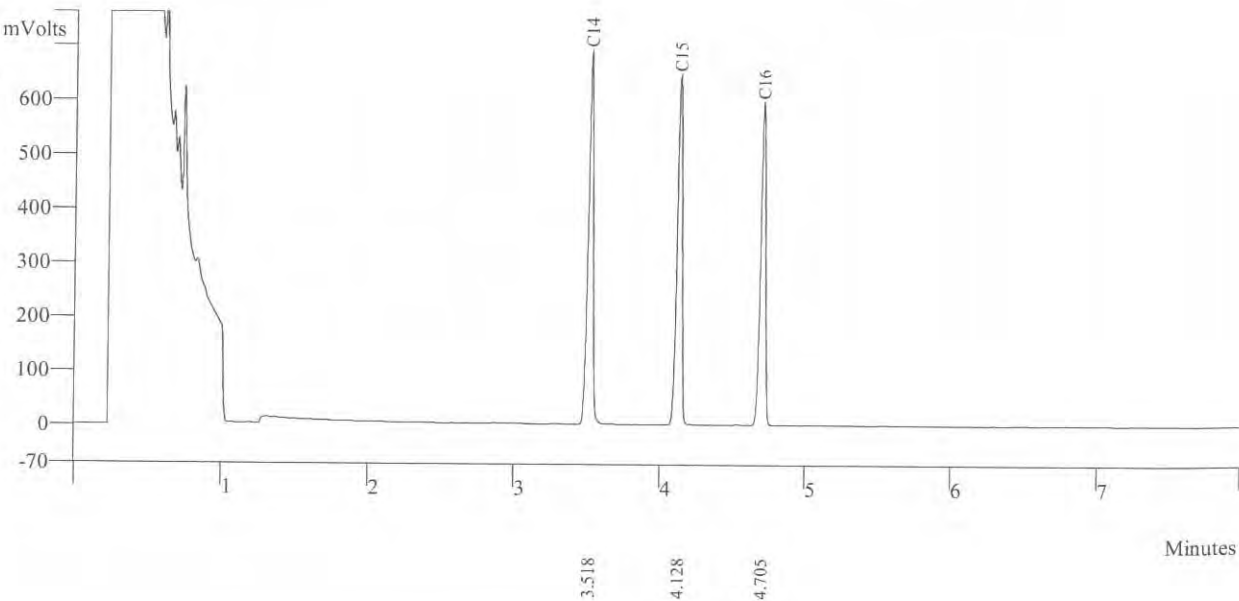
Operator (Inj): suwarot
Injection Date: 05/08/2024
Calc Date: 05/08/2024
Run Time (min): 7.993
Workstation: GC-LAB
Instrument (Inj):



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

c:\star\data\tu\cal2024\fid2024004.run

A = FID 10 V RESULTS



Peak No	Peak Name	Result ()	Ret Time (min)	Peak Area (counts)	Sep. Code	Width 1/2 (sec)
1	C14	162.7865	3.518	165521	BB	2.2
2	C15	157.1159	4.128	152379	BB	2.3
3	C16	138.5997	4.705	146834	BB	2.3
	Totals	458.5021		464734		





Agilent Technologies

Certificate of Analysis

FID-TCD Performance Evaluation Sample Kit

Agilent Part
Number: 5080-8842, 18710-60170

Sample Lot
Number: 0006750304

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

Concentrations:

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

Solvent: hexane

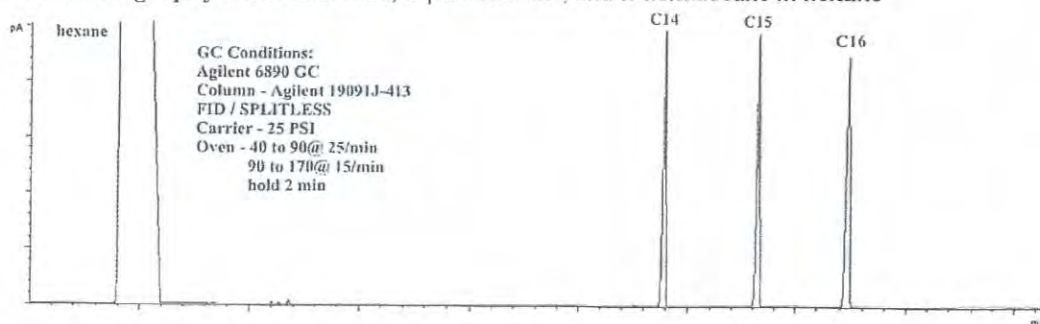
Calibrated Class A glassware and clean bottles were used in the manufacture of this standard. Balances used in the manufacture of this standard are calibrated with weights traceable to NIST in compliance with ANSI/NCSL Z-540-1 and ISO 9001.

Purities:

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

Typical Analytical Spectrum or Chromatography

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



Date of release: 30 June 2023

Date of expiration: 31 July 2025

Monica Bourgeois
QMS Representative



Certificate of Calibration

Certificate No.: WK2312-031-1

Page 1 of 2

Customer : THAI UNIQUE CO., LTD.
80-82 PRACHATHIPATAI RD., BANGKHUNPHROM,
PRANAKORN, BANGKOK 10200

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

Ambient Temperature : $(23 \pm 2) ^\circ\text{C}$
Humidity : $(50 \pm 15) \% \text{RH}$
Received Date : 6-Dec-23
Calibrated Date : 7-Dec-23
Issued Date : 12-Dec-23
Calibrated Location : In Lab

Reference standard instruments :

<u>Instrument</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>	<u>Traceability to</u>
Flow Calibrator	140215-134	L202304114-001	18-Apr-25	MIT
Primary Flow Calibrator	1107-S	WK2305-049-5	22-May-24	WK Electric Co.,Ltd.

MIT : Miracle International Technology Co.,Ltd.

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

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

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

Calibrated by : Mr.Taywanat Hansuwankul

Approved by :

Ms. Budsagorn Patcha
Authorized Signatory



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



Calibration Results

Certificate No. : WK2312-031-1

Page 2 of 2

Calibration Result of the Accuracy

Function : Flow Measurement

Range : 0 ml/min to 750 ml/min

Resolution : 0.01 / 0.1 / 1 ml/min

Unit : ml/min

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

(X) Without Adjustment () After Adjustment

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

**** End of Certificate****



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



Certificate of Calibration

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

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

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

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

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

Calibrated by

Nanthiya Ngampring
Mrs. Nanthiya Ngampring
Metrology Technician

Approved by

A S.
Mrs. Arunee Bamrungtham
Cal-Lab Manager



Measuretronix Limited

Calibration Report

UUC : Fluke 51 Thermometer

Serial No. : 5910857

Asset No. : 5910857

Procedure : CP-LF-04:Rev.02

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

Certificate No. : LF24-0278

Report data type : As-Found

Date of Calibrate : 26-Jun-2024

Date of Receive : 17-Jun-2024

Environment condition

Temperature : 23 °C ± 3 °C

Humidity : 50 %RH ± 20 %RH

Customer : Thai Unique Co., Ltd.

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

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

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

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

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

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

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

Standard Used

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

Test Data

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

End of Calibration Report

Certificate

It is hereby certified that

Suwarot Trikainut

Has successfully completed the Application Training for

Basic Gas Chromatography and Sampler

Training Contents were:

Hardware Operation, Software Operation, Data analysis and

Troubleshooting : Model

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

At Thai Unique Co., Ltd, Bangkok, Thailand

On 15th March, 2019



S. Pohtongkam

Service Manager



บริษัท ไทยยูนิค จำกัด

THAI UNIQUE CO., LTD.

80-82 ถนนประชาธิปไตย แขวงบางขุนพรหม เขตพระนคร กรุงเทพฯ 10200

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

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

GAS CHROMATOGRAPH TEST CERTIFICATION

Certificate No. : SV0825/23032

Instrument Type : Gas Chromatography

Model : 3800

Serial Number : 00734

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

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

Date : 02/08/2025

ELECTRONIC TEST

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

RUN CHROMATOGRAM TEST

DETECTOR : Flame Ionization Detectors (FID Channel-Front)

INJECTOR : 1079 Injector

GC CONDITION:

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

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

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

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



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

Detector Sensitivity (FID)

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

Temperature Specification

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

Relative Standard Deviation % (%RSD)

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

APPROVAL :

Signature:

Engineer : Somchai Pohtongkam

Date : 02/08/2025



VARIAN



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80-82 ถนนประชาธิปไตย แขวงบางขุนพรหม เขตพระนคร กรุงเทพฯ 10200

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

Results Integrated System Testing

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

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

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

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

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



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



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THAI UNIQUE CO., LTD.

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

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

Results Integrated System Testing

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

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

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

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

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



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



VARIAN

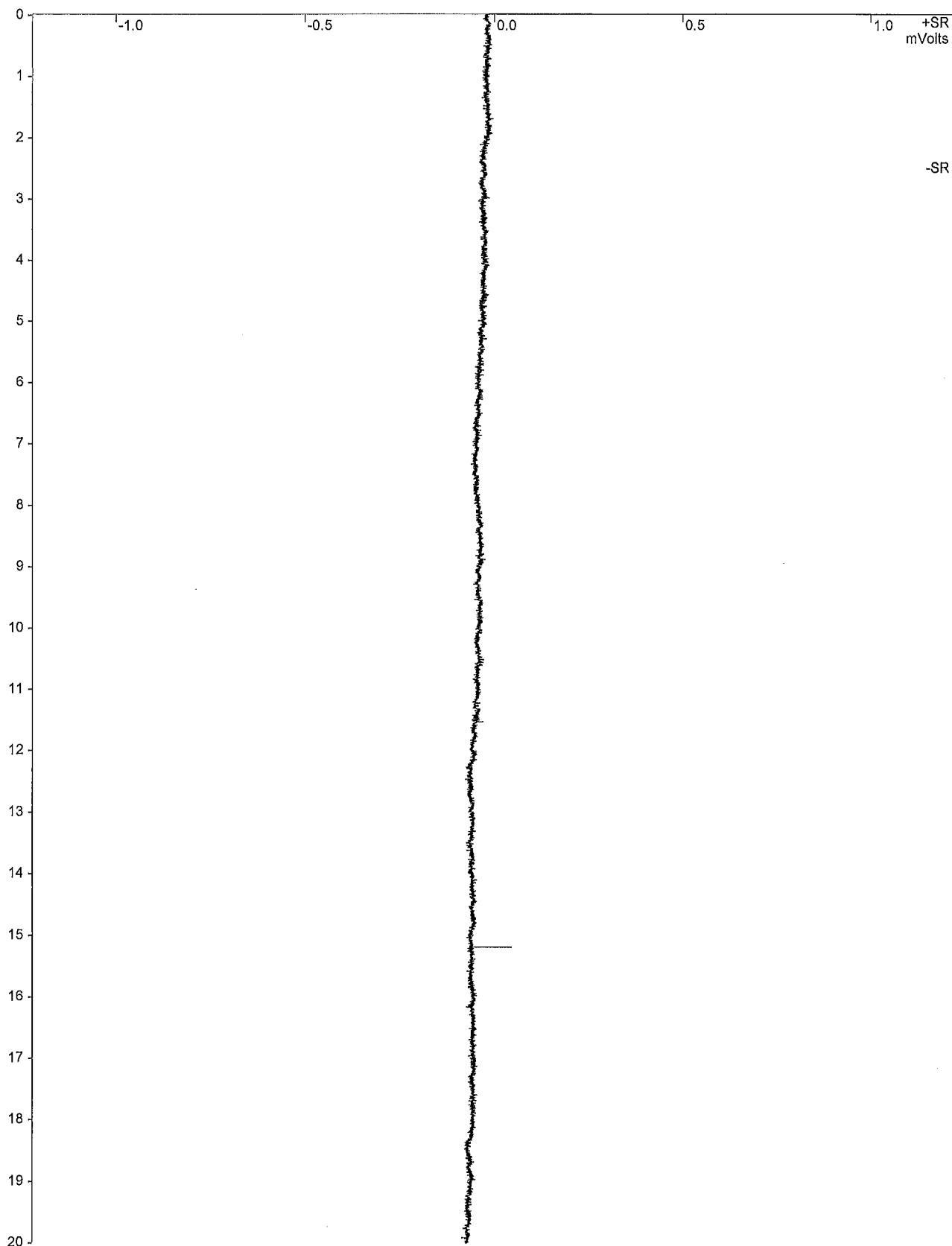
Title :
Run File : e:\sps2025\blk001.run
Method File : c:\star\data\tu\2025\cal fid.mth
Sample ID : blk

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

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

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

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



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

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

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

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

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

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

Total Unidentified Counts : 0 counts

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

Multiplier: 1 Divisor: 1 Unidentified Peak Factor: 0

Baseline Offset: -14 microVolts LSB: 1 microVolts

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

Manual injection

Data Handling: No peaks

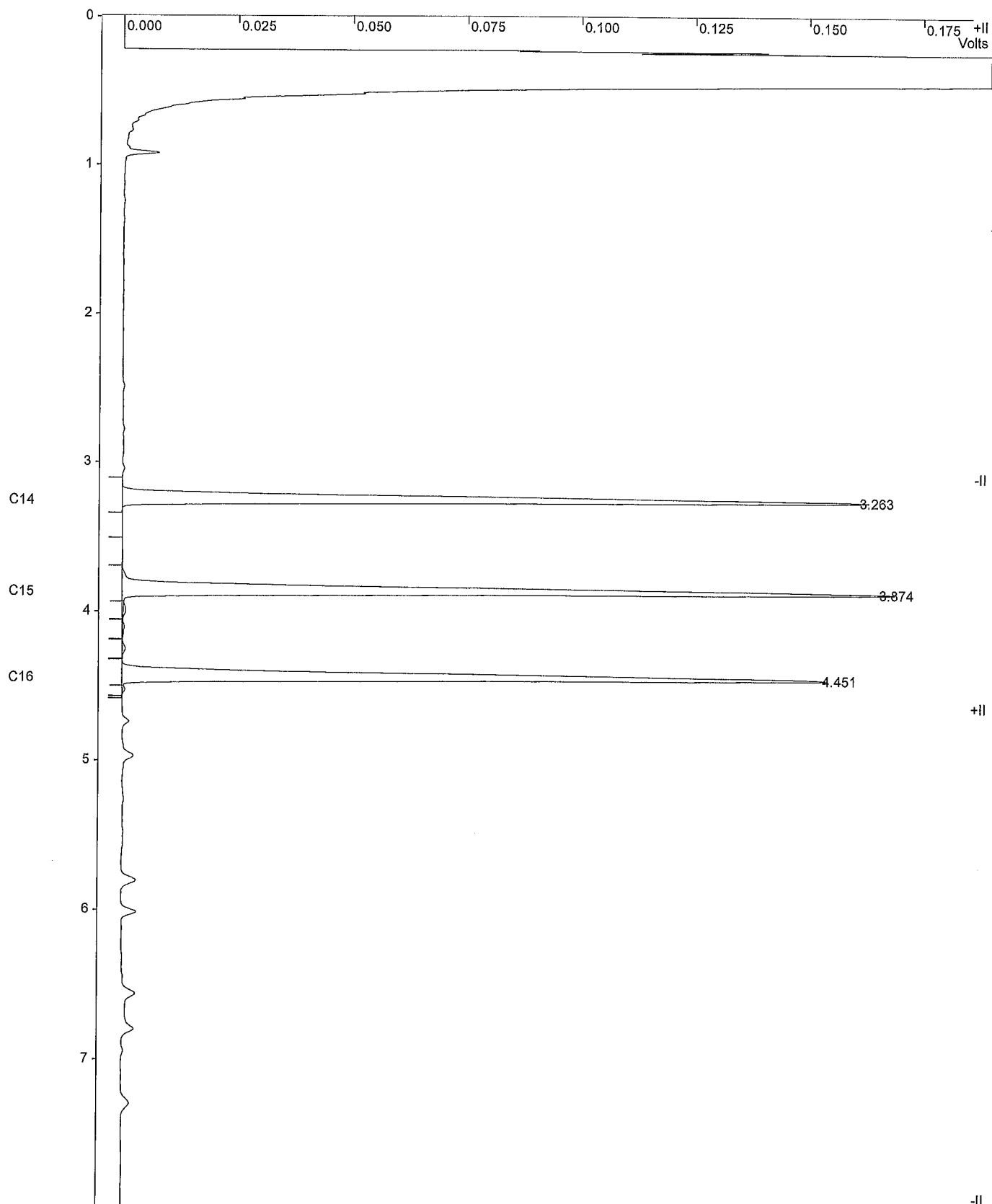
Title :
Run File : e:\sps2025\fidstd001.run
Method File : c:\star\data\tu\2025\cal fid.mth
Sample ID : fidstd

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

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

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

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



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

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

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

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

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

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

Total Unidentified Counts : 0 counts

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

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

Baseline Offset: 6 microVolts LSB: 1 microVolts

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

Manual injection

Sample ID: fid std

Operator (Inj): watsamon

Injection Date: 02/08/2025

Calc Date: 02/08/2025

Run Time (min): 7.993

Workstation: GC-LAB

Instrument (Inj):



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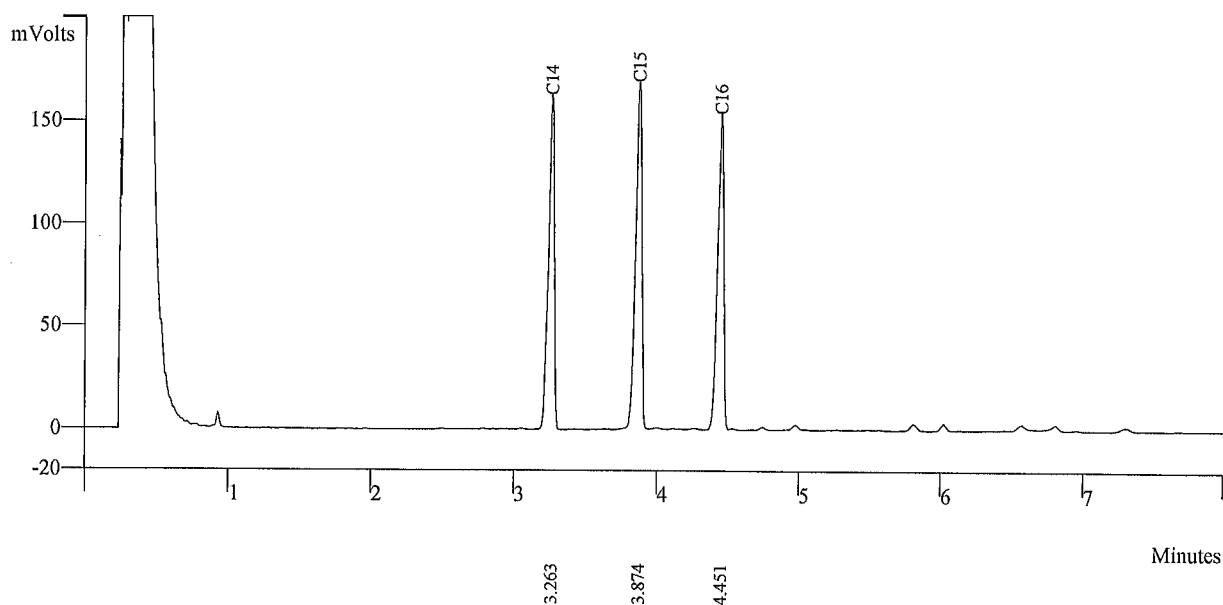
Run Mode: Calibration

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):

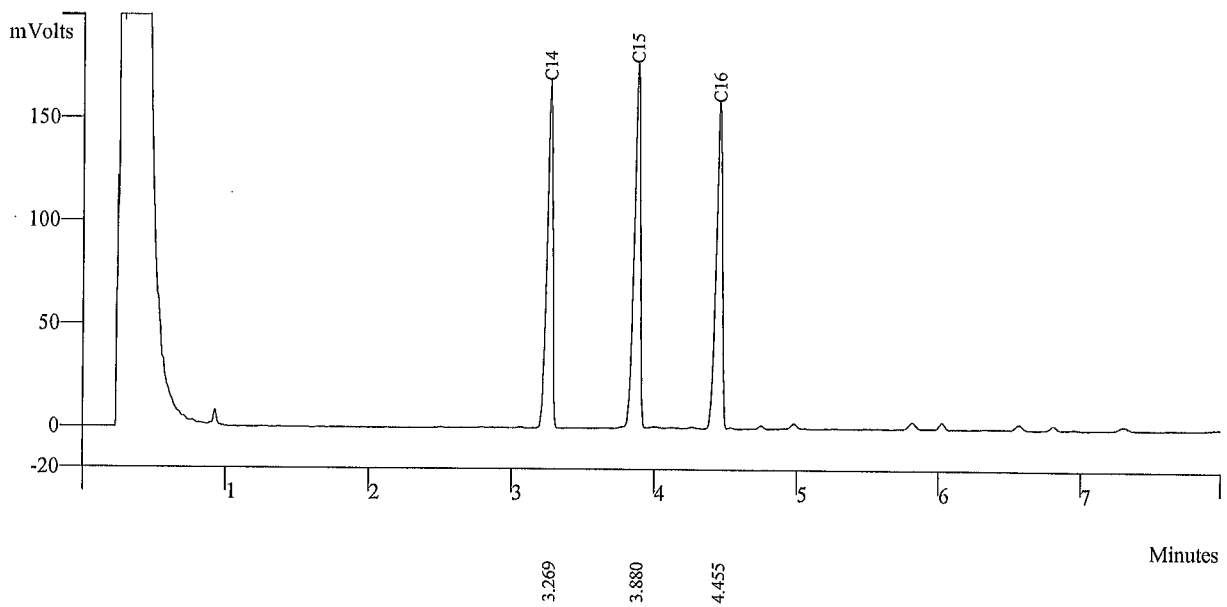
Run Mode: Calibration

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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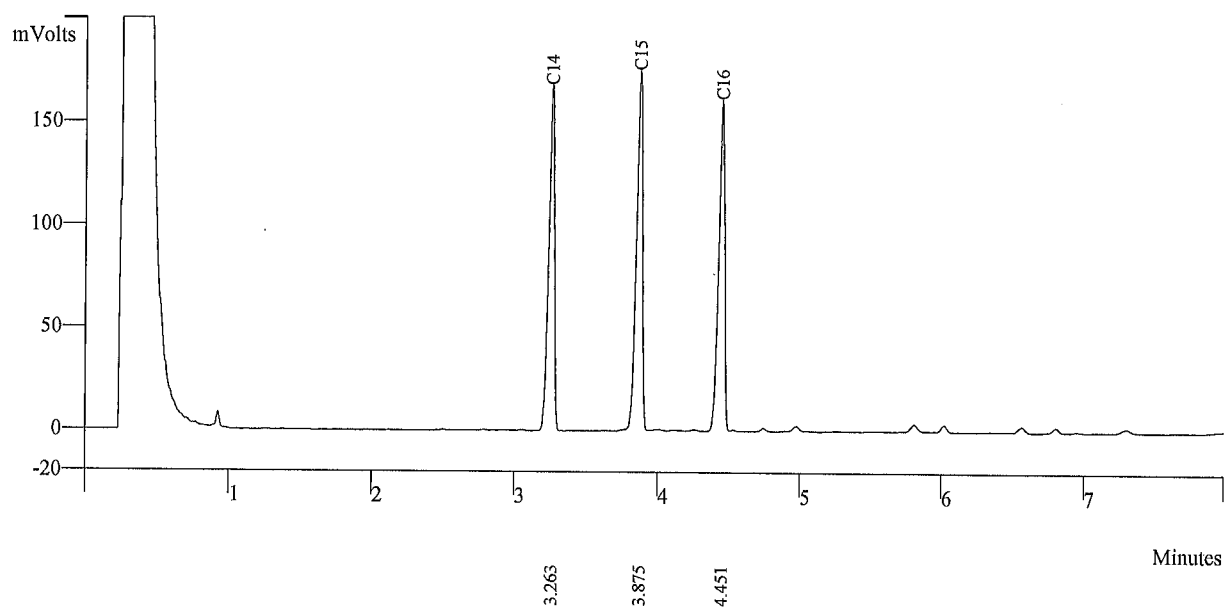
Run Mode: **Calibration**

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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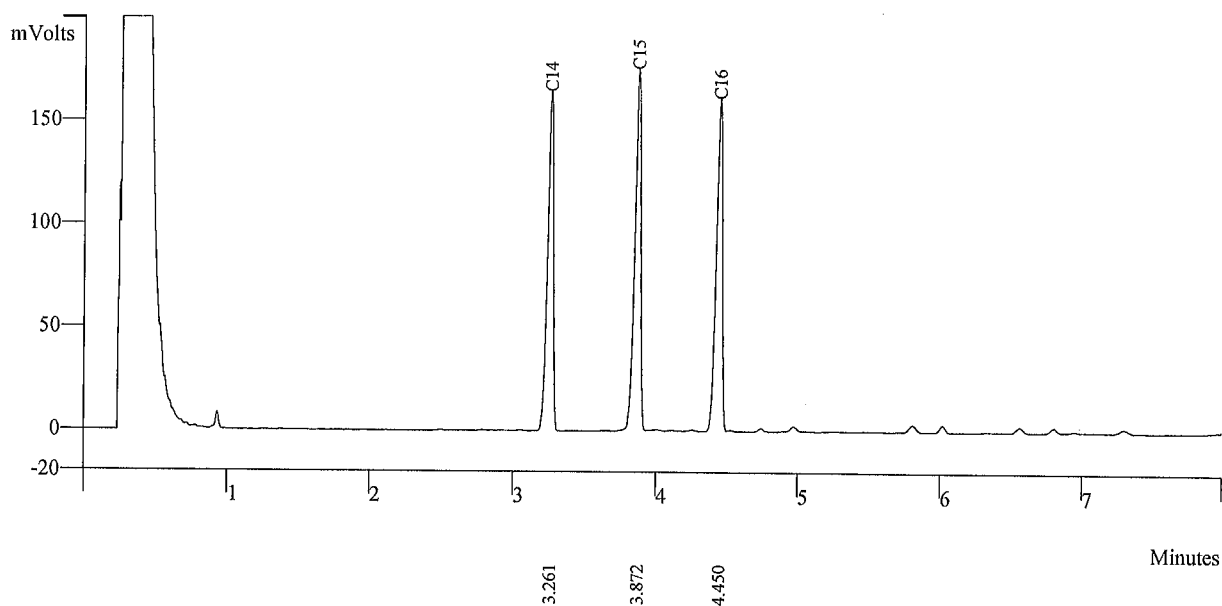
Run Mode: **Calibration**

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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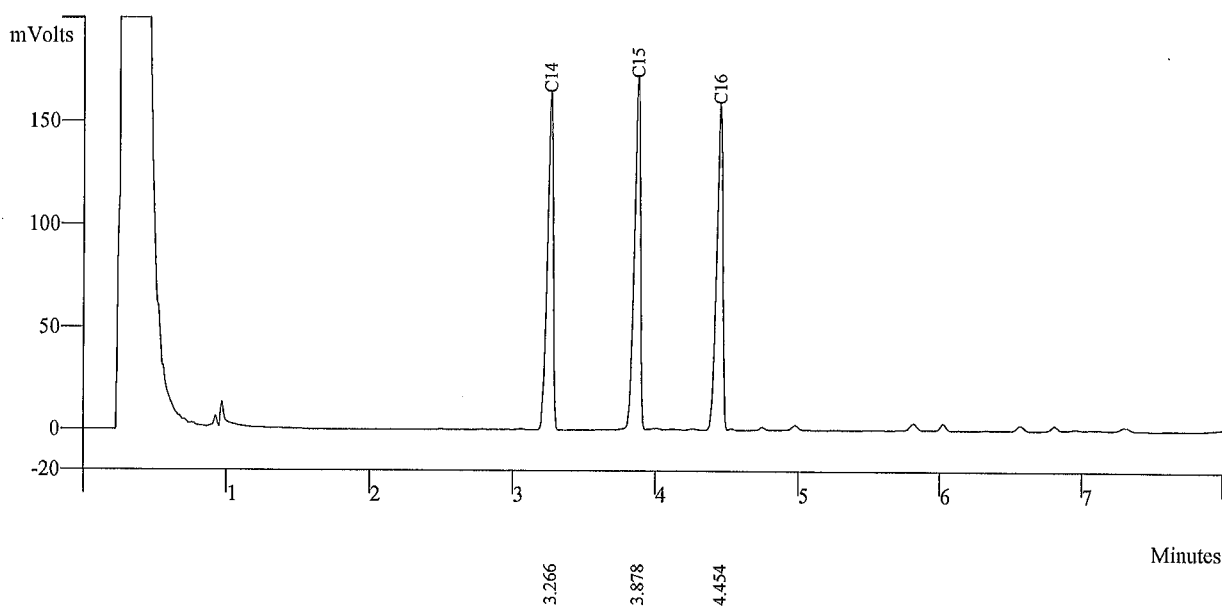
Run Mode: **Calibration**

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

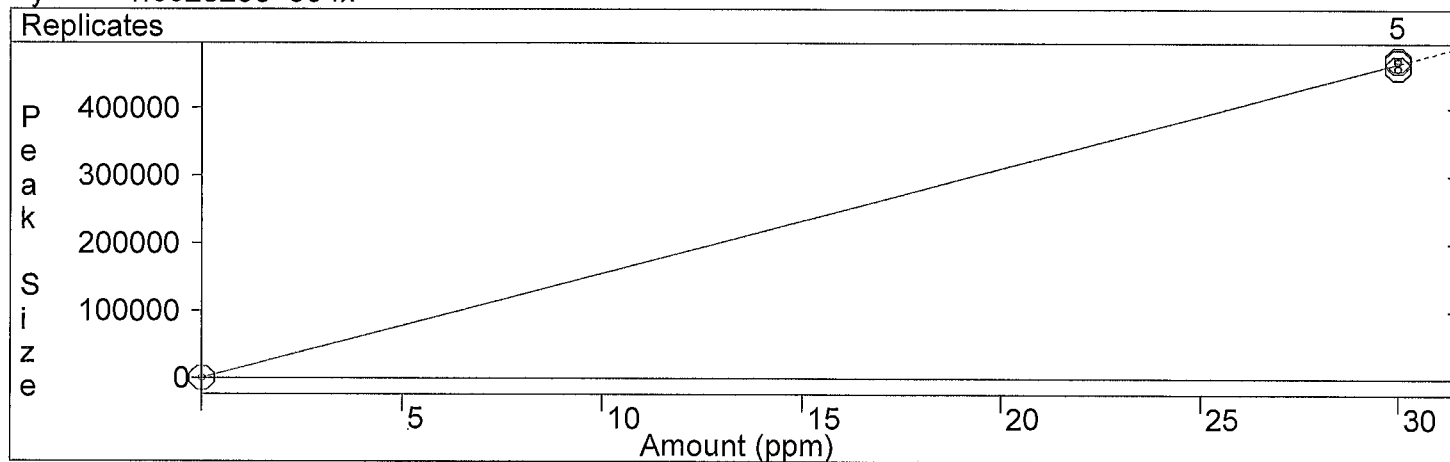
Curve Type: Linear

Origin: Force

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

Resp. Fact. RSD: 1.347%

Coeff. Det.(r²): 0.999130



C15

External Standard Analysis

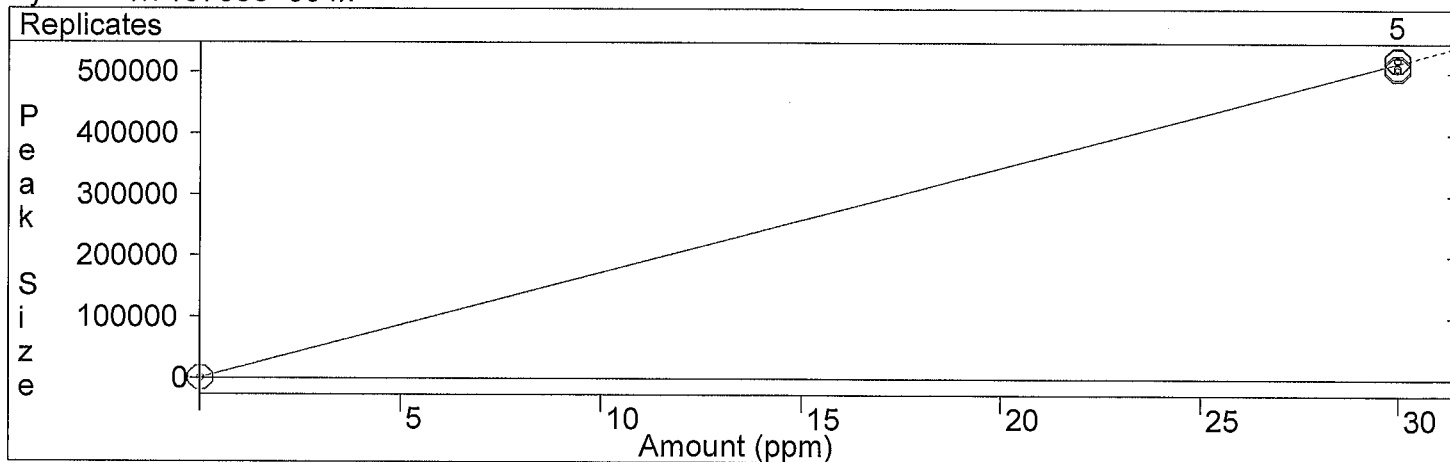
Curve Type: Linear

Origin: Force

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

Resp. Fact. RSD: 1.481%

Coeff. Det.(r²): 0.998948



C16

External Standard Analysis

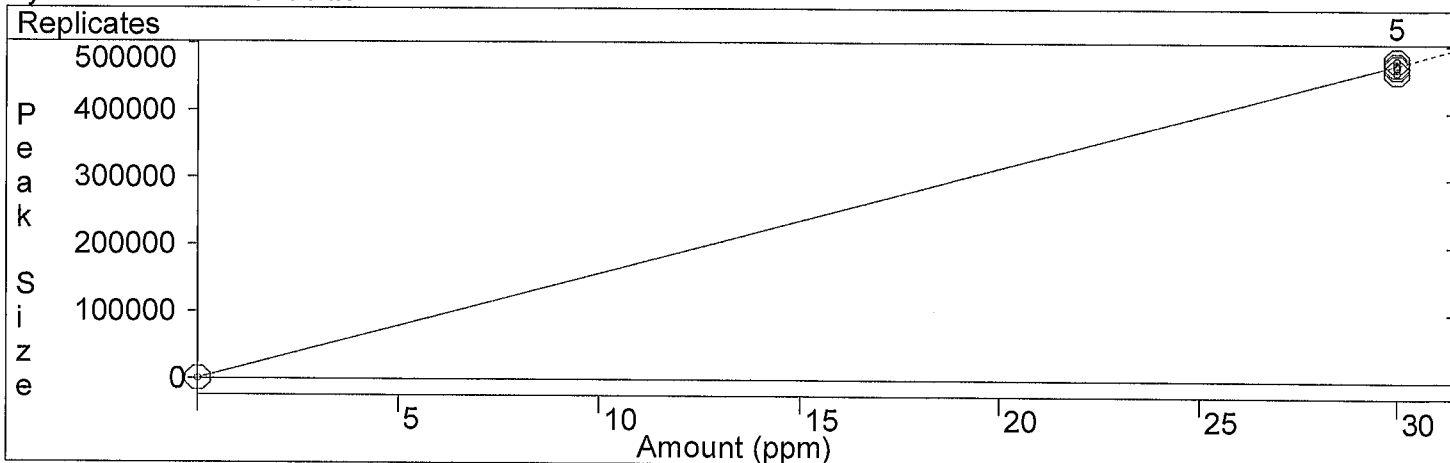
Curve Type: Linear

Origin: Force

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

Resp. Fact. RSD: 1.611%

Coeff. Det.(r²): 0.998756



CERTIFICATE

This is to certify, that

Somchai Pohthongkham

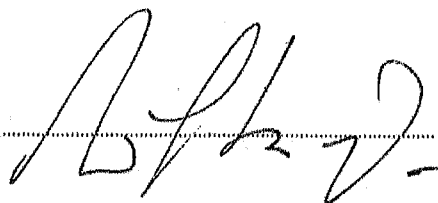
has participated the course

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%

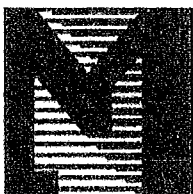
Calibrated by : Mr.Thippatai Mungpungklang

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

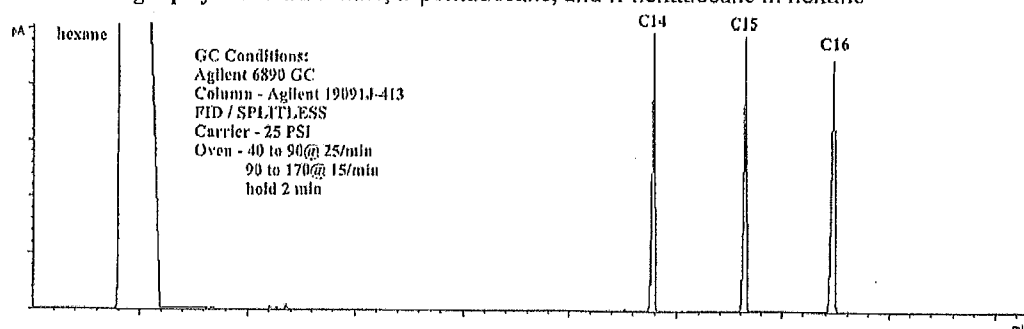
Calibrated Class A glassware and clean bottles were used in the manufacture of this standard. Balances used in the manufacture of this standard are calibrated with weights traceable to NIST in compliance with ANSI/NCSL Z-540-1 and ISO 9001.

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

Cert. No. : SP24020

Pages 1 of 3

Calibration Certificate

Equipment : UV-VIS SPECTROPHOTOMETER

Manufacturer : PERKINELMER

Model : LAMBDA 25

Serial No.: 501S14123010

ID No.: SP03/58

Calibration Mode : WAVELENGTH ACCURACY
PHOTOMETRIC ACCURACY

Condition As Found : GOOD

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

Location : WET CHEMISTRY LABORATORY IV

Ambient Temperature : (28.1 ± 5) °C

Relative Humidity : (47.2 ± 25) %

Received Date : 27 AUGUST 2024

Calibration Date : 27 AUGUST 2024

Date of Issue : 27 AUGUST 2024

Calibrated by : Nathakorn Pisutpaisan

Approved by :


(Thanakul Petchurai)

SITHIPORN ASSOCIATES CO., LTD.

CALIBRATION LABORATORY

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

SITHIPORN
associates



Cert. No. : SP24020

Job No. : VC67SP0013

Pages : 2 of 3

Calibration Method :

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

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

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

Condition of this result of calibration :

1. Certified reference materials

Material	Ref. type	Cell serial No.	Cert. No.	Due Date
Holmium liquid	RM-HL	29706	106864	01/11/2024
Didymium liquid	RM-DL	28912	106905	02/11/2024
Neutral density filter	RM-1N2N3N	13877	106918	03/11/2024
Potassium dichromate solutions	RM-0204060810	14204	106902	02/11/2024
Potassium Iodide solution	-	KI-0701-001	CI-0185-24	14/05/2026

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

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

3.1 The UK National Physical Laboratory (NPL)

3.2 The National Institute of Standards and Technology, NIST.

Result of calibration : Wavelength Accuracy

(Without adjustment)

Material	Certified Values of Reference Material (nm)	UUC* Reading (nm)	Error (nm)	Uncertainty ± (nm)	k Factor
RM-HL	278.13	278.3	0.17	0.16	2.00
	361.25	361.4	0.15	0.16	2.00
	467.82	467.7	-0.12	0.16	2.00
	536.56	536.5	-0.06	0.16	2.00
	640.50	640.4	-0.10	0.16	2.00
RM-DL	740.09	739.9	-0.19	0.16	2.00
	864.94	865.2	0.26	0.16	2.00

UUC* = Unit Under Calibration

F. Petch

SITHIPORN ASSOCIATES CO., LTD.

CALIBRATION LABORATORY

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

SITHIPORN
associates



Cert. No. : SP24020

Job No. : VC67SP0013

Pages : 3 of 3

Result of calibration : Photometric Accuracy

(Without adjustment)

Material	Wavelength (nm)	Filter S/N	Nominal Absorbance (A)	Certified Absorbance (A)	UUC* Reading Absorbance (A)	Error (A)	Uncertainty ± (A)	k Factor
Neutral Density glass filter	440.0	29360	1.0	1.0517	1.0550	0.0033	0.0029	2.00
		29914	0.7	0.7445	0.7460	0.0015	0.0029	2.00
		29381	0.5	0.5416	0.5431	0.0015	0.0030	2.00
	546.1	29360	1.0	0.9821	0.9820	-0.0001	0.0028	2.00
		29914	0.7	0.6961	0.6958	-0.0003	0.0028	2.00
		29381	0.5	0.5073	0.5080	0.0007	0.0029	2.00
	590.0	29360	1.0	1.0222	1.0210	-0.0012	0.0028	2.00
		29914	0.7	0.7237	0.7221	-0.0016	0.0029	2.00
		29381	0.5	0.5361	0.5361	0.0000	0.0031	2.00
	635.0	29360	1.0	0.9753	0.9745	-0.0008	0.0028	2.00
		29914	0.7	0.6910	0.6900	-0.0010	0.0029	2.00
		29381	0.5	0.5211	0.5210	-0.0001	0.0032	2.00
Material	Wavelength (nm)	Solution (mg/l)	Certified Absorbance (A)	UUC* Reading Absorbance (A)	Error (A)	Uncertainty ± (A)	k Factor	
RM-0204060810	235.0	20	0.2422	0.2418	-0.0004	0.0101	2.00	
		40	0.4866	0.4852	-0.0014	0.0115	2.00	
		60	0.7414	0.7389	-0.0025	0.0067	2.00	
		80	0.9858	0.9842	-0.0016	0.0093	2.00	
		100	1.2442	1.2414	-0.0028	0.0086	2.00	

UUC* = Unit Under Calibration

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

Resolution of Wavelength Mode	0.1 nm
Resolution of Photometric Mode	0.0001 A
Parameter Setting	
Measurement Mode	Wavelength, Absorbance
Wavelength Scan	1100 nm-190 nm
Scanning Speed	7.5 nm/min
Data Pitch	0.1 nm
Band width(Wavelength)	1.0 nm
Band width(Vis)	1.0 nm
Band width(Uv)	1.0 nm

Stray Light** UUC* Reading at 220 nm	
Transmission T(%)	Absorbance(A)
0.0117	3.8659

**Specific Acceptance :

Transmission \leq 1.0 T(%), Absorbance \geq 2.0 A

**Stray light not TISI Accredited

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

End of Calibration Certificate

T. Ketch

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

คุณภาพอากาศในบรรยากาศ



MIRACLE INTERNATIONAL TECHNOLOGY CO.,LTD

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



CALIBRATION CERTIFICATE

Page 1 of 4

Certificate No. : L202412119-0001

Date Issued : 13-Dec-24

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

Equipment : Mass Flow meter

Manufacturer : Dwyer

Model : GMF-2101

Serial No. : -

ID No./Tag No. : MF01/51

Date Received : 11-Dec-24

Date Calibrated : 12-Dec-24

Calibrated by : Saruth Srichutikul

Calibration Method or Calibration Procedure Used

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

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

Result of Calibration

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

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

Approved by: 
(Sarayuth Tochua)



Certificate No. : L202412119-0001

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

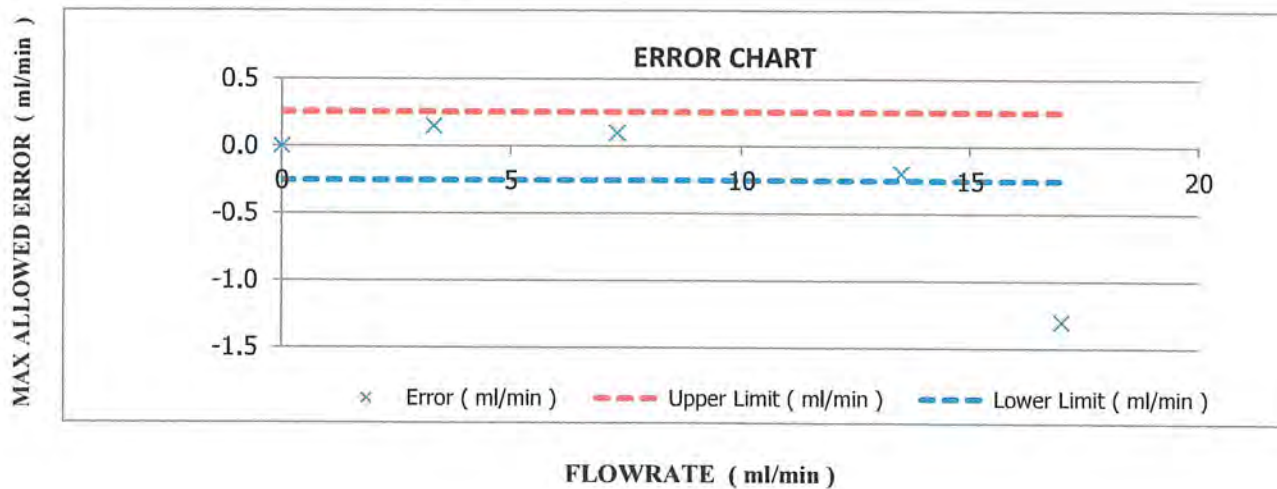
Capacity Range : 17 ml/min

Calibration Media : Air

Type : Mass Flowmeter

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

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

Error = Unit Under Calibration - Standard

Certificate No. : L202412119-0001

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

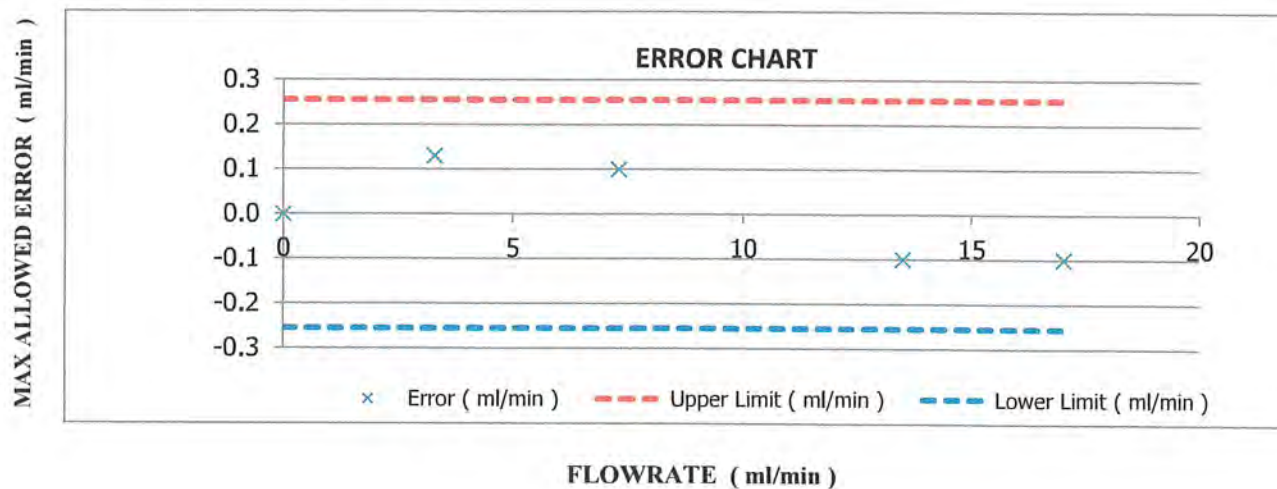
Capacity Range : 17 ml/min

Calibration Media : Air

Type : Mass Flowmeter

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

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

Error = Unit Under Calibration - Standard

Certificate No. : L202412119-0001

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

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

; Q = Flow rate

; P = Absolute pressure

; T = Absolute temperature

; Subscript "Meas" = Measurement condition

; Subscript "Ref" = Reference condition

Condition As-Received : Used Item

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

Traceability of Certificate :

The International System of Units (SI) through

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

End of Certificate



MIRACLE INTERNATIONAL TECHNOLOGY CO.,LTD

214 Bangwaek Rd. Bangpai Bangkoe Bangkok 10160
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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

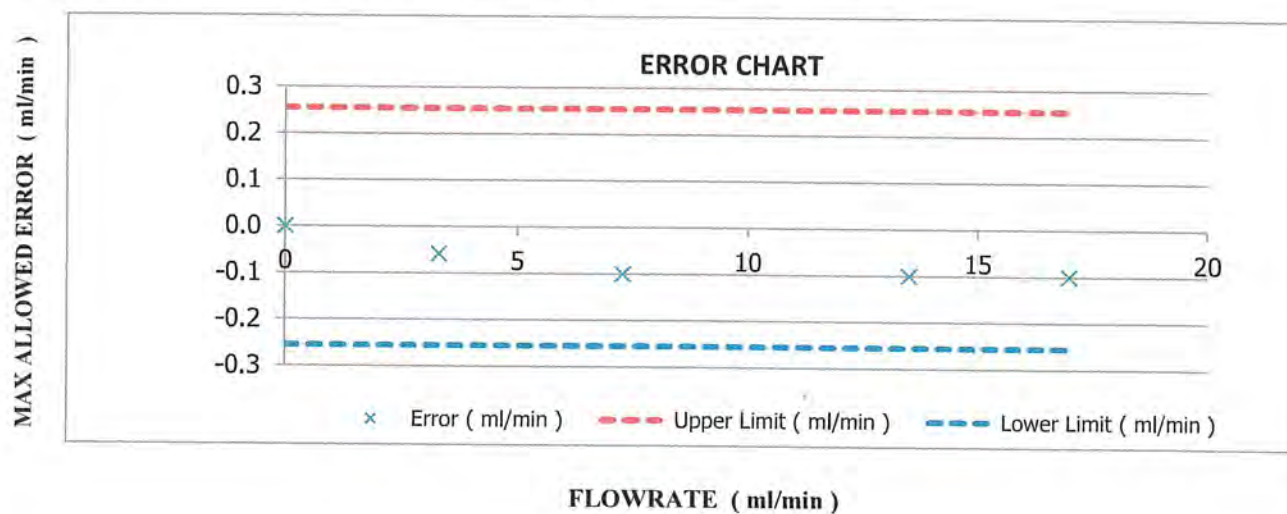
Type : Mass Flowmeter

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



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

CALIBRATION REPORT					
SO ₂ FLUORESCENT ANALYZER					
DATE :	30 November 2025	BRAND :	API	MODEL :	100E
NO.	SO ₂ -R04	SERIAL NO.	3489		
Calibrator (Dilution System)					
Brand	: Teledyne			Model	: 700E
Last Cal. Date	: 29 October 2025			Serial No.	: 201-S
Reference Standard Gas					
Standard Gas	: Sulphur Dioxide (SO ₂)			Cylinder No.	: A00814SK
Certified Date	: 21 June 2021	Expired Date	: 21 June 2029	Cylinder Conc.	: 49.8 ppm
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.6	°C
% RH	50				
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.10	-	0	-
SO 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	28.3	in-Hg	25-35		
SAMPLE FLOW	655	cc/min	650 ± 10%		
PMT	102.8	mV	-20-150 with Zero Air		
UV LAMP	3015.3	mV	1000-4900		
STR. LGT	61.2	PPB	<100		
DRK PMT	63.5	mV	-50 - 200		
DRK LMP	57.8	mV	-50 - 200		
HVPS	673	V	550-900 constant		
DCPS	2515	mV	2500 ± 200		
RCELL TEMP	50.1	°C	50 ± 1		
BOX TEMP	29.3	°C	5-40		
PMT TEMP	7.1	°C	7 ± 2.0		
SO ₂ Span Conc	400	PPB	20-20,000		
SO ₂ Slope	1.003	-	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 :

(Mr.Kaseam Simaphon)

Approved by :

(Mr.Yuthana Thanataranit)



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

CALIBRATION REPORT					
SO ₂ FLUORESCENT ANALYZER					
DATE :	30 November 2025	BRAND :	API	MODEL :	100E
NO.	SO ₂ -R06	SERIAL NO.	066		
Calibrator (Dilution System)					
Brand : Teledyne			Model : 700E		
Last Cal. Date : 29 October 2025			Serial No. : 201-S		
Reference Standard Gas					
Standard Gas : Sulphur Dioxide (SO ₂)			Cylinder No. : A00814SK		
Certified Date : 21 June 2021		Expired Date : 21 June 2029		Cylinder Conc. : 49.8 ppm	
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.6	°C
% RH	50				
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.11	-	0	-
SO ₂ Span	400.0	400.1	0.025	400.0	1.005
API Model 100E SO ₂ Analyzer Check list					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	0-500		
SAMPLE PRESS	28.3	in-Hg	25-35		
SAMPLE FLOW	654	cc/min	650 ± 10%		
PMT	103.1	mV	-20-150 with Zero Air		
UV LAMP	3075.3	mV	1000-4900		
STR. LGT	60.9	PPB	<100		
DRK PMT	62.8	mV	-50 - 200		
DRK LMP	57.5	mV	-50 - 200		
HVPS	671	V	550-900 constant		
DCPS	2517	mV	2500 ± 200		
RCELL TEMP	50.2	°C	50 ± 1		
BOX TEMP	29.1	°C	5-40		
PMT TEMP	7.1	°C	7 ± 2.0		
SO ₂ Span Conc	400	PPB	20-20,000		
SO ₂ Slope	1.005	-	1.0 ± 0.3		
SO ₂ Offset	21.8	mV	<250		
Stability at Zero	0.1	PPB	<0.2		
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)		

Calibrated by :

(Mr.Kaseam Simaphon)

Approved by :

(Mr.Yuthana Thanataranit)



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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

CALIBRATION REPORT					
SO ₂ FLUORESCENT ANALYZER					
DATE :	30 November 2025	BRAND :	TELEDYNE	MODEL :	TML-60
NO.	SO ₂ -R08	SERIAL NO.	TRS1064		
Calibrator (Dilution System)					
Brand	: Teledyne			Model	: 700E
Last Cal. Date	: 29 October 2025			Serial No.	: 201-S
Reference Standard Gas					
Standard Gas	: Sulphur Dioxide (SO ₂)			Cylinder No.	: A00814SK
Certified Date	: 21 June 2021	Expired Date	: 21 June 2029	Cylinder Conc.	: 49.8 ppm
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.6	°C
% RH	50				
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.11	-	0	-
SO ₂ Span	400.0	400.1	0.025	400.0	0.999
API Model TML-60 SO ₂ Analyzer Check list					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	0-500		
SAMPLE PRESS	28.6	in-Hg	25-35		
SAMPLE FLOW	652	cc/min	650 ± 10%		
PMT	103.5	mV	-20-150 with Zero Air		
UV LAMP	3020.4	mV	1000-4900		
STR. LGT	61.3	PPB	<100		
DRK PMT	63.2	mV	-50 - 200		
DRK LMP	57.9	mV	-50 - 200		
HVPS	669	V	550-900 constant		
DCPS	2515	mV	2500 ± 200		
RCCELL TEMP	50.3	°C	50 ± 1		
BOX TEMP	29.0	°C	5-40		
PMT TEMP	7.2	°C	7 ± 2.0		
SO ₂ Span Conc	400	PPB	20-20,000		
SO ₂ Slope	0.999	-	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 :

(Mr.Kaseam Simaphon)

Approved by :

(Mr.Yuthana Thanataranit)



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

CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER					
DATE :	30 November 2025	BRAND :	API	MODEL :	200A
NO.	NOX-B15	SERIAL NO.	213		
Calibrator (Dilution System)					
Brand	: Teledyne			Model	: 700E
Last Cal. Date	: 29 October 2025			Serial No.	: 201-S
Reference Standard Gas					
Standard Gas	: Nitric Oxide (NO)			Cylinder No.	: A00674SV
Certified Date	: 12 March 2025	Expired Date	: 12 March 2028	Cylinder Conc.	: 48.7 ppm
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.6	°C
% RH	50				
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.11	-	0	-
NO Span	400	399.8	-0.050	400.0	1.002
NO _x Span	400	400.2	0.050	400.0	1.005
API Model 200A NO _x Analyzer Check List					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	500 standard		
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air		
SAMPLE FLOW	508	cc/min	500 ± 50		
OZONE FLOW	78	cc/min	80 ± 15		
PMT	102.9	mV	-20 - 150		
AZERO	94.1	mV	-20 - 150		
HVPS	671	V	420 - 900 constant		
RCELL TEMP	50.2	°C	50 ± 1		
BOX TEMP	29.2	°C	8 - 48		
PMT TEMP	7.1	°C	7 ± 2		
MOLY TEMP	314.9	°C	315 ± 5		
RCELL PRESS	8.4	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	1.1	mV	-20 to +150		
NO _x Offset	0.5	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by :

(Mr.Kaseam Simaphon)

Approved by :

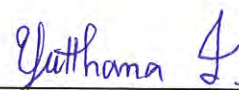
(Mr.Yuthana Thanataranit)



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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 :	30 November 2025	BRAND :	API	MODEL :	200E	
NO.	NOX-R01	SERIAL NO.	769			
Calibrator (Dilution System)						
Brand	: Teledyne			Model	: 700E	
Last Cal. Date	: 29 October 2025			Serial No.	: 201-S	
Reference Standard Gas						
Standard Gas	: Nitric Oxide (NO)			Cylinder No.	: A00674SV	
Certified Date	: 12 March 2025	Expired Date	: 12 March 2028	Cylinder Conc.	: 48.7 ppm	
CALIBRATING CONDITION						
Pressure	1011	mmbar	Temp.	24.6	°C	
% RH						50
CALIBRATION SETTING						
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB		
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope	
Zero	0	-0.10	-	0	-	
NO Span	400	400.1	0.025	400.0	1.004	
NO _x Span	400	400.3	0.075	400.0	1.006	
API Model 200E NO _x Analyzer Check List						
Test Values	Observed Value	Units	Nominal Range			
RANGE	500	PPB	500 standard			
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air			
SAMPLE FLOW	504	cc/min	500 ± 50			
OZONE FLOW	79	cc/min	80 ± 15			
PMT	103.6	mV	-20 - 150			
AZERO	94.1	mV	-20 - 150			
HVPS	770	V	420 - 900 constant			
RCELL TEMP	50.0	°C	50 ± 1			
BOX TEMP	29.1	°C	8 - 48			
PMT TEMP	7.1	°C	7 ± 2			
MOLY TEMP	315.2	°C	315 ± 5			
RCELL PRESS	8.3	IN-Hg-A	2 - 10 constant			
SAMPLE PRESS	28.5	IN-Hg-A	25 - 30 constant			
NO Span Conc	400	PPB	20 - 20,000			
NO _x Span Conc	400	PPB	20 - 20,000			
NO Slope	1.004	-	1.0 ± 0.3			
NO _x Slope	1.006	-	1.0 ± 0.3			
NO Offset	0.8	mV	-20 to +150			
NO _x Offset	0.4	mV	-20 to 150			
Stability at Zero	0.1	PPB	< 0.2			
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas			

Calibrated by : 
(Mr.Kaseam Simaphon)

Approved by : 
(Mr.Yuthana Thanataranit)



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

CALIBRATION REPORT						
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER						
DATE :	30 November 2025	BRAND :	API	MODEL :	200A	
NO.	NOX-B14	SERIAL NO.	212			
Calibrator (Dilution System)						
Brand : Teledyne			Model : 700E			
Last Cal. Date : 29 October 2025			Serial No. : 201-S			
Reference Standard Gas						
Standard Gas : Nitric Oxide (NO)			Cylinder No. : A00674SV			
Certified Date : 12 March 2025		Expired Date : 12 March 2028		Cylinder Conc. : 48.7 ppm		
CALIBRATING CONDITION						
Pressure	1011	mmbar	Temp.	24.6	°C	
% RH						50
CALIBRATION SETTING						
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB		
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope	
Zero	0	0.10	-	0	-	
NO Span	400	400.1	0.025	400.0	1.001	
NO _x Span	400	400.2	0.050	400.0	1.005	
API Model 200A NO _x Analyzer Check List						
Test Values	Observed Value	Units	Nominal Range			
RANGE	500	PPB	500 standard			
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air			
SAMPLE FLOW	504	cc/min	500 ± 50			
OZONE FLOW	79	cc/min	80 ± 15			
PMT	103.5	mV	-20 - 150			
AZERO	94.2	mV	-20 - 150			
HVPS	669	V	420 - 900 constant			
RCELL TEMP	50.1	°C	50 ± 1			
BOX TEMP	29.2	°C	8 - 48			
PMT TEMP	7.2	°C	7 ± 2			
MOLY TEMP	315.2	°C	315 ± 5			
RCELL PRESS	8.4	IN-Hg-A	2 - 10 constant			
SAMPLE PRESS	28.5	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	1.001	-	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 :

(Mr.Kaseam Simaphon)

Approved by :

(Mr.Yuthana Thanataranit)

Job Number :	J092500024-003	Customer Name :	IRPC
Equipment :	AQMs Station.	Contact Name :	KhunWirasakKhumsuk
Model :	AQMs Station.	Telephone Number :	081-803-0475
Serial Number :	Pluak Kate Station	E-mail address/Fax. :	wirasak.k@irpc.co.th
Working Date :	03 December 2025	Working Hour :	4 Hours

Service Report

Working Scope:

Service Station

Physical Checking:

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

Correction working:

Calibrate single-point of all analyzers.	Drain water for pump of Zero Air.
Replace sample filter 47 mm.	Clean หัววัดฝุ่น
Replace diaphragm pump of CO.	

Part Replacements:

- Sample Filter 47 mm. 6 ea. (Part support by IRPC)
- Diaphragm pump of CO. 1 ea. (Part support by IRPC)

Addition Recommended:

- End -

Serviced by :	ชินโรส มุขโรจน์	Serviced Date	03 December 2025
Approved by:		Approved Date :	03 December 2025



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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 :	AQMs Pluak Kate	Model :	-
Serial Number :	Pluak Kate Station	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	26°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	Fail	
9	Zero air compressor operation	OK	OK	นำของบ้านแลงมาใช้แทนชั่วคราว
10	Silica gel for dry air of NO _x analyzer	OK	OK	
11	UPS 3 KVA	OK	OK	
12	Data logger	OK	OK	
13	Ventilation fan	OK	OK	
14	Power cable	OK	OK	
15	Hydrogen Gas	-	350/40 psi	
16	Standard gas#1 (NO,SO ₂ ,HC,CO)	-	1900/32 psi	

Note :



บริษัท คิว-ซี โซลูชั่นส์ จำกัด

7/409 ซอยวิภาวดีรังสิต 36 ถนนวิภาวดีรังสิต แขวงจตุจักร เขตจตุจักร กรุงเทพฯ 10900

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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-BZSAB

Serial Number : CM06280010

Manufacturer : Thermo Scientific

Diagnostic test value				
Parameter	Observed value		Unit	Nominal range
	Before	After		
Sample reading	4.9	2.4	ppb	
Range	500	500	ppb	50 to 1000 ppb
Averaging Time	30	30	Sec	10 to 300 Sec
Calibration Factors				
SO ₂ BKG. ppb	25.4	26.2	ppb	0 to 60
SO ₂ COEF	1.011	1.039	-	1.0 ± 0.3
Instrument Controls				
Temp Correction	On	On	On/Off	On
Pressure Correction	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 Brightness	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	23.9	23.9	Vdc	24.0 +/- 1 Vdc
-3.3 Supply	-3.2	-3.2	Vdc	- 3.3 +/- 1 Vdc
Interface board voltages:				
PMT Supply	-602.0	-602.0		
Flash Supply	823	821		
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	14.7	14.7	Vdc	15.0 +/- 1 Vdc
-15.0 Supply	-15.0	-15.0	Vdc	-15.0 +/- 1 Vdc
24.0 Supply	23.9	23.9	Vdc	24.0 +/- 1 Vdc
Temperatures				
Internal	36.8	37.8	°C	15°C to 45°C
Chamber	45.3	45.2	°C	45°C ± 2°C
Pressure	731.3	733.1	mmHg	750 ± 100 mmHg
Flow	0.624	0.624	L/min	0.5 to 1.00 L/min
Lamp intensity	91	91	%	40 – 100 %

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 Analyzer

Equipment :	NO-NO ₂ -NO _x analyzer.	Model :	42i
Serial Number :	1170530044	Manufacturer :	Thermo Scientific

Diagnostic test value				
Parameter	Observed value		Unit	Nominal range
	Before	After		
Sample reading				
NO reading	12.1	15.1	ppb	
NO _x reading	23.7	44.3	ppb	
Range	500	500	ppb	50 to 1000 ppb
Averaging Time	30	30	Sec	10 to 300 Sec
Calibration Factors				
NO BKG. ppb	19.7	18.6	ppb	0 to 60
NO _x BKG. ppb	23.8	19.3	ppb	0 to 60
NO COEF.	1.217	1.172	-	1.0 ± 0.3
NO _x COEF.	0.975	0.915	-	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	45	45	%	0 to 100
Service Mode	Off	Off	-	On/Off, Up to used
Diagnostics				
Voltages				
PMT Supply	-903.2	-903.2	Vdc	-400 to -1200 Vdc
5 Supply	4.9	4.9	Vdc	5.0 ± 1 Vdc
15 Supply	15.1	15.1	Vdc	15.0 ± 1 Vdc
-15 Supply	-15.0	-15.0	Vdc	-15.0 ± 1 Vdc
Temperatures				
Internal	34.5	35.2	°C	15 °C to 45 °C
Chamber	49.9	49.8	°C	50°C ± 2 °C
Cooler	-2.9	-2.8	°C	(-)3 °C ± 2 °C
Converter	327.4	323.2	°C	325 °C ± 5 °C
Converter Set	325.0	325.0	°C	325 °C
Pressure	272.0	272.8	mmHg	250 ± 100 mmHg
Flow	0.558	0.565	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

SINGLE-POINT GAS CALIBRATION

All analyzer.

Equipment :	All analyzer.	Model :	42C, 43i , 48i, 49i
Serial Number :	0504710413,CM06280010, 1201351403,CM09040067	Manufacturer :	Thermo

Standard gas concentration			Dilutor detail	
Sulfur Dioxide (SO ₂)	44.7	ppm	Manufacturer :	Thermo
Nitric Oxide (NO)	45.0	ppm	Model :	146C
Methane (CH ₄)	498	ppm	Serial number :	0504710414
Carbon oxide (CO)	4550	ppm		
Cylinder NO. :	A00931SK			
Expiration Date :	8 Sep 2026			

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			
CO (ppm)	0.00			40.3			
O ₃ (ppb)	0.00			400			
CH ₄ (ppm)	0.00			5.00			
THC (ppm)	0.00			5.00			

AFTER CALIBRATION RESULT

PARAMETER	ZERO			SPAN			JUDGEMENT
	IDEAL	ACTUAL	ERROR	IDEAL	ACTUAL	%ERROR	
NO (ppb)	0.00	0.9	0.90	400	399.0	-0.25	Valid
NO _x (ppb)	0.00	1.7	1.70	400	402.0	0.50	Valid
SO ₂ (ppb)	0.00	1.2	1.20	400	401.0	0.25	Valid
CO (ppm)	0.00	0.20	0.20	40.3	40.4	0.25	Valid
O ₃ (ppb)	0.00	1.0	1.00	400	399.0	-0.25	Valid
CH ₄ (ppm)	0.00			5.00			
THC (ppm)	0.00			5.00			

Remark :



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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:	N68APSSFEMP
Customer Name (if applicable):	Ms.Naruecha	PM number:	1 of 2
Service Engineer Name:	Monchai Kitcharoenkeat	Service Order Number:	WO-
Date PM Performed: (DD-MMM-YYYY)	22-Feb-2025	Next PM Due Date: (DD-MMM-YYYY)	22-Aug-2025

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 0.33 Volt

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

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

Carrier gas ☒ Helium ☐ Nitrogen ☐ Hydrogen

Moisture level ☒ Good ☐ Need to replace ☐ Other _____

Detector gas ☒ Air Zero ☒ Hydrogen ☐ Nitrogen ☐ Helium

Moisture level ☒ Good ☐ Need to replace ☐ Other _____

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

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

Gas leakage ☒ Pass ☐ Fail Comment _____

- ☒ Perform general inspection of system for cleanliness.

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

Electronic cooling fan ☒ Yes ☐ No

Oven cooling fan ☒ Yes ☐ No

2. Electronic :

- ☒ Check oven temperature. Calibrate if necessary.

Oven temperature set point 150 °C ☒ Pass ☐ Fail

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

Oven temperature set point 5 °C ☐ Pass ☐ Fail

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

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

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

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

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

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

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

Detector Channel A	<u>1.12</u>	mV.
Detector Channel B	<u>NA</u>	mV.

3. Diagnostics Tests:

- ☒ Run instrument diagnostics.

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

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

4. Review:

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

Additional Comments


Additional Comments Regarding the PM

Review

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

GC Clarus 600/680 Preventive Maintenance (PM)

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

Part Number	Release	Publication Date	
TH09370070	C	August 2016	

Scope

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

General Instructions:

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

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Component List

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

Parts Lists

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

Procedure Checklist

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

1. General:

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

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

L-N 220 Volt

L-G 220 Volt

N-G 0.32 Volt

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

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

Carrier gas ☒ Helium ☐ Nitrogen ☐ Hydrogen

Moisture level ☒ Good ☐ Need to replace ☐ Other _____

Detector gas ☒ Air Zero ☒ Hydrogen ☐ Nitrogen ☐ Helium

Moisture level ☒ Good ☐ Need to replace ☐ Other _____

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

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

Gas leakage ☒ Pass ☐ Fail Comment _____

- ☒ Perform general inspection of system for cleanliness.

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

Electronic cooling fan ☒ Yes ☐ No

Oven cooling fan ☒ Yes ☐ No

2. Electronic :

- ☒ Check oven temperature. Calibrate if necessary.

Oven temperature set point 150 °C ☒ Pass ☐ Fail

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

Oven temperature set point 5 °C ☐ Pass ☐ Fail

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

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

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

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

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

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

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

Detector Channel A	<u>0.98</u>	mV.
Detector Channel B	<u>NA</u>	mV.

3. Diagnostics Tests:

- ☒ Run instrument diagnostics.

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

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

4. Review:

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

Additional Comments

Additional Comments Regarding the PM

Review

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

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 -





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)

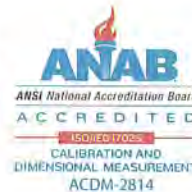
Certificate No. Q25070523

F3-011-05/12-23

page 1 of 4



@clccalibration



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.





CALIBRATION LABORATORY CO., LTD.

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



TRACEABILITY :

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

UNCERTAINTY :

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

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

Certificate No. Q25070523

F3-011-05/12-23

page 3 of 4



@clccalibration



CLC
Accredited
ISO/IEC 17025

CALIBRATION LABORATORY Co., LTD.

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



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

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

CALIBRATION DATA

1. pH METER RESULT @ 25 °C

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

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

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

2. TEMPERATURE RESULT

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

Technical Note. Type of sensor : Thermistor

Probe \varnothing 3 mm

Materials : Metal Sheath.

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

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

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

End of Certificate

Certificate No. Q25070523

F3-011-05/12-23

page 4 of 4



@clccalibration



CERTIFICATE 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

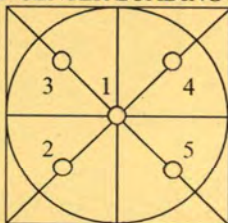
2. TARE FUNCTION : NORMAL

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



CERT.No.: HS-W015C

Certificate of Calibration

Calibration Date : 18 Mar 25

Model : YSI 5000

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

S/N : 15B100751

7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol,

Probe : YSI 5010

Chatuchak, Bangkok, Thailand 10900

S/N : 22D100097

ID NO. : -

Avg Room Temp : 20 °C

Air Temp ref : S/N. F8065C26

Avg Water Temp : 20 °C

Barometric ref : S/N. F8065C26

Air Pressure : 760.00 mmHg

Water Temp ref : -

Salinity : 0 ppt

ID NO. HS001

Technician : Kittipong M.

Calibration Details

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

Mean Measurement 9.07 mg/l -

Inaccuracy 0.02 mg/l -

Overall Status (PASS)

Manufacturer Specification

Accuracy = +/- 0.02 mg/l

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



Technician Signature

(Kittipong Maekwong)



Laboratory Manager

(Natenapha Pisatkunchon)



QUALITY CALIBRATION CO., LTD.

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

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

www.qcalibration.com

CERTIFICATE No : 25T0521

REFERENCE No : 75853-2

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : COD REACTOR

MANUFACTURER : HACH

MODEL : DRB 200

SERIAL No : 15110C0498


ID No : CRB 06/59

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 : 03-Feb-25

APPROVED BY : 
PONGSAK J.

ISSUED DATE : 03-Feb-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 : 25T0521

PAGE : 2 OF 2

Calibration Report

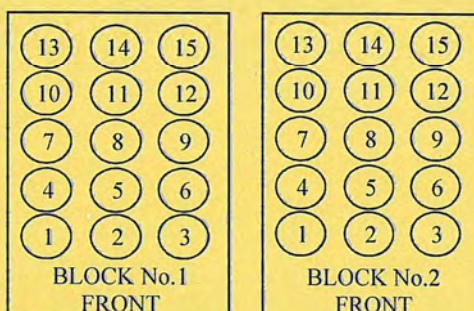
EQUIPMENT : COD REACTOR
MANUFACTURER : HACH
ID NUMBER : CRB 06/59
RECEIVED DATE : 15-Jan-25
AMBIENT TEMPERATURE : 23° C ± 1° C
MODEL : DRB 200
SERIAL NUMBER : 15110C0498
CALIBRATION DATE : 03-Feb-25
RELATIVE HUMIDITY : 53 %RH ± 10 % RH

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	7301307	24T6467	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)		145	145
Indicating Temperature		145	145
Measured Temperature (° C) at Spread Locations	1	150.23	150.64
	2	149.73	149.78
	3	150.29	150.29
	4	150.04	150.49
	5	150.09	150.51
	6	150.74	150.67
	7	149.97	150.66
	8	150.76	150.57
	9	150.54	150.51
	10	149.44	149.94
	11	150.12	150.64
	12	149.93	150.33
	13	149.19	149.82
	14	148.96	149.70
	15	149.09	149.79
Uncertainty of Measurement(± °C)		0.88	0.88

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



Cert. No. : SP24020

Pages 1 of 3

Calibration Certificate

Equipment : UV-VIS SPECTROPHOTOMETER

Manufacturer : PERKINELMER

Model : LAMBDA 25

Serial No.: 501S14123010

ID No.: SP03/58

Calibration Mode : WAVELENGTH ACCURACY
PHOTOMETRIC ACCURACY

Condition As Found : GOOD

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

Location : WET CHEMISTRY LABORATORY IV

Ambient Temperature : (28.1 ± 5) °C

Relative Humidity : (47.2 ± 25) %

Received Date : 27 AUGUST 2024

Calibration Date : 27 AUGUST 2024

Date of Issue : 27 AUGUST 2024

Calibrated by : Nathakorn Pisutpaisan

Approved by :


(Thanakul Petchurai)

SITHIPORN ASSOCIATES CO., LTD.

CALIBRATION LABORATORY

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

SITHIPORN
associates



Cert. No. : SP24020

Job No. : VC67SP0013

Pages : 2 of 3

Calibration Method :

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

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

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

Condition of this result of calibration :

1. Certified reference materials

Material	Ref. type	Cell serial No.	Cert. No.	Due Date
Holmium liquid	RM-HL	29706	106864	01/11/2024
Didymium liquid	RM-DL	28912	106905	02/11/2024
Neutral density filter	RM-1N2N3N	13877	106918	03/11/2024
Potassium dichromate solutions	RM-0204060810	14204	106902	02/11/2024
Potassium Iodide solution	-	KI-0701-001	CI-0185-24	14/05/2026

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

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

3.1 The UK National Physical Laboratory (NPL)

3.2 The National Institute of Standards and Technology, NIST.

Result of calibration : Wavelength Accuracy

(Without adjustment)

Material	Certified Values of Reference Material (nm)	UUC* Reading (nm)	Error (nm)	Uncertainty ± (nm)	k Factor
RM-HL	278.13	278.3	0.17	0.16	2.00
	361.25	361.4	0.15	0.16	2.00
	467.82	467.7	-0.12	0.16	2.00
	536.56	536.5	-0.06	0.16	2.00
	640.50	640.4	-0.10	0.16	2.00
RM-DL	740.09	739.9	-0.19	0.16	2.00
	864.94	865.2	0.26	0.16	2.00

UUC* = Unit Under Calibration

F. Peter

SITHIPORN ASSOCIATES CO., LTD.

CALIBRATION LABORATORY

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

SITHIPORN
associates



Cert. No. : SP24020

Job No. : VC67SP0013

Pages : 3 of 3

Result of calibration : Photometric Accuracy

(Without adjustment)

Material	Wavelength (nm)	Filter S/N	Nominal Absorbance (A)	Certified Absorbance (A)	UUC* Reading Absorbance (A)	Error (A)	Uncertainty ± (A)	k Factor
Neutral Density glass filter	440.0	29360	1.0	1.0517	1.0550	0.0033	0.0029	2.00
		29914	0.7	0.7445	0.7460	0.0015	0.0029	2.00
		29381	0.5	0.5416	0.5431	0.0015	0.0030	2.00
	546.1	29360	1.0	0.9821	0.9820	-0.0001	0.0028	2.00
		29914	0.7	0.6961	0.6958	-0.0003	0.0028	2.00
		29381	0.5	0.5073	0.5080	0.0007	0.0029	2.00
	590.0	29360	1.0	1.0222	1.0210	-0.0012	0.0028	2.00
		29914	0.7	0.7237	0.7221	-0.0016	0.0029	2.00
		29381	0.5	0.5361	0.5361	0.0000	0.0031	2.00
	635.0	29360	1.0	0.9753	0.9745	-0.0008	0.0028	2.00
		29914	0.7	0.6910	0.6900	-0.0010	0.0029	2.00
		29381	0.5	0.5211	0.5210	-0.0001	0.0032	2.00
Material	Wavelength (nm)	Solution (mg/l)	Certified Absorbance (A)	UUC* Reading Absorbance (A)	Error (A)	Uncertainty ± (A)	k Factor	
RM-0204060810	235.0	20	0.2422	0.2418	-0.0004	0.0101	2.00	
		40	0.4866	0.4852	-0.0014	0.0115	2.00	
		60	0.7414	0.7389	-0.0025	0.0067	2.00	
		80	0.9858	0.9842	-0.0016	0.0093	2.00	
		100	1.2442	1.2414	-0.0028	0.0086	2.00	

UUC* = Unit Under Calibration

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

Resolution of Wavelength Mode	0.1 nm
Resolution of Photometric Mode	0.0001 A
Parameter Setting	
Measurement Mode	Wavelength, Absorbance
Wavelength Scan	1100 nm-190 nm
Scanning Speed	7.5 nm/min
Data Pitch	0.1 nm
Band width(Wavelength)	1.0 nm
Band width(Vis)	1.0 nm
Band width(Uv)	1.0 nm

Stray Light** UUC* Reading at 220 nm	
Transmission T(%)	Absorbance(A)
0.0117	3.8659

**Specific Acceptance :

Transmission \leq 1.0 T(%), Absorbance \geq 2.0 A

**Stray light not TISI Accredited

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

End of Calibration Certificate

T. Ketch

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:	1 of 2
Service Engineer Name:	Monchai Kitcharoenkeat	Service Order Number:	WO-
Date PM Performed: (DD-MMM-YYYY)	22-Feb-2025	Next PM Due Date: (DD-MMM-YYYY)	22-Aug-2025

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 0.33 Volt

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

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

Carrier gas ☒ Helium ☐ Nitrogen ☐ Hydrogen

Moisture level ☒ Good ☐ Need to replace ☐ Other _____

Detector gas ☒ Air Zero ☒ Hydrogen ☐ Nitrogen ☐ Helium

Moisture level ☒ Good ☐ Need to replace ☐ Other _____

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

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

Gas leakage ☒ Pass ☐ Fail Comment _____

- ☒ Perform general inspection of system for cleanliness.

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

Electronic cooling fan ☒ Yes ☐ No

Oven cooling fan ☒ Yes ☐ No

2. Electronic :

- ☒ Check oven temperature. Calibrate if necessary.

Oven temperature set point 150 °C ☒ Pass ☐ Fail

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

Oven temperature set point 5 °C ☐ Pass ☐ Fail

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

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

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

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

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

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

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

Detector Channel A	<u>1.12</u>	mV.
Detector Channel B	<u>NA</u>	mV.

3. Diagnostics Tests:

- ☒ Run instrument diagnostics.

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

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

4. Review:

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

Additional Comments


Additional Comments Regarding the PM

Review

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

GC Clarus 600/680 Preventive Maintenance (PM)

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

Part Number	Release	Publication Date	
TH09370070	C	August 2016	

Scope

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

General Instructions:

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

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Component List

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

Parts Lists

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

Procedure Checklist

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

1. General:

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

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

L-N 220 Volt

L-G 220 Volt

N-G 0.32 Volt

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

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

Carrier gas ☒ Helium ☐ Nitrogen ☐ Hydrogen

Moisture level ☒ Good ☐ Need to replace ☐ Other _____

Detector gas ☒ Air Zero ☒ Hydrogen ☐ Nitrogen ☐ Helium

Moisture level ☒ Good ☐ Need to replace ☐ Other _____

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

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

Gas leakage ☒ Pass ☐ Fail Comment _____

- ☒ Perform general inspection of system for cleanliness.

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

Electronic cooling fan ☒ Yes ☐ No

Oven cooling fan ☒ Yes ☐ No

2. Electronic :

- ☒ Check oven temperature. Calibrate if necessary.

Oven temperature set point 150 °C ☒ Pass ☐ Fail

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

Oven temperature set point 5 °C ☐ Pass ☐ Fail

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

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

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

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

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

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

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

Detector Channel A	<u>0.98</u>	mV.
Detector Channel B	<u>NA</u>	mV.

3. Diagnostics Tests:

- ☒ Run instrument diagnostics.

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

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

4. Review:

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

Additional Comments

Additional Comments Regarding the PM

Review

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



MIRACLE INTERNATIONAL TECHNOLOGY CO.,LTD

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



CALIBRATION CERTIFICATE

Certificate No. : S2024090374-0003

Date Issued : 23-Sep-24

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

Equipment : Incubator

Manufacturer : BINDER

Model : BD 115

Serial No. : 12-16967

ID No./Tag No. : IN 05/56

Date Received : 16-Sep-24

Date Calibrated : 16-Sep-24

Calibrated by : Anusak Songliam

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:

Saroyuth T.
(Saroyuth Tochua)



Certificate No. : S2024090374-0003

Environment : Ambient Temperature : Start record 23.7 °C, Stop record 23.5 °C
Relative Humidity : Start record 54.6 %RH, Stop record 54.4 %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	0.04	0.21	0.38
41.5	41.5	41.5	0.07	0.19	0.30

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	34.81	35.12	34.93	34.92	35.02	34.82	34.92	35.13	34.98	0.23
41.5	41.31	41.49	41.33	41.34	41.41	41.31	41.52	41.32	41.46	0.23

Decision Rule with Guard Band

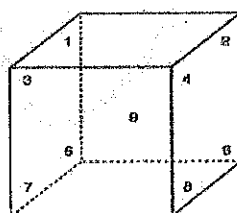
Calibration Temperature (°C)	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	MPE (±°C)
35	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	0.5
41.5	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	0.5

Pass = $|\text{error}| + |\text{uncertainty}| \leq |\text{MPE}|$ MPE = Maximum Permissible Error

Fail = $|\text{error}| + |\text{uncertainty}| > |\text{MPE}|$

Note : Probe No. 9 is Reference Probe

Setting Air Fresh No. 0



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. L202407373-0005 for Temperature Indicator with Sensor Serial No. US37020317, Due 31-Jan-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



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. : S2025070410-0003

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 115

Serial No. : 12-16967

ID No./Tag No. : IN 05/56

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. Nathang
(Nathapong Krudaum)



Certificate No. : S2025070410-0003

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	0.13	0.37	0.57
41.5	41.5	41.5	0.10	0.35	0.49

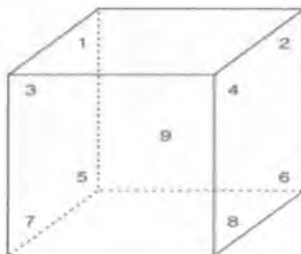
Without adjustment

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	34.97	34.91	34.96	34.82	34.81	34.86	34.83	35.11	34.95	0.23
41.5	41.51	41.37	41.40	41.26	41.27	41.42	41.43	41.53	41.50	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

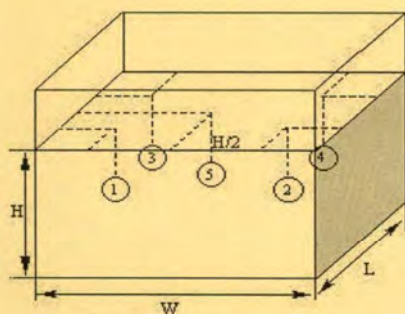
1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO ASTM E715-80 (REAPPROVED 2001) BY COMPARISON WITH CALIBRATED RTD. THE PROBES WERE PLACED ON FIVE POINTS AND LOCATED ONE PROBE IN EACH OF THE FOUR CORNERS OF THE BATH AND PLACED THE FIFTH RTD WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE WATER VOLUME (REFERENCE 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



ระดับเสียงในบริเวณชุมชน



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0220

MTC No. EEL. BP. 44/0268

CALIBRATION CERTIFICATE

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

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

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

Instrument Calibrated :

Description : Sound Calibrator

Manufacturer : ACO

Model : 2127

Serial No. : 130006

Ambient Environment

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

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

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

- Standards used :
1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
 2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.
 3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.
 4. Digital Multimeter Agilent 34401A S/N MY44005560.
 5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.
 6. Audio Analyzer Panasonic VP-7722A S/N 041477D122.
 7. Condenser Microphone B&K 4180 S/N 2889871.

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

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

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

Date of Receipt : 19 Feb. 2025

Date of Calibration : 21 Feb. 2025

1 / 2
W

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

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

FM.BL.MTC.002 Rev.5

Head Office

35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,
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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. 21-68/0220

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

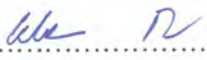
Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	0.95	± 0.50	$\pm 3.0\%$

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 :


.....
f (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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FM.BL.MTC.002 Rev.5

Head Office

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Tel. (66) 0 2577 9036
Fax. (66) 0 2577 9009

Office/Laboratory

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

Office

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



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

Noise R_713/25

Sound Level Meter Calibration Report

Acoustic Calibrator Data

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

Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-R12	ACO	6236	00172040	03 December 2025	93.9	93.9
ACO-R36	ACO	6236	00192048	03 December 2025	93.9	93.9
ACO-B02	ACO	6236	00090370	03 December 2025	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.81 ± 0.10 dB	

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

(Mr. Peera Detudom)

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

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

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

FM.BL.MTC.002 Rev.5

Head Office

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Fax. (66) 0 2577 9009

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

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

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0220

MTC No. EEL. BP. 44/0268

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

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

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

1. Sound Pressure Level

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

2. Frequency

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

3. Total Distortion

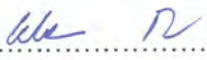
Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	0.95	± 0.50	$\pm 3.0\%$

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :


.....
(Mr. Weerachai Deechaiyae)

Approved by :


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

Date of Calibration : 21 Feb. 2025

Date of Issue : 24 Feb. 2025

Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Ref : 2011268021900739001

End of Certificate

2 / 2

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

FM.BL.MTC.002 Rev.5

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(66) 08 1889 6827



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Noise R_417/25

Sound Level Meter Calibration Report

Acoustic Calibrator Data

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

Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-R40	ACO	6236	00192052	07 July 2025	93.9	93.9
ACO-R41	ACO	6236	00192053	07 July 2025	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.81 ± 0.10 dB	

Calibrated by :

Adul Dangklom

(Mr. Adul Dangklom)

Approved by :

Peera Detudom

(Mr. Peera Detudom)



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Noise R_418/25

Sound Level Meter Calibration Report

Acoustic Calibrator Data

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

Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-R40	ACO	6236	00192052	07 July 2025	93.9	93.9
ACO-R50	ACO	6236	00192062	07 July 2025	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.81 ± 0.10 dB	

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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

Noise R_426/25

Sound Level Meter Calibration Report

Acoustic Calibrator Data

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

Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-R40	ACO	6236	00192052	08 July 2025	93.9	93.9
ACO-R52	ACO	6236	00192064	08 July 2025	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.81 ± 0.10 dB	

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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Noise R_437/25

Sound Level Meter Calibration Report

Acoustic Calibrator Data

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

Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-R41	ACO	6236	00192053	10 July 2025	93.9	93.9
ACO-R52	ACO	6236	00192064	10 July 2025	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.81 ± 0.10 dB	

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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Noise R_438/25

Sound Level Meter Calibration Report

Acoustic Calibrator Data

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

Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-R40	ACO	6236	00192052	10 July 2025	93.9	93.9
ACO-R52	ACO	6236	00192064	10 July 2025	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.81 ± 0.10 dB	

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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Noise R_637/25

Sound Level Meter Calibration Report

Acoustic Calibrator Data

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

Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-B29	ACO	6236	00182011	10 November 2025	93.9	93.9
ACO-R40	ACO	6236	00192052	10 November 2025	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.81 ± 0.10 dB	

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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Noise R_638/25

Sound Level Meter Calibration Report

Acoustic Calibrator Data

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

Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-R40	ACO	6236	00192052	10 November 2025	93.9	93.9
ACO-B43	ACO	6236	00192034	10 November 2025	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.81 ± 0.10 dB	

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

(Signature)
(Mr. Peera Detudom)



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Noise R_643/25

Sound Level Meter Calibration Report

Acoustic Calibrator Data						
Brand	ACO			Number	AC 03/56	
Model	2127			Serial No.	130006	
Calibration Range	94 dB, 1000 Hz			Last Calibration	21 February 2025	
				Due Date	21 February 2026	
Calibration Data						
Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-R50	ACO	6236	00192062	11 November 2025	93.9	93.9
ACO-R51	ACO	6236	00192063	11 November 2025	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.81 ± 0.10 dB	

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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Noise R_651/25

Sound Level Meter Calibration Report

Acoustic Calibrator Data

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

Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-B18	ACO	6236	00172048	12 November 2025	93.9	93.9
ACO-R41	ACO	6236	00192053	12 November 2025	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.81 ± 0.10 dB	

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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Noise R_651/25

Sound Level Meter Calibration Report

Acoustic Calibrator Data

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

Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-B29	ACO	6236	00182011	12 November 2025	93.9	93.9
ACO-R41	ACO	6236	00192053	12 November 2025	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.81 ± 0.10 dB	

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)

คุณภาพอากาศในสถานประกอบการ



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รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Workplace	Acrylonitrile, Styrene, 1,3-Butadiene	DRYCAL FLOWMETER	RYG_FS0208	27-Jan-25	26-Jan-26	12
Workplace		DRYCAL FLOWMETER	BKK_FS0614	9-Sep-24	9-Sep-25	12
Workplace		Air Sampling Pump	RYG_FS0095	3-Jul-25	3-Oct-25	3
Workplace		Air Sampling Pump	RYG_FS0099	6-Jul-25	6-Oct-25	3
Workplace		Air Sampling Pump	RYG_FS0108	6-Jul-25	6-Oct-25	3
Workplace		Air Sampling Pump	RYG_FS0110	7-Jul-25	7-Oct-25	3
Workplace		Air Sampling Pump	RYG_FS0111	7-Jul-25	7-Oct-25	3
Workplace		Air Sampling Pump	RYG_FS0114	6-Jul-25	6-Oct-25	3
Workplace		Air Sampling Pump	RYG_FS0124	6-Jul-25	6-Oct-25	3
Workplace		Air Sampling Pump	RYG_FS0126	6-Jul-25	6-Oct-25	3
Workplace		Air Sampling Pump	RYG_FS0127	7-Jul-25	7-Oct-25	3
Workplace		Air Sampling Pump	RYG_FS0128	7-Jul-25	7-Oct-25	3
Workplace		Air Sampling Pump	RYG_FS0130	7-Jul-25	7-Oct-25	3
Workplace		Air Sampling Pump	RYG_FS0134	7-Jul-25	7-Oct-25	3
Workplace		Air Sampling Pump	RYG_FS0367	7-Jul-25	7-Oct-25	3
Workplace		Air Sampling Pump	RYG_FS0368	6-Jul-25	6-Oct-25	3
Workplace		Air Sampling Pump	RYG_FS0369	7-Jul-25	7-Oct-25	3
Workplace		Air Sampling Pump	RYG_FS0499	7-Jul-25	7-Oct-25	3
Workplace	Acrylonitrile	GC-FID	BKK_EN0126	22-Oct-24	22-Apr-26	18
Workplace	Styrene	GC-MSD	BKK_EN0410	9-May-25	9-May-26	12
Workplace	1,3-Butadiene	GC-MSD	BKK_EN0410	9-May-25	9-May-26	12

INNOVATIVE INSTRUMENT CALIBRATION LAB

INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE

7/139 MOO 13, SOI SUNTINAKORN 11 TAMBON BANG KAE0.

AMPHOE BANG PHU SAMUT PRAKAN PROVINCE 10540 THAILAND.

TEL: (660-2)116-5860-1 FAX: (660-2)116-7140



Page 1/3

Certificate of Calibration

Customer

Name : ALS Laboratory Group Thailand Co., Ltd.

Address : 104 Soi Phatthanakan 40, Phatthanakan Road, Suan Luang,
Bangkok 10250

Certificate No : 25-AFM-023

Request No : Req-2025-0169

Unit Under Calibration Details

Measurement Item : Air Flow Meter

Manufacturer : Mesa Labs

Accuracy : 1% of Reading

Model : 200-510L

Sensor Model : -

Serial Number : 130027

Sensor Serial Number : -

ID : RYG_FS0208

Instrument Status : Used

Location of Calibration : LAB 4 AIR VELOCITY METER

Calibration Environment and Details

Temperature : 23 °C ± 3 °C

Humidity : 55 %RH ± 20 %RH

Barometric Pressure : 1013 hPa ± 10 hPa

Received Date : 21 January 2025

Calibration Date : 27 January 2025

Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	18501010006	Sensidyne	6 August 2025
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	2 August 2025
Temperature meter	GT 11	08000057	Qreborn	1 March 2025
Pressure meter	CPG2400	41000KDU/651882	TPA	21 October 2025

Traceability :

This Certificate is traceable to SI Unit through Sensidyne A2LA Accreditation No. 3943.01

Note :

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %.

Calibration By :

Mr. Noppadon Luangart
Service Calibration Engineer

Approved By :

Mr. Pacit Mathavorn
Calibration Engineer Supervisor

Issue Date :

27 January 2025

Certificate No : 25-AFM-023
Request No : Req-2025-0169

Result of Calibration : Without Adjustment

Temperature (^o C)	Pressure (kPa)	STD (cc/min)	UUC (cc/min)	Error (cc/min)	Uncertainty (cc/min)	MPE (cc/min)	Result
22.50	100.90	20	19.854	-0.1	1.3	0.2	Pass1
22.50	100.90	50	49.732	-0.3	3.3	0.5	Pass1
22.60	100.90	101	100.77	-0.2	2.8	1.0	Pass1
22.70	100.90	151	150.23	-0.8	4.2	1.5	Pass1
22.70	100.90	201	200.39	-0.6	5.6	2.0	Pass1
22.70	100.90	301	300.69	-0.3	8.4	3.0	Pass1
22.80	100.90	400	402.96	3.0	11	4.0	Pass1
23.10	100.90	500	504.62	4.6	7.2	5.0	Pass1

Note STD : Standard UUC : Unit Under Calibration
- UUC Reference Condition : At atmospheric pressure and room temperature condition
- Flow Rate was corrected for non-standard operating condition by using equation :

$$Q_{meas} = Q_{ref} \times \frac{P_{ref}}{P_{meas}} \times \frac{T_{meas}}{T_{ref}}$$

where Q = Flow Rate P = Absolute Pressure T = Absolute Temperature
Meas = Measurement Condition ref = Standard Condition

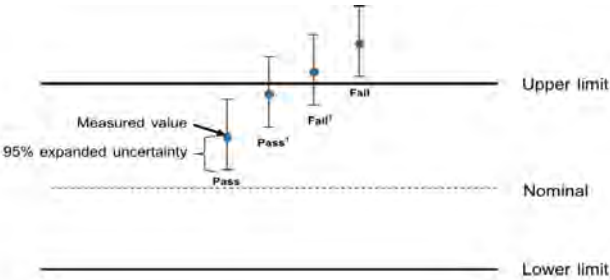
* Indicates non accredited
MPE = Maximum Permissible Error (Specified in Manufacturer's Specifications)
N/A = Not Aavailable, Customer does not require a statement of conformity.

Certificate No : 25-AFM-023
Request No : Req-2025-0169

Decision Rule for Statements of Conformity

The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09/2019; Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

Pass = The measurement result plus the expanded uncertainty with a 95% coverage probability were within the limit.
Pass¹ = The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.
Fail¹ = The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.
Fail = The measurement result plus the expanded uncertainty with a 95% coverage probability were outside the limit.



End of Certificate



Certificate of Calibration

Customer

Name : ALS Laboratory Group Thailand Co., Ltd.
Address : 104 Soi Phatthanakan 40, Phatthanakan Road, Suan Luang,
Bangkok 10250

Certificate No : 24-AFM-179
Request No : Req-2024-1987

Unit Under Calibration Details

Measurement Item : Air Flow Meter
Manufacturer : MesaLabs
Model : Defender 510-M
Serial Number : I51114
ID : BKK_FS0614
Location of Calibration : LAB 4 AIR VELOCITY METER
Accuracy : 1% of Reading
Sensor Model : -
Sensor Serial Number : -
Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 30 August 2024
Calibration Date : 9 September 2024

Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator



Reference Standard	Model	Serial Number	Traceble	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	18501010006	Sensidyne	6 August 2025
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	2 August 2025
Temperature meter	GT 11	08000057	Qreborn	1 March 2025
Pressure meter	CPG2400	41000KDU/651882	TPA	9 November 2024

Traceability :

This Certificate is traceable to SI Unit through Sensidyne A2LA Accreditation No, 3943.01

Note :

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %.

Calibration By : Mr. Noppadon Luangart
Service Calibration Engineer

Approved By : Mr. Pacit Mathavorn
Calibration Engineer Supervisor

Issue Date : 9 September 2024



Certificate No : 24-AFM-179
Request No : Req-2024-1987

Result of Calibration : Without Adjustment

Temperature (°C)	Pressure (kPa)	STD (cc/min)	UUC (cc/min)	Error (cc/min)	Uncertainty (cc/min)	MPE (cc/min)	Result
24.70	100.95	100	100.41	0.4	2.8	1.0	N/A
24.90	100.90	502	500.47	-1.5	7.1	5.0	N/A
24.90	100.97	1003	1001.3	-2	14	10.0	N/A
25.00	100.92	2014	2009.9	-4	29	20.1	N/A
25.20	101.03	3043	3058.3	15	44	30.4	N/A
25.30	101.10	4043	4005.1	-38	57	40.4	N/A
25.50	101.15	5052	5003.9	-48	74	50.5	N/A

Note : STD : Standard UUC : Unit Under Calibration
- UUC Reference Condition : At atmospheric pressure and room temperature condition
- Flow Rate was corrected for non-standard operating condition by using equation :

$$Q_{meas} = Q_{ref} \times \frac{P_{ref}}{P_{meas}} \times \frac{T_{meas}}{T_{ref}}$$

where Q = Flow Rate P = Absolute Pressure T = Absolute Temperature
Meas = Measurement Condition ref = Standard Condition

* Indicates non accredited
MPE = Maximum Permissible Error (Specified in Manufacturer's Specifications)
N/A = Not Aavailable, Customer does not require a statement of conformity.

Certificate No : 24-AFM-179

Request No : Req-2024-1987

Decision Rule for Statements of Conformity

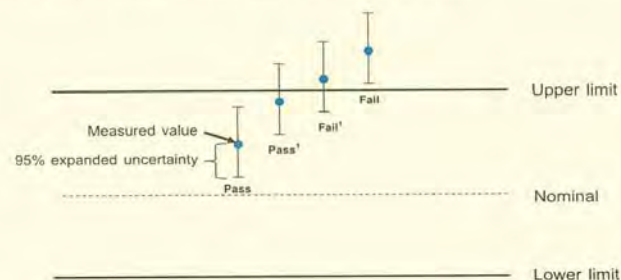
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09/2019: Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

Pass = The measurement result plus the expanded uncertainty with a 95% coverage probability were within the limit.

Pass¹ = The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail¹ = The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

Fail = The measurement result plus the expanded uncertainty with a 95% coverage probability were outside the limit.



End of Certificate

Certificate of Calibration

Certificate No. C-030725-RYG_FS0095

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gillan
Model/Type : GilAir Plus
Equipment ID : RYG_FS0095
Serial No. : 20170410058
Calibration Date : 03-Jul-25
Next calibration date : 03-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L
Equipment ID : RYG_FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

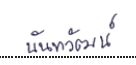
Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M
Equipment ID : BKK_FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	20.5	20.1	19.2	19.9	5%	19 - 21	Passed
50	50.5	50.9	50.3	50.6	5%	48 - 53	Passed
100	97.3	96.0	96.9	96.7	5%	95 - 105	Passed
200	194.2	194.2	193.0	193.8	5%	190 - 210	Passed
High Flow							
500	490.8	490.5	490.2	490.5	3%	485 - 515	Passed
1000	1002.1	1002.3	1002.7	1002.4	3%	970 - 1030	Passed
2000	1990.2	1989.2	1990.6	1990.0	3%	1940 - 2060	Passed
2500	2500.1	2500.2	2500.2	2500.2	3%	2425 - 2575	Passed

END OF REPORT

Calibrated By: 

(Mr. Nantawat Sarin)

RYG Field Services Scientist (1)

Issue date : 04-Jul-25

Approved By: 

(Mr. Supot Salameh)

Field Services Section Head



Certificate of Calibration

Certificate No. C-060725-RYG_FS0099

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus

Equipment ID : RYG_FS0099
Serial No. : 20170410062
Calibration Date : 06-Jul-25
Next calibration date : 06-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L

Equipment ID : RYG_FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M

Equipment ID : BKK_FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	19.5	19.3	19.2	19.3	5%	19 - 21	Passed
50	50.1	49.7	50.1	50.0	5%	48 - 53	Passed
100	98.8	98.7	98.9	98.8	5%	95 - 105	Passed
200	201.1	200.6	201.4	201.0	5%	190 - 210	Passed
High Flow							
500	502.4	501.8	502.5	502.2	3%	485 - 515	Passed
1000	1008.7	1006.2	1009.3	1008.1	3%	970 - 1030	Passed
2000	2007.9	2007.6	2006.5	2007.3	3%	1940 - 2060	Passed
2500	2509.2	2501.1	2501.4	2503.9	3%	2425 - 2575	Passed

----- END OF REPORT -----

Calibrated By: นันทพงษ์

(Mr. Natchapon Thamklang)

RYG Field Services Scientist (1)

Issue date : 07-Jul-25

Approved By: สุพจน์

(Mr. Supot Salamteh)

Field Services Section Head



Certificate of Calibration

Certificate No. C-060725-RYG_FS0108

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus

Equipment ID : RYG_FS0108
Serial No. : 20150310157
Calibration Date : 06-Jul-25
Next calibration date : 06-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L

Equipment ID : RYG_FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M

Equipment ID : BKK_FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	19.8	20.5	20.3	20.2	5%	19 - 21	Passed
50	49.7	51.1	50.6	50.5	5%	48 - 53	Passed
100	98.8	101.6	100.3	100.2	5%	95 - 105	Passed
200	199.5	202.3	201.7	201.2	5%	190 - 210	Passed
High Flow							
500	498.8	501.2	501.5	500.5	3%	485 - 515	Passed
1000	999.5	1000.4	1000.1	1000.0	3%	970 - 1030	Passed
2000	1998.9	2003.2	2002.4	2001.5	3%	1940 - 2060	Passed
2500	2517.7	2511.3	2515.5	2514.8	3%	2425 - 2575	Passed

----- END OF REPORT -----

Calibrated By: นันทพงษ์

(Mr. Natchapon Thamklang)

RYG Field Services Scientist (1)

Issue date : 07-Jul-25

Approved By: สุพจน์

(Mr. Supot Salamteh)

Field Services Section Head



Certificate of Calibration

Certificate No. C-070725-RYG FS0110

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus
Equipment ID : RYG FS0110
Serial No. : 20150310159
Calibration Date : 07-Jul-25
Next calibration date : 07-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L
Equipment ID : RYG FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M
Equipment ID : BKK FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	20.3	19.9	20.1	20.1	5%	19 - 21	Passed
50	51.4	51.9	50.8	51.4	5%	48 - 53	Passed
100	103.4	101.1	104.5	103.0	5%	95 - 105	Passed
200	200.8	198.8	201.8	200.5	5%	190 - 210	Passed
High Flow							
500	498.4	499.1	497.5	498.3	3%	485 - 515	Passed
1000	999.8	998.6	1000.1	999.5	3%	970 - 1030	Passed
2000	2003.6	2001.6	2004.9	2003.4	3%	1940 - 2060	Passed
2500	2495.9	2496.8	2495.5	2496.1	3%	2425 - 2575	Passed

END OF REPORT

Calibrated By:

(Mr. Nantawat Sarin)

RYG Field Services Scientist (1)

Issue date : 08-Jul-25

Approved By:

(Mr. Supot Salamteh)

Field Services Section Head



Certificate of Calibration

Certificate No. C-070725-RYG FS0111

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus
Equipment ID : RYG FS0111
Serial No. : 20150310160
Calibration Date : 07-Jul-25
Next calibration date : 07-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L
Equipment ID : RYG FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M
Equipment ID : BKK FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	19.5	20.0	19.9	19.8	5%	19 - 21	Passed
50	50.8	51.1	51.3	51.1	5%	48 - 53	Passed
100	100.3	101.4	100.4	100.7	5%	95 - 105	Passed
200	199.6	199.9	200.3	199.9	5%	190 - 210	Passed
High Flow							
500	501.6	503.5	503.3	502.8	3%	485 - 515	Passed
1000	1003.3	1000.3	1002.1	1001.9	3%	970 - 1030	Passed
2000	2005.1	2003.6	2002.6	2003.8	3%	1940 - 2060	Passed
2500	2507.4	2506.3	2503.8	2505.8	3%	2425 - 2575	Passed

END OF REPORT

Calibrated By:

(Mr. Amnat Wongsakhen)

RYG Field Services Scientist (1)

Issue date : 08-Jul-25

Approved By:

(Mr. Supot Salamteh)

Field Services Section Head



Certificate of Calibration

Certificate No. C-060725-RYG_FS0114

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus

Equipment ID : RYG_FS0114
Serial No. : 20150310163
Calibration Date : 06-Jul-25
Next calibration date : 06-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L

Equipment ID : RYG_FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M

Equipment ID : BKK_FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	20.0	20.3	20.1	20.1	5%	19 - 21	Passed
50	49.5	49.9	49.9	49.8	5%	48 - 53	Passed
100	101.4	102.2	101.6	101.7	5%	95 - 105	Passed
200	200.7	200.7	200.6	200.7	5%	190 - 210	Passed
High Flow							
500	500.6	502.3	500.6	501.2	3%	485 - 515	Passed
1000	1001.4	1001.9	1002.1	1001.8	3%	970 - 1030	Passed
2000	2000.9	2002.6	2004.9	2002.8	3%	1940 - 2060	Passed
2500	2502.1	2500.3	2502.3	2501.6	3%	2425 - 2575	Passed

END OF REPORT

Calibrated By:

(Mr. Watcharin Pongsamsuan)

RYG Field Services Scientist (1)

Issue date : 07-Jul-25

Approved By:

(Mr. Supot Salamatheh)

Field Services Section Head



Certificate of Calibration

Certificate No. C-060725-RYG_FS0124

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus

Equipment ID : RYG_FS0124
Serial No. : 20150310180
Calibration Date : 06-Jul-25
Next calibration date : 06-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L

Equipment ID : RYG_FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M

Equipment ID : BKK_FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	19.6	19.5	20.5	19.9	5%	19 - 21	Passed
50	51.1	52.2	49.8	51.0	5%	48 - 53	Passed
100	100.9	100.7	100.3	100.6	5%	95 - 105	Passed
200	202.2	202.6	202.8	202.5	5%	190 - 210	Passed
High Flow							
500	498.5	499.6	499.2	499.1	3%	485 - 515	Passed
1000	1001.5	997.4	1010.9	1003.3	3%	970 - 1030	Passed
2000	2002.8	2010.8	2003.2	2005.6	3%	1940 - 2060	Passed
2500	2504.2	2511.1	2510.7	2508.7	3%	2425 - 2575	Passed
4000	4011.9	4019.6	4009.4	4013.6	3%	3880 - 4120	Passed

END OF REPORT

Calibrated By:

(Mr. Watcharin Pongsamsuan)

RYG Field Services Scientist (1)

Issue date : 07-Jul-25

Approved By:

(Mr. Supot Salamatheh)

Field Services Section Head



Certificate of Calibration

Certificate No. C-060725-RYG_FS0126

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus
Equipment ID : RYG_FS0126
Serial No. : 20150410002
Calibration Date : 06-Jul-25
Next calibration date : 06-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L
Equipment ID : RYG_FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M
Equipment ID : BKK_FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	19.9	20.6	20.3	20.3	5%	19 - 21	Passed
50	50.9	51.4	51.1	51.1	5%	48 - 53	Passed
100	105.7	104.7	104.6	105.0	5%	95 - 105	Passed
200	208.2	206.1	206.8	207.0	5%	190 - 210	Passed
High Flow							
500	499.8	498.4	501.2	499.8	3%	485 - 515	Passed
1000	1000.8	1001.7	1001.1	1001.2	3%	970 - 1030	Passed
2000	1999.5	2001.4	2000.9	2000.6	3%	1940 - 2060	Passed
2500	2492.5	2492.9	2494.7	2493.4	3%	2425 - 2575	Passed
4000	4011.8	4019.7	4016.8	4016.1	3%	3880 - 4120	Passed

END OF REPORT

Calibrated By:

(Mr. Nantawat Sarin)

RYG Field Services Scientist (1)

Issue date : 07-Jul-25

Approved By:

(Mr. Supot Salamteh)

Field Services Section Head



Certificate of Calibration

Certificate No. C-070725-RYG_FS0127

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus
Equipment ID : RYG_FS0127
Serial No. : 20150410003
Calibration Date : 07-Jul-25
Next calibration date : 07-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L
Equipment ID : RYG_FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M
Equipment ID : BKK_FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	20.1	19.6	21.1	20.3	5%	19 - 21	Passed
50	50.3	51.0	51.6	51.0	5%	48 - 53	Passed
100	100.7	100.1	100.1	100.3	5%	95 - 105	Passed
200	202.7	201.8	202.2	202.2	5%	190 - 210	Passed
High Flow							
500	487.2	481.9	488.3	485.8	3%	485 - 515	Passed
1000	1018.0	1015.0	1015.1	1016.0	3%	970 - 1030	Passed
2000	1994.5	1997.6	2003.5	1998.5	3%	1940 - 2060	Passed
2500	2497.4	2498.0	2487.6	2494.3	3%	2425 - 2575	Passed
4000	4013.6	4010.3	4007.1	4010.3	3%	3880 - 4120	Passed

END OF REPORT

Calibrated By:

(Mr. Watcharin Pongsamsuan)

RYG Field Services Scientist (1)

Issue date : 08-Jul-25

Approved By:

(Mr. Supot Salamteh)

Field Services Section Head



Certificate of Calibration

Certificate No. C-070725-RYG_FS0128

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus

Equipment ID : RYG_FS0128
Serial No. : 20150410004
Calibration Date : 07-Jul-25
Next calibration date : 07-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L

Equipment ID : RYG_FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M

Equipment ID : BKK_FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	20.8	19.7	20.3	20.3	5%	19 - 21	Passed
50	50.1	50.5	51.5	50.7	5%	48 - 53	Passed
100	99.8	101.8	100.3	100.6	5%	95 - 105	Passed
200	200.7	201.4	199.8	200.6	5%	190 - 210	Passed
High Flow							
500	499.9	503.3	502.7	502.0	3%	485 - 515	Passed
1000	1001.5	998.8	1000.3	1000.2	3%	970 - 1030	Passed
2000	2003.6	2008.9	2006.7	2006.4	3%	1940 - 2060	Passed
2500	2515.7	2514.8	2516.1	2515.5	3%	2425 - 2575	Passed
4000	3996.3	4009.5	4018.4	4008.1	3%	3880 - 4120	Passed

END OF REPORTCalibrated By: 

(Mr. Natchapon Thamklang)

RYG Field Services Scientist (1)

Issue date : 08-Jul-25

Approved By: 

(Mr. Supot Salamteh)

Field Services Section Head



Certificate of Calibration

Certificate No. C-070725-RYG_FS0130

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus

Equipment ID : RYG_FS0130
Serial No. : 20150410006
Calibration Date : 07-Jul-25
Next calibration date : 07-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L

Equipment ID : RYG_FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M

Equipment ID : BKK_FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	20.8	20.6	19.6	20.3	5%	19 - 21	Passed
50	48.8	48.5	49.1	48.8	5%	48 - 53	Passed
100	101.2	100.2	100.5	100.6	5%	95 - 105	Passed
200	195.2	195.3	195.7	195.4	5%	190 - 210	Passed
High Flow							
500	509.4	496.2	510.7	505.4	3%	485 - 515	Passed
1000	1007.1	1007.4	999.4	1004.6	3%	970 - 1030	Passed
2000	2002.1	1998.5	2002.3	2001.0	3%	1940 - 2060	Passed
2500	2506.1	2510.1	2509.5	2508.6	3%	2425 - 2575	Passed
4000	4003.3	4003.0	3999.8	4002.0	3%	3880 - 4120	Passed

END OF REPORTCalibrated By: 

(Mr. Watcharin Pongsamsuan)

RYG Field Services Scientist (1)

Issue date : 08-Jul-25

Approved By: 

(Mr. Supot Salamteh)

Field Services Section Head



Certificate of Calibration

Certificate No. C-070725-RYG FS0134

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus

Equipment ID : RYG FS0134
Serial No. : 20201110102
Calibration Date : 07-Jul-25
Next calibration date : 07-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L

Equipment ID : RYG FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M

Equipment ID : BKK FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	20.6	20.6	20.6	20.6	5%	19 - 21	Passed
50	49.6	49.1	49.3	49.3	5%	48 - 53	Passed
100	100.1	99.4	100.0	99.8	5%	95 - 105	Passed
200	200.5	201.6	201.4	201.2	5%	190 - 210	Passed
High Flow							
500	496.5	497.7	497.9	497.4	3%	485 - 515	Passed
1000	996.8	997.9	995.6	996.8	3%	970 - 1030	Passed
2000	1997.3	1993.0	1998.5	1996.3	3%	1940 - 2060	Passed
2500	2493.7	2491.2	2500.9	2495.3	3%	2425 - 2575	Passed

END OF REPORTCalibrated By: นันทapon

(Mr. Natchapon Thamklang)

RYG Field Services Scientist (1)

Issue date : 08-Jul-25

Approved By: Supot

(Mr. Supot Salamteh)

Field Services Section Head



Certificate of Calibration

Certificate No. C-070725-RYG FS0367

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus

Equipment ID : RYG FS0367
Serial No. : 20180610060
Calibration Date : 07-Jul-25
Next calibration date : 07-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L

Equipment ID : RYG FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M

Equipment ID : BKK FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	20.5	20.6	20.4	20.5	5%	19 - 21	Passed
50	49.3	49.5	49.6	49.5	5%	48 - 53	Passed
100	99.8	99.8	99.7	99.8	5%	95 - 105	Passed
200	201.6	200.9	200.6	201.0	5%	190 - 210	Passed
High Flow							
500	502.8	501.7	500.9	501.8	3%	485 - 515	Passed
1000	1000.3	1007.6	1003.2	1003.7	3%	970 - 1030	Passed
2000	2007.2	2005.6	2006.7	2006.5	3%	1940 - 2060	Passed
2500	2501.6	2505.2	2503.8	2503.5	3%	2425 - 2575	Passed

END OF REPORTCalibrated By: Amnat

(Mr. Amnat Wongsakhen)

RYG Field Services Scientist (1)

Issue date : 08-Jul-25

Approved By: Supot

(Mr. Supot Salamteh)

Field Services Section Head



Certificate of Calibration

Certificate No. C-060725-RYG FS0368

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus

Equipment ID : RYG FS0368
Serial No. : 20180610061
Calibration Date : 06-Jul-25
Next calibration date : 06-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L

Equipment ID : RYG FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M

Equipment ID : BKK FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	19.4	20.7	20.5	20.2	5%	19 - 21	Passed
50	50.8	49.4	49.6	49.9	5%	48 - 53	Passed
100	99.8	99.8	99.6	99.7	5%	95 - 105	Passed
200	200.2	200.2	200.2	200.2	5%	190 - 210	Passed
High Flow							
500	502.5	503.7	502.2	502.8	3%	485 - 515	Passed
1000	1003.7	1003.2	1005.6	1004.2	3%	970 - 1030	Passed
2000	1998.1	2003.9	1999.8	2000.6	3%	1940 - 2060	Passed
2500	2503.2	2500.8	2502.6	2502.2	3%	2425 - 2575	Passed

END OF REPORT

Calibrated By:

(Mr. Watcharin Pongsamsuan)

RYG Field Services Scientist (1)

Issue date : 07-Jul-25

Approved By:

(Mr. Supot Salamatheh)

Field Services Section Head



Certificate of Calibration

Certificate No. C-070725-RYG FS0369

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus

Equipment ID : RYG FS0369
Serial No. : 20180610062
Calibration Date : 07-Jul-25
Next calibration date : 07-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L

Equipment ID : RYG FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M

Equipment ID : BKK FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	19.8	20.2	20.7	20.2	5%	19 - 21	Passed
50	50.1	50.2	49.9	50.1	5%	48 - 53	Passed
100	100.0	99.7	100.4	100.0	5%	95 - 105	Passed
200	199.0	199.1	198.6	198.9	5%	190 - 210	Passed
High Flow							
500	501.9	501.2	500.9	501.3	3%	485 - 515	Passed
1000	1003.4	1002.4	1001.2	1002.3	3%	970 - 1030	Passed
2000	2002.2	1999.5	2000.2	2000.6	3%	1940 - 2060	Passed
2500	2503.4	2501.3	2502.7	2502.5	3%	2425 - 2575	Passed

END OF REPORT

Calibrated By:

(Mr. Amnat Wongsakhen)

RYG Field Services Scientist (1)

Issue date : 08-Jul-25

Approved By:

(Mr. Supot Salamatheh)

Field Services Section Head

ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Phatthanakan, Suan Luang, Bangkok 10250
T +66 2 760 3000 F +66 2 760 3197



Certificate of Calibration

Certificate No. C-070725-RYG_FS0499

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus
Equipment ID : RYG_FS0499
Serial No. : 20201110088
Calibration Date : 07-Jul-25
Next calibration date : 07-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L
Equipment ID : RYG_FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M
Equipment ID : BKK_FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	19.7	19.7	20.0	19.8	5%	19 - 21	Passed
50	50.7	51.7	50.7	51.0	5%	48 - 53	Passed
100	99.5	99.3	99.9	99.6	5%	95 - 105	Passed
200	202.1	201.7	202.0	201.9	5%	190 - 210	Passed
High Flow							
500	502.1	501.9	499.5	501.2	3%	485 - 515	Passed
1000	1004.4	1006.9	1005.3	1005.5	3%	970 - 1030	Passed
2000	2012.4	2015.4	2014.1	2014.0	3%	1940 - 2060	Passed
2500	2512.3	2516.5	2514.5	2514.4	3%	2425 - 2575	Passed

END OF REPORT

Calibrated By:

(Mr. Natchapon Thamklang)

RYG Field Services Scientist (1)

Issue date : 08-Jul-25

Approved By:

(Mr. Supot Salamteh)

Field Services Section Head

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Agilent CrossLab Compliance Services

Certificate of System Qualification

GC-OQ

System ID: GC-6_CN11461066
Organization Name: ALS Laboratory Group (Thailand) Co., Ltd.
Organization Location: 104 Soi 40 Phatthanakan Rd,Khwang Suan Luang, Khet Suan Luang, Bangkok 10250

Date: October 22, 2024 9:27:05 AM
EQP Name: AgilentRecommended
EQP Revision: GC.02.53
Overall Qualification Status: Pass

REVIEW BY
APPROVED BY
NEXT CAL. DATE 22 Apr 2026

CDS Logon Verification - GC

Logon: Saenguthai Tarak

Overall CDS Logon Verification - GC Test Status

Pass

System Inspection and Basic Safety and Operation

Name: 7890

Setpoint Status: Pass

Overall System Inspection and Basic Safety and Operation Test Status

Pass

Inlet Pressure Decay

Name: 7890

Front SSL

Setpoint Status: Pass

Pressure: 25.0 psi

Pressure Change: 0.0 psi /5 minutes

Agilent Recommended: >= -2.0 and <= 0.5

Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

Overall Inlet Pressure Decay Test Status

Pass

Inlet Pressure Accuracy

Name: 7890
Front SSL

Setpoint Status: Pass

Inlet Pressure: Setpoint 25.0 psi Actual 25.07 psi
Accuracy: 0.1 psi
Agilent Recommended: ≤ 1.2

Overall Inlet Pressure Accuracy Test Status

Pass

Inlet Pressure Decay

Name: 7890
Back SSL

Setpoint Status: Pass

Pressure: 25.0 psi
Pressure Change: 0.0 psi /5 minutes
Agilent Recommended: ≥ -2.0 and ≤ 0.5

Overall Inlet Pressure Decay Test Status

Pass

Inlet Pressure Accuracy

Name: 7890
Back SSL

Setpoint Status: Pass

Inlet Pressure: Setpoint 25.0 psi Actual 25.06 psi
Accuracy: 0.1 psi
Agilent Recommended: ≤ 1.2

Overall Inlet Pressure Accuracy Test Status

Pass

Detector Flow Accuracy

Name: 7890
Front FID

Setpoint Status: Pass

Flow Type: Fuel
Setpoint: 30.0 mL/min Measured Flow: 28.8 mL/min
Accuracy: 1.2 mL/min
Agilent Recommended: ≤ 10.0 % setpoint (3.0 mL/min)
Limit is percentage of setpoint or 0.5 mL/minute, whichever is largest.

Setpoint Status: Pass

Flow Type: Oxidizer
Setpoint: 400.0 mL/min Measured Flow: 392 mL/min
Accuracy: 8.0 mL/min
Agilent Recommended: ≤ 10.0 % setpoint (40.0 mL/min)
Limit is percentage of setpoint or 0.5 mL/minute, whichever is largest.

Setpoint Status: Pass

Flow Type: Makeup
Setpoint: 25.0 mL/min Measured Flow: 25.4 mL/min
Accuracy: 0.4 mL/min
Agilent Recommended: ≤ 10.0 % setpoint (2.5 mL/min)
Limit is percentage of setpoint or 0.5 mL/minute, whichever is largest.

Overall Detector Flow Accuracy Test Status

Pass

Detector Flow Accuracy

Name: 7890
Back FID

Setpoint Status: Pass

Flow Type: Fuel
Setpoint: 30.0 mL/min Measured Flow: 30.8 mL/min

Accuracy: 0.8 mL/min
Agilent Recommended: ≤ 10.0 % setpoint (3.0 mL/min)

Limit is percentage of setpoint or 0.5 ml/minute, whichever is largest.

Setpoint Status: Pass

Flow Type: Oxidizer
Setpoint: 400.0 mL/min Measured Flow: 393 mL/min

Accuracy: 7.0 mL/min
Agilent Recommended: ≤ 10.0 % setpoint (40.0 mL/min)

Limit is percentage of setpoint or 0.5 ml/minute, whichever is largest.

Setpoint Status: Pass

Flow Type: Makeup
Setpoint: 25.0 mL/min Measured Flow: 25.2 mL/min

Accuracy: 0.2 mL/min
Agilent Recommended: ≤ 10.0 % setpoint (2.5 mL/min)

Limit is percentage of setpoint or 0.5 ml/minute, whichever is largest.

Overall Detector Flow Accuracy Test Status

Pass

GC Oven Temperature Accuracy

Name: 7890

Date: October 22, 2024 9:27:05 AM

System ID: GC-6_CN11461068

Setpoint Status: Pass

Zone: Oven

Setpoint/Actual

Temperature: 230.0 230.3 °C

Accuracy: 0.3 °C

Agilent Recommended: ≥ -1.0 % setpoint in K (-5.0 °C)

≤ 1.0 % setpoint in K (5.0 °C)

Setpoint Status: Pass

Zone: Oven

Setpoint/Actual

Temperature: 100.0 100.0 °C

Accuracy: 0.0 °C

Agilent Recommended: ≥ -1.0 % setpoint in K (-3.7 °C)

≤ 1.0 % setpoint in K (3.7 °C)

Overall GC Oven Temperature Accuracy Test Status

Pass

GC Oven Temperature Stability

Name: 7890

Setpoint Status: Pass

Setpoint/Average

Temperature: 100.0 100.0167 °C

Stability: 0.1 °C

Agilent Recommended: ≤ 0.5

Overall GC Oven Temperature Stability Test Status

Pass

Scouting Run

Tested Combination1 Front SSL / Front FID

Injection Tower

Name: 7693A

Date: October 22, 2024 9:27:05 AM

System ID: GC-6_CN11461068

Setpoint Status: Completed

Injection Volume on Column: 1.0 uL

Overall Scouting Run Status

Completed

Noise and Drift

Tested Combination1 Front SSL / Front FID

Name: 7890

Setpoint Status: Pass

Base Signal: 14.05 pA

ASTM Noise		Drift	
pA		pA/Hr	
	0.05		0.03
Agilent Recommended:	<= 0.10		<= 2.50
Status:	Pass		Pass

Overall Noise and Drift Test Status

Pass

Injection Precision

Tested Combination1 Front SSL / Front FID

Name: 7693A

Setpoint Status: Pass

Injection Volume on Column: 1.0 uL

Area RSD:	0.30 %	Retention Time RSD:	0.63 %
Agilent Recommended:	<= 3.00		<= 1.00

Overall Injection Precision Test Status

Pass

Signal to Noise

Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

Tested Combination1 Front SSL / Front FID

Injection Tower

Name: 7890

Setpoint Status: Pass

Signal to Noise: 11078525

Agilent Recommended: >= 300000

Overall Signal to Noise Test Status

Pass

Scouting Run

Tested Combination2 Back SSL / Back FID

Injection Tower

Name: 7693A

Setpoint Status: Completed

Injection Volume on Column: 1.0 uL

Overall Scouting Run Status

Completed

Noise and Drift

Tested Combination2 Back SSL / Back FID

Name: 7890

Setpoint Status: Pass

Base Signal: 13.79 pA

ASTM Noise		Drift	
pA		pA/Hr	
	0.05		0.01
Agilent Recommended:	<= 0.10		<= 2.50
Status:	Pass		Pass

Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

Overall Noise and Drift Test Status

Pass

Injection Precision

Tested Combination2	Back	SSL	/ Back	FID
Name:	7693A			
Setpoint Status:	Pass			
Injection Volume on Column:	1.0	uL		
Area RSD:	1.06	%	Retention Time RSD:	0.93 %
Agilent Recommended:	<=	3.00	<=	1.00

Overall Injection Precision Test Status

Pass

Signal to Noise

Tested Combination2	Back	SSL	/ Back	FID
	Injection Tower			
Name:	7890			
Setpoint Status:	Pass			
Signal to Noise:	1771221			
Agilent Recommended:	>=	300000		

Overall Signal to Noise Test Status

Pass

Instrument Details

Purpose

This section describes the as found system configuration.

Details

System	
System ID	GC-6_CN11461066
Manufacturer	Agilent Technologies
Name	7890
Flow Data Input	Manual Data
Temperature Data Input	Manual Data or Other Data Logging
Tested Combination1	
Injection Technique	Injection Tower
Sampler Identifier	Sampler 1
Inlet	Front
Detector	Front
LTM Included?	No
Tested Combination2	
Injection Technique	Injection Tower
Sampler Identifier	Sampler 2
Inlet	Back
Detector	Back
LTM Included?	No
Sampler 1	
Manufacturer	Agilent Technologies
Type	Injection Tower
Name	7693A
Model Number	G4513A
Serial Number	CNCN10340103
Firmware Revision	A.11.06
Usage	Sample Injection
Location	Front
Syringe Volume (uL)	10

Sampler 2

Manufacturer	Agilent Technologies
Type	Injection Tower
Name	7693A
Model Number	G4513A
Serial Number	CN16280128
Firmware Revision	A.11.06
Usage	Sample Injection
Location	Back
Syringe Volume (µL)	10

Sampler 3

Manufacturer	Agilent Technologies
Type	Tray
Name	7693A
Model Number	G4514A
Serial Number	CN15380030
Firmware Revision	A.11.03
Vial Heater	Not installed

Mainframe 1

Manufacturer	Agilent Technologies
Name	7890
Model Number	G3440A
Serial Number	CN11461066
Firmware Revision	A.01.16
Oven Type	Standard

Inlet 1

Manufacturer	Agilent Technologies
Name	7890
Type	SSL
Location	Front
Carrier Gas	Helium
Control Type	Electronic Pressure Control (EPC)
Purged Inlet	Yes

Inlet 2

Manufacturer	Agilent Technologies
Name	7890
Type	SSL
Location	Back
Carrier Gas	Helium
Control Type	Electronic Pressure Control (EPC)
Purged Inlet	Yes

Detector 1

Manufacturer	Agilent Technologies
Name	7890
Type	FID
Adapter	Capillary
Control Type	Electronic Pressure Control (EPC)
Location	Front
Makeup Gas	Nitrogen

Detector 2

Manufacturer	Agilent Technologies
Name	7890
Type	FID
Adapter	Capillary
Control Type	Electronic Pressure Control (EPC)
Location	Back
Makeup Gas	Nitrogen

Electronic Signature

Purpose

This signature page was created and published because the ACE sign-off action was executed, which is valid for the entire document, including attachments. The ACE sign-off is an electronic signature that requires two distinct identification components: unique username and personal password. The Agilent representative who has delivered this service understands the meaning and legal status of an electronic signature. As a trained official operator, the Agilent representative has a unique password and logon to access ACE and electronically sign this document. (Other e-signatures can be applied to this document using a Document Content Management or other suitable method defined in your data access and control procedures.)

Details

Full Name of Signer:Saengulhai Tarak

Logged On User Name:saengulhai.tarak@non.agilent.com

Signature Creation Date:October 22, 2024

Reason for Signature:Executed protocol and published this original version of document

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User Name: saengulhai.tarakSystem ID: GC-6_CN11461086

Report Generated by Hostname: LAPTOP-CO3SKOMVPrint Date: October 22, 2024 9:27:06 AM

2024_ALS_GC-6_CN11461086_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2024 3:16:06 PM	Audit	SessionCreated	Session	None
October 21, 2024 3:16:07 PM	Start	Configuration	Session	None
October 21, 2024 3:16:07 PM	Audit	Entitlement	Licensing	User is Nonpaying and does not require an unlock code
October 21, 2024 3:22:40 PM	Audit	EqpLoaded	Session	EOP details for primary technique [Gc] - File path: [ProtocolPacks\Gc\Configuration\02.53\Gc-02.53.eop], EOP File Name: [Gc-02.53.eop], EOP Name: [AgilentRecommended], Protocol Revision :[Gc-02.53]
October 21, 2024 3:22:44 PM	End	Configuration	Session	None
October 21, 2024 3:32:47 PM	Start	Qualification	Session	OQ
October 21, 2024 3:22:48 PM	Start	Execution	CDS Logon Verification - GC-7890: - Qualitative test	None
October 21, 2024 3:23:36 PM	End	Execution	CDS Logon Verification - GC-7890: - Qualitative test	Run Count: 1
October 21, 2024 3:23:45 PM	Start	Execution	System Inspection and Basic Safety and Operation - 7890: - Qualitative Test - No setpoints associated	None
October 21, 2024 3:23:59 PM	End	Execution	System Inspection and Basic Safety and Operation - 7890: - Qualitative Test - No setpoints associated	Run Count: 1

User Name: saenguthai.larak
Report Generated by Hostname: LAPTOP-CQ3SKQMV

System Id: GC-6_CN11461066
Print Date: October 22, 2024 9:27:06 AM

2024_ALS_GC-6_CN11461066_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2024 3:24:01 PM	Start	Execution	Inlet Pressure Decay - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and <= 0.5 psi	None
October 21, 2024 3:25:26 PM	End	Execution	Inlet Pressure Decay - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and <= 0.5 psi	Run Count : 1
October 21, 2024 3:25:28 PM	Start	Execution	Inlet Pressure Accuracy - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
October 21, 2024 3:25:32 PM	End	Execution	Inlet Pressure Accuracy - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count : 1
October 21, 2024 3:25:50 PM	Start	Execution	Inlet Pressure Decay - Back SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and <= 0.5 psi	None
October 21, 2024 3:26:01 PM	End	Execution	Inlet Pressure Decay - Back SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and <= 0.5 psi	Run Count : 1
October 21, 2024 3:26:05 PM	Start	Execution	Inlet Pressure Accuracy - Back SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
October 21, 2024 3:26:10 PM	End	Execution	Inlet Pressure Accuracy - Back SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count : 1
October 21, 2024 3:26:12 PM	Start	Execution	Detector Flow Accuracy - Front FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	None

Page 2 / 10

Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

Page 14 / 22

User Name: saenguthai.larak
Report Generated by Hostname: LAPTOP-CQ3SKQMV

System Id: GC-6_CN11461066
Print Date: October 22, 2024 9:27:06 AM

2024_ALS_GC-6_CN11461066_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2024 3:26:50 PM	Audit	Data	Detector Flow Accuracy - Front FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 21, 2024 3:26:53 PM	End	Execution	Detector Flow Accuracy - Front FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
October 21, 2024 3:26:54 PM	Start	Execution	Detector Flow Accuracy - Front FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	None
October 21, 2024 3:27:10 PM	Audit	Data	Detector Flow Accuracy - Front FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 21, 2024 3:27:13 PM	End	Execution	Detector Flow Accuracy - Front FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
October 21, 2024 3:26:11 PM	Start	Execution	Detector Flow Accuracy - Front FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	None
October 21, 2024 3:29:27 PM	Audit	Data	Detector Flow Accuracy - Front FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 21, 2024 3:29:29 PM	End	Execution	Detector Flow Accuracy - Front FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
October 21, 2024 3:29:30 PM	Start	Execution	Detector Flow Accuracy - Back FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	None
October 21, 2024 3:29:47 PM	Audit	Data	Detector Flow Accuracy - Back FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 21, 2024 3:29:52 PM	End	Execution	Detector Flow Accuracy - Back FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Run Count : 1

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Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

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User Name: saenguthai.larak
Report Generated by Hostname: LAPTOP-CQ3SKQMV

System Id: GC-6_CN11461066
Print Date: October 22, 2024 9:27:06 AM

2024_ALS_GC-6_CN11461066_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2024 3:29:54 PM	Start	Execution	Detector Flow Accuracy - Back FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint.	None
October 21, 2024 3:30:07 PM	Audit	Data	Detector Flow Accuracy - Back FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 21, 2024 3:30:08 PM	End	Execution	Detector Flow Accuracy - Back FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
October 21, 2024 3:30:11 PM	Start	Execution	Detector Flow Accuracy - Back FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	None
October 21, 2024 3:30:34 PM	Audit	Data	Detector Flow Accuracy - Back FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 21, 2024 3:30:37 PM	End	Execution	Detector Flow Accuracy - Back FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
October 21, 2024 3:30:38 PM	Start	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
October 21, 2024 3:31:55 PM	Audit	Data	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
October 21, 2024 3:31:57 PM	End	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count : 1

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Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

User Name: saenguthai.larak
Report Generated by Hostname: LAPTOP-CQ3SKQMV

System Id: GC-6_CN11461066
Print Date: October 22, 2024 8:27:06 AM

2024_ALS_GC-6_CN11461066_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2024 3:31:59 PM	Start	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
October 21, 2024 3:34:37 PM	Audit	Data	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
October 21, 2024 3:34:39 PM	End	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count : 1
October 21, 2024 3:34:42 PM	Start	Execution	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	None
October 21, 2024 3:38:05 PM	Audit	Data	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Manual Data Entry
October 21, 2024 3:39:07 PM	End	Execution	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Run Count : 1
October 21, 2024 3:39:33 PM	Start	Execution	GC Scouting Run - Injection Tower, Front SSL, Front FID: - Part of System Preparation - No limits associated	None
October 21, 2024 3:40:12 PM	Audit	AccClosed	Session	None
October 22, 2024 8:55:47 AM	Audit	AccRestarted	Session	None
October 22, 2024 8:55:50 AM	Audit	SessionReloaded	Session	None
October 22, 2024 8:56:02 AM	Start	Qualification	Session	OQ

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Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

User Name: saenguthai.larak
Report Generated by Hostname: LAPTOP-CQ3SKOMV

System ID: GC-6_CN11461066
Print Date: October 22, 2024 9:27:06 AM

2024_ALS_GC-6_CN11461066_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 22, 2024 8:55:02 AM	Start	Execution	GC Scouting Run - Injection Tower, Front SSL, Front FID: - Part of System Preparation - No limits associated	None
October 22, 2024 8:56:48 AM	Audit	Data	GC Scouting Run - Injection Tower, Front SSL, Front FID: - Part of System Preparation - No limits associated	Data files Path : G:\Data\Front\Front_SC10.D\FID1A.ch
October 22, 2024 8:57:25 AM	End	Execution	GC Scouting Run - Injection Tower, Front SSL, Front FID: - Part of System Preparation - No limits associated	Run Count : 1
October 22, 2024 8:57:39 AM	Start	Execution	Noise and Drift - Front FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	None
October 22, 2024 8:58:03 AM	Audit	Data	Noise and Drift - Front FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	Data files Path : G:\Data\Front\Front_ND10.D\FID1A.ch
October 22, 2024 8:58:37 AM	End	Execution	Noise and Drift - Front FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	Run Count : 1
October 22, 2024 8:58:40 AM	Start	Execution	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	None
October 22, 2024 8:59:06 AM	Audit	Data	Data Manager	Data Manager was in a data verification state but the user chose to start over

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Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

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User Name: saenguthai.larak
Report Generated by Hostname: LAPTOP-CQ3SKOMV

System ID: GC-6_CN11461066
Print Date: October 22, 2024 9:27:06 AM

2024_ALS_GC-6_CN11461066_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 22, 2024 9:01:43 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Front\Front_IP0105.D\FID1A.ch
October 22, 2024 9:01:43 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Front\Front_IP0106.D\FID1A.ch
October 22, 2024 9:01:43 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Front\Front_IP0107.D\FID1A.ch
October 22, 2024 9:01:43 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Front\Front_IP0108.D\FID1A.ch
October 22, 2024 9:01:43 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Front\Front_IP0109.D\FID1A.ch
October 22, 2024 9:01:43 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Front\Front_IP0110.D\FID1A.ch
October 22, 2024 9:02:11 AM	End	Execution	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Run Count : 1
October 22, 2024 9:02:16 AM	Start	Execution	Signal to Noise - Injection Tower, Front SSL, Front FID: - Detector FID - L: >= 300000	None
October 22, 2024 9:02:34 AM	Audit	Data	Signal to Noise - Injection Tower, Front SSL, Front FID: - Detector FID - L: >= 300000	Data files Path : G:\Data\Front\Front_SN01.D\FID1A.ch

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Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

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User Name: saenguthai.tarak
Report Generated by Hostname: LAPTOP-CQ3SKOMV

System ID: GC-6_CN11461066
Print Date: October 22, 2024 9:27:06 AM

2024_ALS_GC-6_CN11461066_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 22, 2024 9:02:54 AM	End	Execution	Signal to Noise - Injection Tower, Front SSL, Front FID: - Detector FID - L: >= 300000	Run Count: 1
October 22, 2024 9:03:00 AM	Start	Execution	GC Scouting Run - Injection Tower, Back SSL, Back FID: - Part of System Preparation - No limits associated	None
October 22, 2024 9:03:31 AM	Audit	Data	GC Scouting Run - Injection Tower, Back SSL, Back FID: - Part of System Preparation - No limits associated	Data files Path : G:\Data\Back\Back_SC01.D\FID2B.ch
October 22, 2024 9:04:00 AM	End	Execution	GC Scouting Run - Injection Tower, Back SSL, Back FID: - Part of System Preparation - No limits associated	Run Count: 1
October 22, 2024 9:04:06 AM	Start	Execution	Noise and Drift - Back FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	None
October 22, 2024 9:08:58 AM	Audit	Data	Noise and Drift - Back FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	Data files Path : G:\Data\Back\Back_NO013.D\FID2B.ch
October 22, 2024 9:09:13 AM	End	Execution	Noise and Drift - Back FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	Run Count: 1
October 22, 2024 9:09:26 AM	Start	Execution	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	None

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Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

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User Name: saenguthai.tarak
Report Generated by Hostname: LAPTOP-CQ3SKOMV

System ID: GC-6_CN11461066
Print Date: October 22, 2024 9:27:06 AM

2024_ALS_GC-6_CN11461066_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 22, 2024 9:10:44 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Back\Back_IP0111.D\FID2B.ch
October 22, 2024 9:10:44 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Back\Back_IP0112.D\FID2B.ch
October 22, 2024 9:10:44 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Back\Back_IP0113.D\FID2B.ch
October 22, 2024 9:10:44 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Back\Back_IP0114.D\FID2B.ch
October 22, 2024 9:10:44 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Back\Back_IP0115.D\FID2B.ch
October 22, 2024 9:10:44 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Back\Back_IP0116.D\FID2B.ch
October 22, 2024 9:11:15 AM	End	Execution	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Run Count: 1
October 22, 2024 9:11:23 AM	Start	Execution	Signal to Noise - Injection Tower, Back SSL, Back FID: - Detector FID - L: >= 300000	None
October 22, 2024 9:11:45 AM	Audit	Data	Signal to Noise - Injection Tower, Back SSL, Back FID: - Detector FID - L: >= 300000	Data files Path : G:\Data\Back\Back_SN01.D\FID2B.ch

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Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

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User Name: saongat(hai).tarak
Report Generated by Hostname: LAPTOP-CQ3SKOMV

System ID: GC-6_CN11461066
Print Date: October 22, 2024 9:27:05 AM

2024_ALS_GC-6_CN11461066_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 22, 2024 9:12:08 AM	End	Execution	Signal to Noise - Injection Tower, Back SSL, Back FID - Detector FID - L: >= 300000	Run Count: 1
October 22, 2024 9:12:15 AM	End	Qualification	Session	OQ
October 22, 2024 9:12:15 AM	Start	Reporting	Session	None
October 22, 2024 9:24:09 AM	Audit	Reporting	Session	Report Generated: Certificate
October 22, 2024 9:25:56 AM	Audit	Reporting	Session	Report Generated: Report

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Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

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Certificate of System Qualification

GC-OQ + GCMS-OQ

System ID: GM-12
Organization Name: ALS Laboratory Groups (Thailand) Co Ltd.
Organization Location: 104 Phattanakani 40 Phattanakani Rd Bangkok 10250
Date: May 9, 2025 3:29:14 PM
EQP Name: AgilentRecommended , AgilentRecommended
EQP Revision: GC.02.53, GCMS.02.54
Overall Qualification Status: Pass

REVIEW BY Suchada T.
APPROVED BY Tongstorn M.
NEXT CAL. DATE 9 May 26

CDS Logon Verification - GC

Logon: asbkk.env03

Overall CDS Logon Verification - GC Test Status

Pass

System Inspection and Basic Safety and Operation

Name: 8890

Setpoint Status: Pass

Overall System Inspection and Basic Safety and Operation Test Status

Pass

Inlet Pressure Accuracy

Name: 8890

Front SSL

Setpoint Status: Pass

	Setpoint	Actual
Inlet Pressure:	25.0 psi	24.8 psi
Accuracy:		0.2 psi
Agilent Recommended:		<= 1.2

Date: May 9, 2025 3:29:14 PM
System ID: GM-12

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Overall Inlet Pressure Accuracy Test Status

Pass

GC Oven Temperature Accuracy

Name: 8890

Setpoint Status: Pass

Zone: Oven

Setpoint/Actual
Temperature: 230.0 230.1 °C

Accuracy: 0.1 °C

Agilent Recommended: >= -1.0 % setpoint in K (-5.0 °C)

<= 1.0 % setpoint in K (5.0 °C)

Setpoint Status: Pass

Zone: Oven

Setpoint/Actual
Temperature: 100.0 100.1 °C

Accuracy: 0.1 °C

Agilent Recommended: >= -1.0 % setpoint in K (-3.7 °C)

<= 1.0 % setpoint in K (3.7 °C)

Overall GC Oven Temperature Accuracy Test Status

Pass

GC Oven Temperature Stability

Name: 8890

Setpoint Status: Pass

Setpoint/Average
Temperature: 100.0 100.1167 °C

Stability: 0.1 °C

Agilent Recommended: <= 0.5

Overall GC Oven Temperature Stability Test Status

Pass

Log Amp

Tested Combination1 Front SSL / External SQ

Name: 5977C

Setpoint Status: Pass

Overall Log Amp Test Status

Pass

RFPA

Tested Combination1 Front SSL / External SQ

Name: 5977C

Setpoint Status: Pass

Amu: 1050 m/z Drift After Five Minutes: 1 mV RFP Voltage: 497 mV

Agilent Recommended: >= -100 and <= 100 <= 1100

Overall RFPA Test Status

Pass

Tune EI

Tested Combination1 Front SSL / External SQ

Name: 5977C

Setpoint Status: Pass

Filament: 1

Setpoint Status: Pass

Filament: 2

Overall Tune EI Test Status

Pass

Scouting Run

Tested Combination1	Front	SSL	/ External	SQ
	Injection Tower			
Name:	7693A			
Source:	EI - Extractor			
Setpoint Status:	Completed			
Injection Volume on Column:	1.0 uL			
Overall Scouting Run Status	Completed			

Instrument Detection Limit

Tested Combination1	Front	SSL	/ External	SQ
	Injection Tower			
Name:	7693A			
Source:	EI - Extractor			
Setpoint Status:	Pass			
Injection Volume on Column:	1.0 uL			
Minimum RSD:	Area		Retention Time	
	1.27 %		0.01 %	
Agilent Recommended:	<= 5.00		<= 1.00	
Status:	Pass		Pass	
Instrument Detection Limit:	4.28135 fg			
Agilent Recommended:	<= 16.82500			
Status:	Pass			

Overall Instrument Detection Limit Test Status

Pass

Mass Ratio Precision

Tested Combination1	Front	SSL	/ External	SQ
	Injection Tower			
Name:	7693A			
Source:	EI - Extractor			
Setpoint Status:	Pass			
Injection Volume on Column:	1.0 uL			
	Area Mass 1		Mass Ratio	
	Abundance*s			
RSD:	2.17 %		0.50 %	
Agilent Recommended:	<= 5.00		<= 5.00	
	Pass		Pass	

Overall Mass Ratio Precision Test Status

Pass

NOTE: This test's 1 comment(s) and 0 deviation(s) are available in the Attachments section.

Instrument Details

Purpose

This section describes the as found system configuration.

Details

Tested Combination1

Injection Technique	Injection Tower
Inlet	Front
Detector	External
LTM Included?	No

Sampler 1

Manufacturer	Agilent Technologies
Type	Injection Tower
Name	7693A
Model Number	G4513A
Serial Number	CN23125102
Firmware Revision	A.11.07
Usage	Sample Injection
Location	Front
Syringe Volume (µL)	10

Sampler 2

Manufacturer	Agilent Technologies
Type	Tray
Name	7693A
Model Number	G4514A
Serial Number	CN23147049
Firmware Revision	A.12.03
Vial Heater	Not installed

Mainframe 1

Manufacturer	Agilent Technologies
Name	8890
Model Number	G3540A
Serial Number	CN2303A031
Firmware Revision	2.B.1.6
Oven Type	Standard

Inlet 1

Manufacturer	Agilent Technologies
Name	8890
Type	SSL
Location	Front
Carrier Gas	Helium
Control Type	Electronic Pressure Control (EPC)
Purged Inlet	Yes

Mass Spectrometer 1

Manufacturer	Agilent Technologies
Type	SQ
Name	5977C
Model Number	G7077C
Serial Number	US2307MA35
Firmware Revision	6.00.35
Rough Pump	Wet Mechanical Vacuum Pump
High Vacuum System	Turbo Pump
Scouting Run Standard	OFN Std

Electronic Signature

Purpose

This signature page was created and published because the ACE sign-off action was executed, which is valid for the entire document, including attachments. The ACE sign-off is an electronic signature that requires two distinct identification components: unique username and personal password. The Agilent representative who has delivered this service understands the meaning and legal status of an electronic signature. As a trained official operator, the Agilent representative has a unique password and login to access ACE and electronically sign this document. (Other e-signatures can be applied to this document using a Document Content Management or other suitable method defined in your data access and control procedures.)

Details

Full Name of Signer:	Phuwanai Yoktragul
Logged On User Name:	phuwanai.yoktragul@agilent.com
Signature Creation Date:	May 9, 2025
Reason for Signature:	Executed protocol and published this original version of document

ACE Self Qualification Status

The installed version of ACE used to deliver this service passed qualification; the results conform with expected values. The self qualification summary report is available in the session folder location SDS\ClearStore\AceSelfQualification.

Regulatory Disclaimer

This document provides a protocol to verify and record instrument configuration and evidence of proper operation. It has been prepared from our interpretation of applicable regulations as well as industry best practices. The document is designed to provide an important component of a complete compliance package. Validation depends upon many factors and use of this protocol alone does not assure compliance. Agilent Technologies makes no promises or representations as to its sufficiency for any specific regulatory program.

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User Name: phuwanai.yoktragul				System Id: GM-12
Report Generated by Hostname: 5CG9217CJG				Print Date: May 9, 2025 3:29:17 PM
OQ2025_GM-12 Transaction log :				
Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 8, 2025 2:38:52 PM	Audit	SessionCreated	Session	Host Name: 5CG9217CJG, Drive Serial Number: BC4F1A47
May 8, 2025 2:38:52 PM	start	Configuration	Session	None
May 8, 2025 2:38:52 PM	Audit	Entitlement	Licensing	User is FieldEngineer and does not require an unlock code
May 8, 2025 2:41:01 PM	Audit	EqplLoaded	Session	EQP details for primary technique [Gc] - File path: [ProtocolPacks\Gc\Configuration\02.53\Gc.02.53.eqp], EQP File Name: [Gc.02.53.eqp], EQP Name: [AgilentRecommended], Protocol Revision: [Gc.02.53] EQP details for hyphenated technique [GcMs] - File path: [ProtocolPacks\GcMs\Configurations\02.54\GcMs.02.54.eqp], EQP File Name: [GcMs.02.54.eqp], EQP Name: [AgilentRecommended]
May 8, 2025 2:41:05 PM	End	Configuration	Session	None
May 8, 2025 2:41:09 PM	start	Qualification	Session	OQ
May 8, 2025 2:41:10 PM	start	Execution	CDS Logon Verification - GC - 889Q - Qualitative test	None
May 8, 2025 2:42:42 PM	End	Execution	CDS Logon Verification - GC - 889Q - Qualitative test	Run Count: 1
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User Name: phuwanai.yoktragul
Report Generated by Hostname: 5CG9217CJG

System Id: GM-12
Print Date: May 9, 2025 3:25:17 PM

OQ2025_GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 8, 2025 2:43:00 PM	start	Execution	System Inspection and Basic Safety and Operation - 8890; - Qualitative Test - No setpoints associated	None
May 8, 2025 2:43:16 PM	End	Execution	System Inspection and Basic Safety and Operation - 8890; - Qualitative Test - No setpoints associated	Run Count : 1
May 8, 2025 2:43:21 PM	start	Execution	Inlet Pressure Accuracy - Front SSL; - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
May 8, 2025 2:44:22 PM	End	Execution	Inlet Pressure Accuracy - Front SSL; - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count : 1
May 8, 2025 2:44:28 PM	start	Execution	GC Oven Temperature Accuracy - 8890; - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
May 8, 2025 2:52:02 PM	Audit	Data	GC Oven Temperature Accuracy - 8890; - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
May 8, 2025 2:52:05 PM	End	Execution	GC Oven Temperature Accuracy - 8890; - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count : 1
May 8, 2025 2:52:13 PM	start	Execution	GC Oven Temperature Accuracy - 8890; - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
May 8, 2025 3:01:36 PM	Audit	Data	GC Oven Temperature Accuracy - 8890; - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry

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User Name: phuwanai.yoktragul
Report Generated by Hostname: 5CG9217CJG

System Id: GM-12
Print Date: May 9, 2025 3:29:17 PM

OQ2025_GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 8, 2025 3:01:39 PM	End	Execution	GC Oven Temperature Accuracy - 8890; - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count : 1
May 8, 2025 3:01:42 PM	start	Execution	GC Oven Temperature Stability - 8890; - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	None
May 8, 2025 3:20:17 PM	Audit	Data	GC Oven Temperature Stability - 8890; - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Manual Data Entry
May 8, 2025 3:20:19 PM	End	Execution	GC Oven Temperature Stability - 8890; - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Run Count : 1
May 8, 2025 3:20:42 PM	start	Execution	Log Amp - 5977C SQ; - Source: EI - Extractor	None
May 8, 2025 3:25:45 PM	End	Execution	Log Amp - 5977C SQ; - Source: EI - Extractor	Run Count : 1
May 8, 2025 3:25:48 PM	start	Execution	RFPD - 5977C SQ; - Source: EI - Extractor	None
May 8, 2025 3:36:10 PM	End	Execution	RFPD - 5977C SQ; - Source: EI - Extractor	Run Count : 1
May 8, 2025 3:36:50 PM	start	Execution	Tune EI - 5977C SQ; - Source: EI - Extractor Filament 1 (Qualitative - No setpoints associated)	None
May 8, 2025 3:43:21 PM	End	Execution	Tune EI - 5977C SQ; - Source: EI - Extractor Filament 1 (Qualitative - No setpoints associated)	Run Count : 1
May 8, 2025 3:43:27 PM	start	Execution	Tune EI - 5977C SQ; - Source: EI - Extractor Filament 2 (Qualitative - No setpoints associated)	None

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User Name: phuwanai.yoktragul
Report Generated by Hostname: SCG9217CJG

System Id: GM-12
Print Date: May 9, 2025 3:29:17 PM

OQ2025_GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 8, 2025 3:45:57 PM	End	Execution	Tune EI - 5977C-SQ: - Source: - Run Count : 1 EI - Extractor Filament 2 (Qualitative - No setpoints associated)	
May 8, 2025 3:46:04 PM	Audit	AccClosed	Session	None
May 9, 2025 9:33:04 AM	Audit	AccRestarted	Session	Host Name: SCG9217CJG, Drive Serial Number: BCAF1A47
May 9, 2025 9:33:06 AM	Audit	SessionReloaded	Session	None
May 9, 2025 9:33:59 AM	start	Qualification	Session	OQ
May 9, 2025 9:34:19 AM	start	Execution	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor- Part of GCMS System Preparation	None
May 9, 2025 9:35:36 AM	start	Execution	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	None
May 9, 2025 9:39:00 AM	start	Execution	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor- Part of GCMS System Preparation	None
May 9, 2025 9:39:03 AM	start	Execution	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	None
May 9, 2025 9:43:57 AM	start	Execution	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor- Part of GCMS System Preparation	None

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Date: May 9, 2025 3:29:14 PM
System ID: GM-12

User Name: phuwanai.yoktragul
Report Generated by Hostname: SCG9217CJG

System Id: GM-12
Print Date: May 9, 2025 3:29:17 PM

OQ2025_GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 9, 2025 10:04:26 AM	start	Execution	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	None
May 9, 2025 10:04:28 AM	start	Execution	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor- Part of GCMS System Preparation	None
May 9, 2025 1:12:30 PM	start	Execution	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	None
May 9, 2025 3:02:09 PM	start	Execution	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor- Part of GCMS System Preparation	None
May 9, 2025 3:03:52 PM	Audit	Data	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor- Part of GCMS System Preparation	Data files Path : C:\Users\yoktragul\Downloads VALS_OQ2025\OQ2025\OQ2 025\SC_OPN.D
May 9, 2025 3:04:25 PM	Audit	Reporting	Reintegration	Reintegration Count: 1 - [Integration Type: Injection,Baseline Correction Mode: Advanced,Initial Slope Sensitivity: 10,Initial Peak Width: 0.01,Initial Area Reject: 0,Initial Height Reject: 150,Integration: Off at 0,Integration: On at 4]

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Date: May 9, 2025 3:29:14 PM
System ID: GM-12

User Name: phuwanai.yoktragu
Report Generated by Hostname: 5CG9217CJG

System Id: GM-12
Print Date: May 9, 2025 3:29:17 PM

OQ2025_GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 9, 2025 3:04:39 PM	Audit	Reporting	Reintegration	Reintegration Count: 2 - [Integration Type: Injection; Baseline Correction Mode: Advanced; Initial Slope Sensitivity: 10; Initial Peak Width: 0.01; Initial Area Reject: 0; Initial Height Reject: 100; Integration: Off at 0; Integration: On at 4]
May 9, 2025 3:04:46 PM	Audit	Reporting	Reintegration	Reintegration Count: 3 - [Integration Type: Injection; Baseline Correction Mode: Advanced; Initial Slope Sensitivity: 10; Initial Peak Width: 0.02; Initial Area Reject: 0; Initial Height Reject: 100; Integration: Off at 0; Integration: On at 4]
May 9, 2025 3:05:17 PM	End	Execution	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - Part of GCMS System Preparation	Run Count : 1
May 9, 2025 3:05:21 PM	start	Execution	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	None
May 9, 2025 3:07:51 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : C:\Users\yoktragu\Downloads\VALS_OQ2025\OQ2025\IQ2 025\IDL2.D

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Date: May 9, 2025 3:29:14 PM
System ID: GM-12

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User Name: phuwanai.yoktragu
Report Generated by Hostname: 5CG9217CJG

System Id: GM-12
Print Date: May 9, 2025 3:29:17 PM

OQ2025_GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 9, 2025 3:07:51 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : C:\Users\yoktragu\Downloads\VALS_OQ2025\OQ2025\IQ2 025\IDL3.D
May 9, 2025 3:07:51 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : C:\Users\yoktragu\Downloads\VALS_OQ2025\OQ2025\IQ2 025\IDL4.D
May 9, 2025 3:07:51 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : C:\Users\yoktragu\Downloads\VALS_OQ2025\OQ2025\IQ2 025\IDL5.D
May 9, 2025 3:07:51 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : C:\Users\yoktragu\Downloads\VALS_OQ2025\OQ2025\IQ2 025\IDL6.D
May 9, 2025 3:07:51 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : C:\Users\yoktragu\Downloads\VALS_OQ2025\OQ2025\IQ2 025\IDL7.D
May 9, 2025 3:07:51 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : C:\Users\yoktragu\Downloads\VALS_OQ2025\OQ2025\IQ2 025\IDL8.D
May 9, 2025 3:07:51 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : C:\Users\yoktragu\Downloads\VALS_OQ2025\OQ2025\IQ2 025\IDL9.D

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Date: May 9, 2025 3:29:14 PM
System ID: GM-12

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User Name: phuwanai.yoktragul
Report Generated by Hostname: SCG9217CJG

System Id: GM-12
Print Date: May 9, 2025 3:29:17 PM

OQ2025_GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 9, 2025 3:07:51 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : C:\Users\yoktragul\Downloads\VALS_OQ2025\OQ2025\IDL10.D
May 9, 2025 3:07:51 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : C:\Users\yoktragul\Downloads\VALS_OQ2025\OQ2025\IDL11.D
May 9, 2025 3:08:43 PM	Audit	Reporting	Reintegration	Reintegration Count: 1 - [Integration Type: Injection; Baseline Correction Mode: Advanced; Initial Slope Sensitivity: 10; Initial Peak Width: 0.01; Initial Area Reject: 0; Initial Height Reject: 50; Integration: Off at 0; Integration: On at 4.6]
May 9, 2025 3:09:07 PM	Audit	Reporting	Reintegration	Reintegration Count: 2 - [Integration Type: Injection; Baseline Correction Mode: Advanced; Initial Slope Sensitivity: 10; Initial Peak Width: 0.01; Initial Area Reject: 0; Initial Height Reject: 200; Integration: Off at 0; Integration: On at 4.6]
May 9, 2025 3:10:29 PM	End	Execution	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Run Count : 1

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Date: May 9, 2025 3:29:14 PM
System ID: GM-12

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User Name: phuwanai.yoktragul
Report Generated by Hostname: SCG9217CJG

System Id: GM-12
Print Date: May 9, 2025 3:29:17 PM

OQ2025_GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 9, 2025 3:11:01 PM	start	Execution	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	None
May 9, 2025 3:12:51 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : C:\Users\yoktragul\Downloads\VALS_OQ2025\OQ2025\MRP5.D
May 9, 2025 3:12:51 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : C:\Users\yoktragul\Downloads\VALS_OQ2025\OQ2025\MRP6.D
May 9, 2025 3:12:51 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : C:\Users\yoktragul\Downloads\VALS_OQ2025\OQ2025\MRP7.D
May 9, 2025 3:12:51 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : C:\Users\yoktragul\Downloads\VALS_OQ2025\OQ2025\MRP8.D
May 9, 2025 3:12:51 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : C:\Users\yoktragul\Downloads\VALS_OQ2025\OQ2025\MRP9.D
May 9, 2025 3:12:51 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : C:\Users\yoktragul\Downloads\VALS_OQ2025\OQ2025\MRP10.D

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Date: May 9, 2025 3:29:14 PM
System ID: GM-12

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User Name: phuwanai.yoktragulSystem id: GM-12
Report Generated by Hostname: 5CG9217CJGPrint Date: May 9, 2025 3:29:17 PM

OQ2025_GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 9, 2025 2:13:49 PM	Audit	Reporting	Reintegration	Reintegration Count: 1 -- [Integration Type: Injection;Baseline Correction Mode: Advanced;Initial Slope Sensitivity: 10;Initial Peak Width: 0.01;Initial Area Reject: 0;Initial Height Reject: 50000;Integration: Off at 0;Integration: On at 2]
May 9, 2025 3:15:04 PM	End	Execution	Mass Ratio Precision - Injection Tower, Front SST, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Run Count : 1
May 9, 2025 3:16:15 PM	End	Qualification	Session	OQ
May 9, 2025 3:16:15 PM	start	Reporting	Session	None
May 9, 2025 3:26:19 PM	Audit	Reporting	Session	Report Generated : Certificate
May 9, 2025 3:27:20 PM	Audit	Reporting	Session	Report Generated : Report
May 9, 2025 3:28:25 PM	Audit	Reporting	Session	Report Generated : Report with Certificate



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รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Workplace	Acrylonitrile / Styrene	DRYCAL FLOWMETER	RYG_FS0208	27-Jan-25	26-Jan-26	12
Workplace		DRYCAL FLOWMETER	BKK_FS0614	9-Sep-24	9-Sep-25	12
Workplace		Air Sampling Pump	RYG_FS0146	6-Jul-25	6-Oct-25	3
Workplace		Air Sampling Pump	RYG_FS0141	7-Jul-25	7-Oct-25	3
Workplace		Air Sampling Pump	RYG_FS0139	6-Jul-25	6-Oct-25	3
Workplace		Air Sampling Pump	RYG_FS0135	7-Jul-25	7-Oct-25	3
Workplace		Air Sampling Pump	RYG_FS0134	7-Jul-25	7-Oct-25	3
Workplace		Air Sampling Pump	RYG_FS0130	7-Jul-25	7-Oct-25	3
Workplace		Air Sampling Pump	RYG_FS0128	7-Jul-25	7-Oct-25	3
Workplace		Air Sampling Pump	RYG_FS0127	7-Jul-25	7-Oct-25	3
Workplace		Air Sampling Pump	RYG_FS0126	6-Jul-25	6-Oct-25	3
Workplace		Air Sampling Pump	RYG_FS0124	6-Jul-25	6-Oct-25	3
Workplace	Acrylonitrile	GC-FID	BKK_EN0126	22-Oct-24	22-Apr-26	18
Workplace	Styrene	GC-MSD	BKK_EN0410	10-May-24	10-Nov-25	12

INNOVATIVE INSTRUMENT CALIBRATION LAB

INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE

7/139 MOO 13, SOI SUNTINAKORN 11 TAMBON BANG KAE0.

AMPHOE BANG PHU SAMUT PRAKAN PROVINCE 10540 THAILAND.

TEL: (660)2116-5860-1 FAX: (660)2116-7140



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Certificate of Calibration

Customer

Name : ALS Laboratory Group Thailand Co., Ltd.

Address : 104 Soi Phatthanakan 40, Phatthanakan Road, Suan Luang,
Bangkok 10250

Certificate No : 25-AFM-023

Request No : Req-2025-0169

Unit Under Calibration Details

Measurement Item : Air Flow Meter

Manufacturer : Mesa Labs

Accuracy : 1% of Reading

Model : 200-510L

Sensor Model : -

Serial Number : 130027

Sensor Serial Number : -

ID : RYG_FS0208

Instrument Status : Used

Location of Calibration : LAB 4 AIR VELOCITY METER

Calibration Environment and Details

Temperature : 23 °C ± 3 °C

Humidity : 55 %RH ± 20 %RH

Barometric Pressure : 1013 hPa ± 10 hPa

Received Date : 21 January 2025

Calibration Date : 27 January 2025

Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	18501010006	Sensidyne	6 August 2025
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	2 August 2025
Temperature meter	GT 11	08000057	Qreborn	1 March 2025
Pressure meter	CPG2400	41000KDU/651882	TPA	21 October 2025

Traceability :

This Certificate is traceable to SI Unit through Sensidyne A2LA Accreditation No. 3943.01

Note :

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %.

Calibration By :
Mr. Noppadon Luangart
Service Calibration Engineer

Approved By :
Mr. Pacit Mathavorn
Calibration Engineer Supervisor

Issue Date : 27 January 2025

Certificate No : 25-AFM-023
Request No : Req-2025-0169

Result of Calibration : Without Adjustment

Temperature (^o C)	Pressure (kPa)	STD (cc/min)	UUC (cc/min)	Error (cc/min)	Uncertainty (cc/min)	MPE (cc/min)	Result
22.50	100.90	20	19.854	-0.1	1.3	0.2	Pass1
22.50	100.90	50	49.732	-0.3	3.3	0.5	Pass1
22.60	100.90	101	100.77	-0.2	2.8	1.0	Pass1
22.70	100.90	151	150.23	-0.8	4.2	1.5	Pass1
22.70	100.90	201	200.39	-0.6	5.6	2.0	Pass1
22.70	100.90	301	300.69	-0.3	8.4	3.0	Pass1
22.80	100.90	400	402.96	3.0	11	4.0	Pass1
23.10	100.90	500	504.62	4.6	7.2	5.0	Pass1

Note STD : Standard UUC : Unit Under Calibration
- UUC Reference Condition : At atmospheric pressure and room temperature condition
- Flow Rate was corrected for non-standard operating condition by using equation :

$$Q_{meas} = Q_{ref} \times \frac{P_{ref}}{P_{meas}} \times \frac{T_{meas}}{T_{ref}}$$

where Q = Flow Rate P = Absolute Pressure T = Absolute Temperature
Meas = Measurement Condition ref = Standard Condition

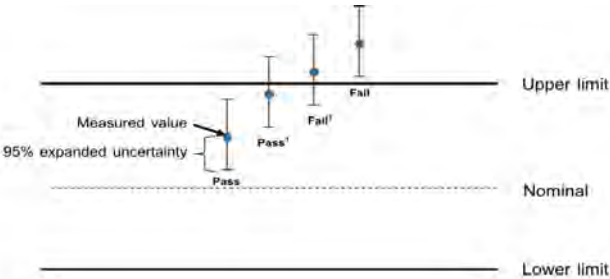
* Indicates non accredited
MPE = Maximum Permissible Error (Specified in Manufacturer's Specifications)
N/A = Not Aavailable, Customer does not require a statement of conformity.

Certificate No : 25-AFM-023
Request No : Req-2025-0169

Decision Rule for Statements of Conformity

The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09/2019; Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

Pass = The measurement result plus the expanded uncertainty with a 95% coverage probability were within the limit.
Pass¹ = The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.
Fail¹ = The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.
Fail = The measurement result plus the expanded uncertainty with a 95% coverage probability were outside the limit.



End of Certificate

Certificate of Calibration

Customer
Name : ALS Laboratory Group Thailand Co., Ltd.
Address : 104 Soi Phatthanakan 40, Phatthanakan Road, Suan Luang,
Bangkok 10250
Unit Under Calibration Details
Measurement Item : Air Flow Meter
Manufacturer : MesaLabs
Model : Defender 510-M
Serial Number : I51114
ID : BKK_FS0614
Accuracy : 1% of Reading
Sensor Model : -
Sensor Serial Number : -
Instrument Status : Used

Location of Calibration : LAB 4 AIR VELOCITY METER

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 30 August 2024
Calibration Date : 9 September 2024

Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator


Reference Standard	Model	Serial Number	Traceble	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	18501010006	Sensidyne	6 August 2025
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	2 August 2025
Temperature meter	GT 11	08000057	Qreborn	1 March 2025
Pressure meter	CPG2400	41000KDU/651882	TPA	9 November 2024


Traceability :

This Certificate is traceable to SI Unit through Sensidyne A2LA Accreditation No. 3943.01

Note :

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %.

Calibration By : 
Mr. Noppadon Luangart
Service Calibration Engineer

Approved By : 
Mr. Pacit Mathavorn
Calibration Engineer Supervisor

Issue Date : 9 September 2024

Certificate No : 24-AFM-179
Request No : Req-2024-1987

Result of Calibration : Without Adjustment

Temperature (°C)	Pressure (kPa)	STD (cc/min)	UUC (cc/min)	Error (cc/min)	Uncertainty (cc/min)	MPE (cc/min)	Result
24.70	100.95	100	100.41	0.4	2.8	1.0	N/A
24.90	100.90	502	500.47	-1.5	7.1	5.0	N/A
24.90	100.97	1003	1001.3	-2	14	10.0	N/A
25.00	100.92	2014	2009.9	-4	29	20.1	N/A
25.20	101.03	3043	3058.3	15	44	30.4	N/A
25.30	101.10	4043	4005.1	-38	57	40.4	N/A
25.50	101.15	5052	5003.9	-48	74	50.5	N/A

Note
STD : Standard UUC : Unit Under Calibration
- UUC Reference Condition : At atmospheric pressure and room temperature condition
- Flow Rate was corrected for non-standard operating condition by using equation :

$$Q_{meas} = Q_{ref} \times \frac{P_{ref}}{P_{meas}} \times \frac{T_{meas}}{T_{ref}}$$

where Q = Flow Rate P = Absolute Pressure T = Absolute Temperature
Meas = Measurement Condition ref = Standard Condition

* Indicates non accredited
MPE = Maximum Permissible Error (Specified in Manufacturer's Specifications)
N/A = Not Aavailable, Customer does not require a statement of conformity.

Certificate No : 24-AFM-179

Request No : Req-2024-1987

Decision Rule for Statements of Conformity

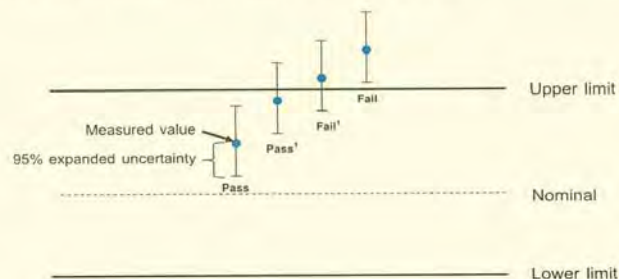
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09/2019: Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

Pass = The measurement result plus the expanded uncertainty with a 95% coverage probability were within the limit.

Pass¹ = The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail¹ = The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

Fail = The measurement result plus the expanded uncertainty with a 95% coverage probability were outside the limit.



End of Certificate

ALS Laboratory Group (Thailand) Co., Ltd.

104 Phatthanakan 40, Phatthanakan Rd.,
Phatthanakan, Suan Luang, Bangkok 10250
T +66 2 760 3000 F +66 2 760 3197



Certificate of Calibration

Certificate No. C-060725-RYG_FS0146

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gillian
Model/Type : GilAir Plus
Equipment ID : RYG_FS0146
Serial No. : 20150310176
Calibration Date : 06-Jul-25
Next calibration date : 06-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L
Equipment ID : RYG_FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M
Equipment ID : BKK_FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)			Evaluation (Pass/ Fail)
	1	2	3						
Low Flow									
20	20.2	20.5	20.1	20.3	5%	19	-	21	Passed
50	51.5	51.8	52.0	51.8	5%	48	-	53	Passed
100	101.1	102.5	103.2	102.3	5%	95	-	105	Passed
200	204.2	204.6	205.1	204.6	5%	190	-	210	Passed
High Flow									
500	505.2	505.6	506.7	505.8	3%	485	-	515	Passed
1000	1006.5	1006.8	1007.2	1006.8	3%	970	-	1030	Passed
2000	2010.2	2011.5	2012.2	2011.3	3%	1940	-	2060	Passed
2500	2515.2	2516.2	2515.5	2515.6	3%	2425	-	2575	Passed

END OF REPORT

Calibrated By: Suphachai W.

(Mr. Suphachai Wongsurichai)

RYG Field Services Scientist (2)

Issue date : 07-Jul-25

Approved By: Supot S.

(Mr. Supot Salamteh)

Field Services Section Head



Certificate of Calibration

Certificate No. C-070725-RYG_FS0141

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus

Equipment ID : RYG_FS0141
Serial No. : 20150810060
Calibration Date : 07-Jul-25
Next calibration date : 07-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L

Equipment ID : RYG_FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M

Equipment ID : BKK_FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	20.1	20.0	20.0	20.0	5%	19 - 21	Passed
50	52.1	51.2	50.9	51.4	5%	48 - 53	Passed
100	99.2	98.9	98.6	98.9	5%	95 - 105	Passed
200	201.2	201.8	201.6	201.5	5%	190 - 210	Passed
High Flow							
500	502.5	503.8	507.9	504.7	3%	485 - 515	Passed
1000	1003.0	1001.7	1004.1	1002.9	3%	970 - 1030	Passed
2000	2002.9	2003.8	2002.2	2003.0	3%	1940 - 2060	Passed
2500	2502.6	2507.3	2504.7	2504.9	3%	2425 - 2575	Passed

END OF REPORT

Calibrated By:

(Mr. Watcharin Pongsamsuan)

RYG Field Services Scientist (1)

Issue date : 08-Jul-25

Approved By:

(Mr. Supot Salamatheh)

Field Services Section Head



Certificate of Calibration

Certificate No. C-060725-RYG_FS0139

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus

Equipment ID : RYG_FS0139
Serial No. : 20150510087
Calibration Date : 06-Jul-25
Next calibration date : 06-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L

Equipment ID : RYG_FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M

Equipment ID : BKK_FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	20.6	21.0	20.4	20.7	5%	19 - 21	Passed
50	52.6	51.2	52.3	52.0	5%	48 - 53	Passed
100	101.2	100.5	100.2	100.6	5%	95 - 105	Passed
200	200.1	201.1	201.1	200.8	5%	190 - 210	Passed
High Flow							
500	501.4	502.6	502.0	502.0	3%	485 - 515	Passed
1000	999.0	997.1	998.7	998.3	3%	970 - 1030	Passed
2000	1999.6	1995.6	1998.1	1997.8	3%	1940 - 2060	Passed
2500	2491.2	2495.4	2494.0	2493.5	3%	2425 - 2575	Passed

END OF REPORT

Calibrated By:

(Mr. Nantawat Sarin)

RYG Field Services Scientist (1)

Issue date : 07-Jul-25

Approved By:

(Mr. Supot Salamatheh)

Field Services Section Head



Certificate of Calibration

Certificate No. C-070725-RYG_FS0135

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus

Equipment ID : RYG_FS0135
Serial No. : 20150410011
Calibration Date : 07-Jul-25
Next calibration date : 07-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L

Equipment ID : RYG_FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M

Equipment ID : BKK_FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	19.4	19.5	19.4	19.4	5%	19 - 21	Passed
50	49.4	49.1	49.5	49.3	5%	48 - 53	Passed
100	99.7	100.0	99.6	99.8	5%	95 - 105	Passed
200	199.8	200.5	198.7	199.7	5%	190 - 210	Passed
High Flow							
500	500.4	502.0	499.9	500.8	3%	485 - 515	Passed
1000	1003.4	1003.3	1001.2	1002.6	3%	970 - 1030	Passed
2000	2001.7	2002.6	2002.1	2002.1	3%	1940 - 2060	Passed
2500	2504.2	2502.5	2508.6	2505.1	3%	2425 - 2575	Passed

END OF REPORT

Calibrated By:

(Mr. Watcharin Pongsamsuan)

RYG Field Services Scientist (1)

Issue date : 08-Jul-25

Approved By:

(Mr. Supot Salamteh)

Field Services Section Head



Certificate of Calibration

Certificate No. C-070725-RYG_FS0134

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus

Equipment ID : RYG_FS0134
Serial No. : 20201110102
Calibration Date : 07-Jul-25
Next calibration date : 07-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L

Equipment ID : RYG_FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M

Equipment ID : BKK_FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	20.6	20.6	20.6	20.6	5%	19 - 21	Passed
50	49.6	49.1	49.3	49.3	5%	48 - 53	Passed
100	100.1	99.4	100.0	99.8	5%	95 - 105	Passed
200	200.5	201.6	201.4	201.2	5%	190 - 210	Passed
High Flow							
500	496.5	497.7	497.9	497.4	3%	485 - 515	Passed
1000	996.8	997.9	995.6	996.8	3%	970 - 1030	Passed
2000	1997.3	1993.0	1998.5	1996.3	3%	1940 - 2060	Passed
2500	2493.7	2491.2	2500.9	2495.3	3%	2425 - 2575	Passed

END OF REPORT

Calibrated By:

(Mr. Natchapon Thamklang)

RYG Field Services Scientist (1)

Issue date : 08-Jul-25

Approved By:

(Mr. Supot Salamteh)

Field Services Section Head



Certificate of Calibration

Certificate No. C-070725-RYG_FS0130

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus

Equipment ID : RYG_FS0130
Serial No. : 20150410006
Calibration Date : 07-Jul-25
Next calibration date : 07-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L

Equipment ID : RYG_FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M

Equipment ID : BKK_FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	20.8	20.6	19.6	20.3	5%	19 - 21	Passed
50	48.8	48.5	49.1	48.8	5%	48 - 53	Passed
100	101.2	100.2	100.5	100.6	5%	95 - 105	Passed
200	195.2	195.3	195.7	195.4	5%	190 - 210	Passed
High Flow							
500	509.4	496.2	510.7	505.4	3%	485 - 515	Passed
1000	1007.1	1007.4	999.4	1004.6	3%	970 - 1030	Passed
2000	2002.1	1998.5	2002.3	2001.0	3%	1940 - 2060	Passed
2500	2506.1	2510.1	2509.5	2508.6	3%	2425 - 2575	Passed
4000	4003.3	4003.0	3999.8	4002.0	3%	3880 - 4120	Passed

END OF REPORT

Calibrated By:

(Mr. Watcharin Pongsamsuan)
RYG Field Services Scientist (1)

Issue date : 08-Jul-25

Approved By:

(Mr. Supot Salamteh)
Field Services Section Head

Certificate of Calibration

Certificate No. C-070725-RYG_FS0128

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus

Equipment ID : RYG_FS0128
Serial No. : 20150410004
Calibration Date : 07-Jul-25
Next calibration date : 07-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L

Equipment ID : RYG_FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M

Equipment ID : BKK_FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	20.8	19.7	20.3	20.3	5%	19 - 21	Passed
50	50.1	50.5	51.5	50.7	5%	48 - 53	Passed
100	99.8	101.8	100.3	100.6	5%	95 - 105	Passed
200	200.7	201.4	199.8	200.6	5%	190 - 210	Passed
High Flow							
500	499.9	503.3	502.7	502.0	3%	485 - 515	Passed
1000	1001.5	998.8	1000.3	1000.2	3%	970 - 1030	Passed
2000	2003.6	2008.9	2006.7	2006.4	3%	1940 - 2060	Passed
2500	2515.7	2514.8	2516.1	2515.5	3%	2425 - 2575	Passed
4000	3996.3	4009.5	4018.4	4008.1	3%	3880 - 4120	Passed

END OF REPORT

Calibrated By:

(Mr. Natchapon Thamklang)
RYG Field Services Scientist (1)

Issue date : 08-Jul-25

Approved By:

(Mr. Supot Salamteh)
Field Services Section Head



Certificate of Calibration

Certificate No. C-070725-RYG_FS0127

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus
Equipment ID : RYG_FS0127
Serial No. : 20150410003
Calibration Date : 07-Jul-25
Next calibration date : 07-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L
Equipment ID : RYG_FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M
Equipment ID : BKK_FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	20.1	19.6	21.1	20.3	5%	19 - 21	Passed
50	50.3	51.0	51.6	51.0	5%	48 - 53	Passed
100	100.7	100.1	100.1	100.3	5%	95 - 105	Passed
200	202.7	201.8	202.2	202.2	5%	190 - 210	Passed
High Flow							
500	487.2	481.9	488.3	485.8	3%	485 - 515	Passed
1000	1018.0	1015.0	1015.1	1016.0	3%	970 - 1030	Passed
2000	1994.5	1997.6	2003.5	1998.5	3%	1940 - 2060	Passed
2500	2497.4	2498.0	2487.6	2494.3	3%	2425 - 2575	Passed
4000	4013.6	4010.3	4007.1	4010.3	3%	3880 - 4120	Passed

END OF REPORT

Calibrated By:

(Mr. Watcharin Pongsamsuan)
RYG Field Services Scientist (1)

Issue date : 08-Jul-25

Approved By:

(Mr. Supot Salamteh)
Field Services Section Head



Certificate of Calibration

Certificate No. C-060725-RYG_FS0126

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus
Equipment ID : RYG_FS0126
Serial No. : 20150410002
Calibration Date : 06-Jul-25
Next calibration date : 06-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L
Equipment ID : RYG_FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M
Equipment ID : BKK_FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	19.9	20.6	20.3	20.3	5%	19 - 21	Passed
50	50.9	51.4	51.1	51.1	5%	48 - 53	Passed
100	105.7	104.7	104.6	105.0	5%	95 - 105	Passed
200	208.2	206.1	206.8	207.0	5%	190 - 210	Passed
High Flow							
500	499.8	498.4	501.2	499.8	3%	485 - 515	Passed
1000	1000.8	1001.7	1001.1	1001.2	3%	970 - 1030	Passed
2000	1999.5	2001.4	2000.9	2000.6	3%	1940 - 2060	Passed
2500	2492.5	2492.9	2494.7	2493.4	3%	2425 - 2575	Passed
4000	4011.8	4019.7	4016.8	4016.1	3%	3880 - 4120	Passed

END OF REPORT

Calibrated By:

(Mr. Nantawat Sarin)
RYG Field Services Scientist (1)

Issue date : 07-Jul-25

Approved By:

(Mr. Supot Salamteh)
Field Services Section Head

ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Phatthanakan, Suan Luang, Bangkok 10250
T +66 2 760 3000 F +66 2 760 3197



Certificate of Calibration

Certificate No. C-060725-RYG_FS0124

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus
Equipment ID : RYG_FS0124
Serial No. : 20150310180
Calibration Date : 06-Jul-25
Next calibration date : 06-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L
Equipment ID : RYG_FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M
Equipment ID : BKK_FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	19.6	19.5	20.5	19.9	5%	19 - 21	Passed
50	51.1	52.2	49.8	51.0	5%	48 - 53	Passed
100	100.9	100.7	100.3	100.6	5%	95 - 105	Passed
200	202.2	202.6	202.8	202.5	5%	190 - 210	Passed
High Flow							
500	498.5	499.6	499.2	499.1	3%	485 - 515	Passed
1000	1001.5	997.4	1010.9	1003.3	3%	970 - 1030	Passed
2000	2002.8	2010.8	2003.2	2005.6	3%	1940 - 2060	Passed
2500	2504.2	2511.1	2510.7	2508.7	3%	2425 - 2575	Passed
4000	4011.9	4019.6	4009.4	4013.6	3%	3880 - 4120	Passed

END OF REPORT

Calibrated By:
(Mr. Watcharin Pongsamsuan)
RYG Field Services Scientist (1)
Issue date : 07-Jul-25

Approved By:
(Mr. Supot Salamteh)
Field Services Section Head

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Agilent CrossLab Compliance Services

Certificate of System Qualification

GC-OQ

System ID: GC-6_CN11461066
Organization Name: ALS Laboratory Group (Thailand) Co., Ltd.
Organization Location: 104 Soi 40 Phatthanakan Rd,Khwang Suan Luang, Khet Suan Luang, Bangkok 10250

Date: October 22, 2024 9:27:05 AM
EQP Name: AgilentRecommended
EQP Revision: GC.02.53
Overall Qualification Status: Pass

REVIEW BY
APPROVED BY
NEXT CAL. DATE 22 Apr 2026

CDS Logon Verification - GC

Logon: Saenguthai Tarak

Overall CDS Logon Verification - GC Test Status

Pass

System Inspection and Basic Safety and Operation

Name: 7890

Setpoint Status: Pass

Overall System Inspection and Basic Safety and Operation Test Status

Pass

Inlet Pressure Decay

Name: 7890

Front SSL

Setpoint Status: Pass

Pressure: 25.0 psi

Pressure Change: 0.0 psi /5 minutes

Agilent Recommended: >= -2.0 and <= 0.5

Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

Overall Inlet Pressure Decay Test Status

Pass

Inlet Pressure Accuracy

Name: 7890
Front SSL

Setpoint Status: Pass

Inlet Pressure: Setpoint 25.0 psi Actual 25.07 psi
Accuracy: 0.1 psi
Agilent Recommended: ≤ 1.2

Overall Inlet Pressure Accuracy Test Status

Pass

Inlet Pressure Decay

Name: 7890
Back SSL

Setpoint Status: Pass

Pressure: 25.0 psi
Pressure Change: 0.0 psi /5 minutes
Agilent Recommended: ≥ -2.0 and ≤ 0.5

Overall Inlet Pressure Decay Test Status

Pass

Inlet Pressure Accuracy

Name: 7890
Back SSL

Setpoint Status: Pass

Inlet Pressure: Setpoint 25.0 psi Actual 25.06 psi
Accuracy: 0.1 psi
Agilent Recommended: ≤ 1.2

Overall Inlet Pressure Accuracy Test Status

Pass

Detector Flow Accuracy

Name: 7890
Front FID

Setpoint Status: Pass

Flow Type: Fuel
Setpoint: 30.0 mL/min Measured Flow: 28.8 mL/min
Accuracy: 1.2 mL/min
Agilent Recommended: ≤ 10.0 % setpoint (3.0 mL/min)
Limit is percentage of setpoint or 0.5 mL/minute, whichever is largest.

Setpoint Status: Pass

Flow Type: Oxidizer
Setpoint: 400.0 mL/min Measured Flow: 392 mL/min
Accuracy: 8.0 mL/min
Agilent Recommended: ≤ 10.0 % setpoint (40.0 mL/min)
Limit is percentage of setpoint or 0.5 mL/minute, whichever is largest.

Setpoint Status: Pass

Flow Type: Makeup
Setpoint: 25.0 mL/min Measured Flow: 25.4 mL/min
Accuracy: 0.4 mL/min
Agilent Recommended: ≤ 10.0 % setpoint (2.5 mL/min)
Limit is percentage of setpoint or 0.5 mL/minute, whichever is largest.

Overall Detector Flow Accuracy Test Status

Pass

Detector Flow Accuracy

Name: 7890
Back FID

Setpoint Status: Pass

Flow Type: Fuel
Setpoint: 30.0 mL/min Measured Flow: 30.8 mL/minAccuracy: 0.8 mL/min
Agilent Recommended: ≤ 10.0 % setpoint (3.0 mL/min)

Limit is percentage of setpoint or 0.5 ml/minute, whichever is largest.

Setpoint Status: Pass

Flow Type: Oxidizer
Setpoint: 400.0 mL/min Measured Flow: 393 mL/minAccuracy: 7.0 mL/min
Agilent Recommended: ≤ 10.0 % setpoint (40.0 mL/min)

Limit is percentage of setpoint or 0.5 ml/minute, whichever is largest.

Setpoint Status: Pass

Flow Type: Makeup
Setpoint: 25.0 mL/min Measured Flow: 25.2 mL/minAccuracy: 0.2 mL/min
Agilent Recommended: ≤ 10.0 % setpoint (2.5 mL/min)

Limit is percentage of setpoint or 0.5 ml/minute, whichever is largest.

Overall Detector Flow Accuracy Test Status

Pass

GC Oven Temperature Accuracy

Name: 7890

Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461068

Setpoint Status: Pass

Zone: Oven

Setpoint/Actual
Temperature: 230.0 230.3 °CAccuracy: 0.3 °C
Agilent Recommended: ≥ -1.0 % setpoint in K (-5.0 °C)
≤ 1.0 % setpoint in K (5.0 °C)

Setpoint Status: Pass

Zone: Oven

Setpoint/Actual
Temperature: 100.0 100.0 °CAccuracy: 0.0 °C
Agilent Recommended: ≥ -1.0 % setpoint in K (-3.7 °C)
≤ 1.0 % setpoint in K (3.7 °C)

Overall GC Oven Temperature Accuracy Test Status

Pass

GC Oven Temperature Stability

Name: 7890

Setpoint Status: Pass

Setpoint/Average
Temperature: 100.0 100.0167 °CStability: 0.1 °C
Agilent Recommended: ≤ 0.5

Overall GC Oven Temperature Stability Test Status

Pass

Scouting Run

Tested Combination1 Front SSL / Front FID
Injection Tower

Name: 7693A

Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461068

Setpoint Status: Completed

Injection Volume on Column: 1.0 uL

Overall Scouting Run Status

Completed

Noise and Drift

Tested Combination1 Front SSL / Front FID

Name: 7890

Setpoint Status: Pass

Base Signal: 14.05 pA

ASTM Noise		Drift	
pA		pA/Hr	
	0.05		0.03
Agilent Recommended:	<= 0.10		<= 2.50
Status:	Pass		Pass

Overall Noise and Drift Test Status

Pass

Injection Precision

Tested Combination1 Front SSL / Front FID

Name: 7693A

Setpoint Status: Pass

Injection Volume on Column: 1.0 uL

Area RSD: 0.30 % Retention Time RSD: 0.63 %

Agilent Recommended: <= 3.00 <= 1.00

Overall Injection Precision Test Status

Pass

Signal to Noise

Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

Tested Combination1 Front SSL / Front FID

Injection Tower

Name: 7890

Setpoint Status: Pass

Signal to Noise: 11078525

Agilent Recommended: >= 300000

Overall Signal to Noise Test Status

Pass

Scouting Run

Tested Combination2 Back SSL / Back FID

Injection Tower

Name: 7693A

Setpoint Status: Completed

Injection Volume on Column: 1.0 uL

Overall Scouting Run Status

Completed

Noise and Drift

Tested Combination2 Back SSL / Back FID

Name: 7890

Setpoint Status: Pass

Base Signal: 13.79 pA

ASTM Noise		Drift	
pA		pA/Hr	
	0.05		0.01
Agilent Recommended:	<= 0.10		<= 2.50
Status:	Pass		Pass

Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

Overall Noise and Drift Test Status

Pass

Injection Precision

Tested Combination2	Back	SSL	/ Back	FID
Name:	7693A			
Setpoint Status:	Pass			
Injection Volume on Column:	1.0	uL		
Area RSD:	1.06	%	Retention Time RSD:	0.93 %
Agilent Recommended:	<=	3.00	<=	1.00

Overall Injection Precision Test Status

Pass

Signal to Noise

Tested Combination2	Back	SSL	/ Back	FID
	Injection Tower			
Name:	7890			
Setpoint Status:	Pass			
Signal to Noise:	1771221			
Agilent Recommended:	>=	300000		

Overall Signal to Noise Test Status

Pass

Instrument Details

Purpose

This section describes the as found system configuration.

Details

System	
System ID	GC-6_CN11461066
Manufacturer	Agilent Technologies
Name	7890
Flow Data Input	Manual Data
Temperature Data Input	Manual Data or Other Data Logging
Tested Combination1	
Injection Technique	Injection Tower
Sampler Identifier	Sampler 1
Inlet	Front
Detector	Front
LTM Included?	No
Tested Combination2	
Injection Technique	Injection Tower
Sampler Identifier	Sampler 2
Inlet	Back
Detector	Back
LTM Included?	No
Sampler 1	
Manufacturer	Agilent Technologies
Type	Injection Tower
Name	7693A
Model Number	G4513A
Serial Number	CNCN10340103
Firmware Revision	A.11.06
Usage	Sample Injection
Location	Front
Syringe Volume (uL)	10

Sampler 2

Manufacturer	Agilent Technologies
Type	Injection Tower
Name	7693A
Model Number	G4513A
Serial Number	CN16280128
Firmware Revision	A.11.06
Usage	Sample Injection
Location	Back
Syringe Volume (µL)	10

Sampler 3

Manufacturer	Agilent Technologies
Type	Tray
Name	7693A
Model Number	G4514A
Serial Number	CN15380030
Firmware Revision	A.11.03
Vial Heater	Not installed

Mainframe 1

Manufacturer	Agilent Technologies
Name	7890
Model Number	G3440A
Serial Number	CN11461066
Firmware Revision	A.01.16
Oven Type	Standard

Inlet 1

Manufacturer	Agilent Technologies
Name	7890
Type	SSL
Location	Front
Carrier Gas	Helium
Control Type	Electronic Pressure Control (EPC)
Purged Inlet	Yes

Inlet 2

Manufacturer	Agilent Technologies
Name	7890
Type	SSL
Location	Back
Carrier Gas	Helium
Control Type	Electronic Pressure Control (EPC)
Purged Inlet	Yes

Detector 1

Manufacturer	Agilent Technologies
Name	7890
Type	FID
Adapter	Capillary
Control Type	Electronic Pressure Control (EPC)
Location	Front
Makeup Gas	Nitrogen

Detector 2

Manufacturer	Agilent Technologies
Name	7890
Type	FID
Adapter	Capillary
Control Type	Electronic Pressure Control (EPC)
Location	Back
Makeup Gas	Nitrogen

Electronic Signature

Purpose

This signature page was created and published because the ACE sign-off action was executed, which is valid for the entire document, including attachments. The ACE sign-off is an electronic signature that requires two distinct identification components: unique username and personal password. The Agilent representative who has delivered this service understands the meaning and legal status of an electronic signature. As a trained official operator, the Agilent representative has a unique password and logon to access ACE and electronically sign this document. (Other e-signatures can be applied to this document using a Document Content Management or other suitable method defined in your data access and control procedures.)

Details

Full Name of Signer:Saengulhai Tarak

Logged On User Name:saengulhai.tarak@non.agilent.com

Signature Creation Date:October 22, 2024

Reason for Signature:Executed protocol and published this original version of document

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User Name: saengulhai.tarakSystem ID: GC-6_CN11461086

Report Generated by Hostname: LAPTOP-CO3SKOMVPrint Date: October 22, 2024 9:27:06 AM

2024_ALS_GC-6_CN11461086_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2024 3:16:06 PM	Audit	SessionCreated	Session	None
October 21, 2024 3:16:07 PM	Start	Configuration	Session	None
October 21, 2024 3:16:07 PM	Audit	Entitlement	Licensing	User is Nonpaying and does not require an unlock code
October 21, 2024 3:22:40 PM	Audit	EqpLoaded	Session	EOP details for primary technique [Gc] - File path: [ProtocolPacks\Gc\Configuration\02.53\Gc-02.53.eop], EOP File Name: [Gc-02.53.eop], EOP Name: [AgilentRecommended], Protocol Revision :[Gc-02.53]
October 21, 2024 3:22:44 PM	End	Configuration	Session	None
October 21, 2024 3:32:47 PM	Start	Qualification	Session	OQ
October 21, 2024 3:22:48 PM	Start	Execution	CDS Logon Verification - GC-7890: - Qualitative test	None
October 21, 2024 3:23:36 PM	End	Execution	CDS Logon Verification - GC-7890: - Qualitative test	Run Count: 1
October 21, 2024 3:23:46 PM	Start	Execution	System Inspection and Basic Safety and Operation - 7890: - Qualitative Test - No setpoints associated	None
October 21, 2024 3:23:59 PM	End	Execution	System Inspection and Basic Safety and Operation - 7890: - Qualitative Test - No setpoints associated	Run Count: 1

User Name: saenguthai.larak
Report Generated by Hostname: LAPTOP-CQ3SKQMV

System Id: GC-6_CN11461066
Print Date: October 22, 2024 9:27:06 AM

2024_ALS_GC-6_CN11461066_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2024 3:24:01 PM	Start	Execution	Inlet Pressure Decay - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and <= 0.5 psi	None
October 21, 2024 3:25:26 PM	End	Execution	Inlet Pressure Decay - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and <= 0.5 psi	Run Count : 1
October 21, 2024 3:25:28 PM	Start	Execution	Inlet Pressure Accuracy - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
October 21, 2024 3:25:32 PM	End	Execution	Inlet Pressure Accuracy - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count : 1
October 21, 2024 3:25:50 PM	Start	Execution	Inlet Pressure Decay - Back SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and <= 0.5 psi	None
October 21, 2024 3:26:01 PM	End	Execution	Inlet Pressure Decay - Back SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and <= 0.5 psi	Run Count : 1
October 21, 2024 3:26:05 PM	Start	Execution	Inlet Pressure Accuracy - Back SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
October 21, 2024 3:26:10 PM	End	Execution	Inlet Pressure Accuracy - Back SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count : 1
October 21, 2024 3:26:12 PM	Start	Execution	Detector Flow Accuracy - Front FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	None

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Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

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User Name: saenguthai.larak
Report Generated by Hostname: LAPTOP-CQ3SKQMV

System Id: GC-6_CN11461066
Print Date: October 22, 2024 9:27:06 AM

2024_ALS_GC-6_CN11461066_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2024 3:26:50 PM	Audit	Data	Detector Flow Accuracy - Front FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 21, 2024 3:26:53 PM	End	Execution	Detector Flow Accuracy - Front FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
October 21, 2024 3:26:54 PM	Start	Execution	Detector Flow Accuracy - Front FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	None
October 21, 2024 3:27:10 PM	Audit	Data	Detector Flow Accuracy - Front FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 21, 2024 3:27:13 PM	End	Execution	Detector Flow Accuracy - Front FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
October 21, 2024 3:26:11 PM	Start	Execution	Detector Flow Accuracy - Front FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	None
October 21, 2024 3:29:27 PM	Audit	Data	Detector Flow Accuracy - Front FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 21, 2024 3:29:29 PM	End	Execution	Detector Flow Accuracy - Front FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
October 21, 2024 3:29:30 PM	Start	Execution	Detector Flow Accuracy - Back FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	None
October 21, 2024 3:29:47 PM	Audit	Data	Detector Flow Accuracy - Back FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 21, 2024 3:29:52 PM	End	Execution	Detector Flow Accuracy - Back FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Run Count : 1

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Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

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User Name: saenguthai.larak
Report Generated by Hostname: LAPTOP-CQ3SKQMV

System Id: GC-6_CN11461066
Print Date: October 22, 2024 9:27:06 AM

2024_ALS_GC-6_CN11461066_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2024 3:29:54 PM	Start	Execution	Detector Flow Accuracy - Back FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint.	None
October 21, 2024 3:30:07 PM	Audit	Data	Detector Flow Accuracy - Back FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 21, 2024 3:30:08 PM	End	Execution	Detector Flow Accuracy - Back FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
October 21, 2024 3:30:11 PM	Start	Execution	Detector Flow Accuracy - Back FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	None
October 21, 2024 3:30:34 PM	Audit	Data	Detector Flow Accuracy - Back FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 21, 2024 3:30:37 PM	End	Execution	Detector Flow Accuracy - Back FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
October 21, 2024 3:30:38 PM	Start	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
October 21, 2024 3:31:55 PM	Audit	Data	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
October 21, 2024 3:31:57 PM	End	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count : 1

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Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

User Name: saenguthai.larak
Report Generated by Hostname: LAPTOP-CQ3SKQMV

System Id: GC-6_CN11461066
Print Date: October 22, 2024 8:27:06 AM

2024_ALS_GC-6_CN11461066_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2024 3:31:59 PM	Start	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
October 21, 2024 3:34:37 PM	Audit	Data	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
October 21, 2024 3:34:39 PM	End	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count : 1
October 21, 2024 3:34:42 PM	Start	Execution	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	None
October 21, 2024 3:38:05 PM	Audit	Data	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Manual Data Entry
October 21, 2024 3:39:07 PM	End	Execution	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Run Count : 1
October 21, 2024 3:39:33 PM	Start	Execution	GC Scouting Run - Injection Tower, Front SSL, Front FID: - Part of System Preparation - No limits associated	None
October 21, 2024 3:40:12 PM	Audit	AccClosed	Session	None
October 22, 2024 8:55:47 AM	Audit	AccRestarted	Session	None
October 22, 2024 8:55:50 AM	Audit	SessionReloaded	Session	None
October 22, 2024 8:56:02 AM	Start	Qualification	Session	OQ

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Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

User Name: saenguthai.larak
Report Generated by Hostname: LAPTOP-CQ3SKOMV

System ID: GC-6_CN11461066
Print Date: October 22, 2024 9:27:06 AM

2024_ALS_GC-6_CN11461066_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 22, 2024 8:55:02 AM	Start	Execution	GC Scouting Run - Injection Tower, Front SSL, Front FID: - Part of System Preparation - No limits associated	None
October 22, 2024 8:56:48 AM	Audit	Data	GC Scouting Run - Injection Tower, Front SSL, Front FID: - Part of System Preparation - No limits associated	Data files Path : G:\Data\Front\Front_SC10.D\FID1A.ch
October 22, 2024 8:57:25 AM	End	Execution	GC Scouting Run - Injection Tower, Front SSL, Front FID: - Part of System Preparation - No limits associated	Run Count : 1
October 22, 2024 8:57:39 AM	Start	Execution	Noise and Drift - Front FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	None
October 22, 2024 8:58:03 AM	Audit	Data	Noise and Drift - Front FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	Data files Path : G:\Data\Front\Front_ND10.D\FID1A.ch
October 22, 2024 8:58:37 AM	End	Execution	Noise and Drift - Front FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	Run Count : 1
October 22, 2024 8:58:40 AM	Start	Execution	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	None
October 22, 2024 8:59:06 AM	Audit	Data	Data Manager	Data Manager was in a data verification state but the user chose to start over

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Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

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User Name: saenguthai.larak
Report Generated by Hostname: LAPTOP-CQ3SKOMV

System ID: GC-6_CN11461066
Print Date: October 22, 2024 9:27:06 AM

2024_ALS_GC-6_CN11461066_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 22, 2024 9:01:43 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Front\Front_IP0105.D\FID1A.ch
October 22, 2024 9:01:43 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Front\Front_IP0106.D\FID1A.ch
October 22, 2024 9:01:43 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Front\Front_IP0107.D\FID1A.ch
October 22, 2024 9:01:43 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Front\Front_IP0108.D\FID1A.ch
October 22, 2024 9:01:43 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Front\Front_IP0109.D\FID1A.ch
October 22, 2024 9:01:43 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Front\Front_IP0110.D\FID1A.ch
October 22, 2024 9:02:11 AM	End	Execution	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Run Count : 1
October 22, 2024 9:02:16 AM	Start	Execution	Signal to Noise - Injection Tower, Front SSL, Front FID: - Detector FID - L: >= 300000	None
October 22, 2024 9:02:34 AM	Audit	Data	Signal to Noise - Injection Tower, Front SSL, Front FID: - Detector FID - L: >= 300000	Data files Path : G:\Data\Front\Front_SN01.D\FID1A.ch

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Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

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User Name: saenguthai.tarak
Report Generated by Hostname: LAPTOP-CQ3SKOMV

System ID: GC-6_CN11461066
Print Date: October 22, 2024 9:27:06 AM

2024_ALS_GC-6_CN11461066_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 22, 2024 9:02:54 AM	End	Execution	Signal to Noise - Injection Tower, Front SSL, Front FID: - Detector FID - L: >= 300000	Run Count: 1
October 22, 2024 9:03:00 AM	Start	Execution	GC Scouting Run - Injection Tower, Back SSL, Back FID: - Part of System Preparation - No limits associated	None
October 22, 2024 9:03:31 AM	Audit	Data	GC Scouting Run - Injection Tower, Back SSL, Back FID: - Part of System Preparation - No limits associated	Data files Path : G:\Data\Back\Back_SC01.D\FID2B.ch
October 22, 2024 9:04:00 AM	End	Execution	GC Scouting Run - Injection Tower, Back SSL, Back FID: - Part of System Preparation - No limits associated	Run Count: 1
October 22, 2024 9:04:06 AM	Start	Execution	Noise and Drift - Back FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	None
October 22, 2024 9:08:58 AM	Audit	Data	Noise and Drift - Back FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	Data files Path : G:\Data\Back\Back_NO013.D\FID2B.ch
October 22, 2024 9:09:13 AM	End	Execution	Noise and Drift - Back FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	Run Count: 1
October 22, 2024 9:09:26 AM	Start	Execution	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	None

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Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

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User Name: saenguthai.tarak
Report Generated by Hostname: LAPTOP-CQ3SKOMV

System ID: GC-6_CN11461066
Print Date: October 22, 2024 9:27:06 AM

2024_ALS_GC-6_CN11461066_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 22, 2024 9:10:44 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Back\Back_IP0111.D\FID2B.ch
October 22, 2024 9:10:44 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Back\Back_IP0112.D\FID2B.ch
October 22, 2024 9:10:44 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Back\Back_IP0113.D\FID2B.ch
October 22, 2024 9:10:44 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Back\Back_IP0114.D\FID2B.ch
October 22, 2024 9:10:44 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Back\Back_IP0115.D\FID2B.ch
October 22, 2024 9:10:44 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Back\Back_IP0116.D\FID2B.ch
October 22, 2024 9:11:15 AM	End	Execution	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Run Count: 1
October 22, 2024 9:11:23 AM	Start	Execution	Signal to Noise - Injection Tower, Back SSL, Back FID: - Detector FID - L: >= 300000	None
October 22, 2024 9:11:45 AM	Audit	Data	Signal to Noise - Injection Tower, Back SSL, Back FID: - Detector FID - L: >= 300000	Data files Path : G:\Data\Back\Back_SN01.D\FID2B.ch

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Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

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User Name: saongat(hai).tarak
Report Generated by Hostname: LAPTOP-CQ3SKOMV

System Id: GC-6_CN11461066
Print Date: October 22, 2024 9:27:05 AM

2024_ALS_GC-6_CN11461066_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 22, 2024 9:12:08 AM	End	Execution	Signal to Noise - Injection Tower, Back SSL, Back FID - Detector FID - L: >= 300000	Run Count: 1
October 22, 2024 9:12:15 AM	End	Qualification	Session	OQ
October 22, 2024 9:12:15 AM	Start	Reporting	Session	None
October 22, 2024 9:24:09 AM	Audit	Reporting	Session	Report Generated: Certificate
October 22, 2024 9:25:56 AM	Audit	Reporting	Session	Report Generated: Report

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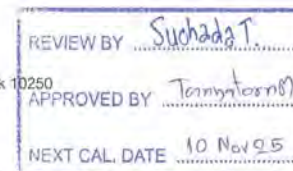
Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

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Certificate of System Qualification

GC-OQ + GCMS-OQ

System ID: GM-12
Organization Name: ALS Laboratory Group (Thailand) Co Ltd.
Organization Location: 104 Phattanakan 40 Phatthanakan Rd Bangkok 10250
Date: May 10, 2024 2:18:55 PM
EQP Name: AgilentRecommended , AgilentRecommended
EQP Revision: GC.02.53, GCMS.02.54
Overall Qualification Status: Pass



CDS Logon Verification - GC

Logon: asbkk.env03

Overall CDS Logon Verification - GC Test Status

Pass

System Inspection and Basic Safety and Operation

Name: 8890

Setpoint Status: Pass

Overall System Inspection and Basic Safety and Operation Test Status

Pass

Inlet Pressure Accuracy

Name: 8890

Front SSL

Setpoint Status: Pass

	Setpoint		Actual
Inlet Pressure:	25.0	psi	25.0
			psi
Accuracy:			0.0
			psi
Agilent Recommended:			<= 1.2

Date: May 10, 2024 2:18:55 PM
System ID: GM-12

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Overall Inlet Pressure Accuracy Test Status

Pass

GC Oven Temperature Accuracy

Name: 8890

Setpoint Status: Pass

Zone: Oven

Setpoint/Actual
Temperature: 230.0 229.1 °C

Accuracy: -0.9 °C

Agilent Recommended: >= -1.0 % setpoint in K (-5.0 °C)
<= 1.0 % setpoint in K (5.0 °C)

Setpoint Status: Pass

Zone: Oven

Setpoint/Actual
Temperature: 100.0 101.1 °C

Accuracy: 1.1 °C

Agilent Recommended: >= -1.0 % setpoint in K (-3.7 °C)
<= 1.0 % setpoint in K (3.7 °C)

Overall GC Oven Temperature Accuracy Test Status

Pass

GC Oven Temperature Stability

Name: 8890

Setpoint Status: Pass

Setpoint/Average
Temperature: 100.0 100.9 °C

Stability: 0.0 °C

Agilent Recommended: <= 0.5

Overall GC Oven Temperature Stability Test Status

Pass

Log Amp

Tested Combination1 Front SSL / External SQ

Name: 5977C

Setpoint Status: Pass

Overall Log Amp Test Status

Pass

RFPA

Tested Combination1 Front SSL / External SQ

Name: 5977C

Setpoint Status: Pass

Amu: 1050 m/z Drift After Five Minutes: 4 mV RFPA Voltage: 482 mV

Agilent Recommended: >= -100 and <= 100 <= 1100

Overall RFPA Test Status

Pass

Tune EI

Tested Combination1 Front SSL / External SQ

Name: 5977C

Setpoint Status: Pass

Filament: 1

Setpoint Status: Pass

Filament: 2

Overall Tune EI Test Status

Pass

Scouting Run

Tested Combination1	Front	SSL	/ External	SQ
Injection Tower				
Name:	7693A			
Source:	EI - Extractor			

Setpoint Status:	Completed
Injection Volume on Column:	1.0 uL

Overall Scouting Run Status
Completed

Instrument Detection Limit				
Tested Combination1	Front	SSL	/ External	SQ
Injection Tower				
Name:	7693A			
Source:	EI - Extractor			

Setpoint Status:	Pass	
Injection Volume on Column:	1.0 uL	
Minimum RSD:	Area	Retention Time
0.72 %	0.01 %	
Agilent Recommended:	<= 5.00	<= 1.00
Status:	Pass	Pass
Instrument Detection Limit:	2.41164 fg	
Agilent Recommended:	<= 15.82500	
Status:	Pass	

Overall Instrument Detection Limit Test Status
Pass

Mass Ratio Precision

Tested Combination1	Front	SSL	/ External	SQ
Injection Tower				
Name:	7693A			
Source:	EI - Extractor			

Setpoint Status:	Pass
Injection Volume on Column:	1.0 uL

RSD:	Area Mass 1	Mass Ratio
Agilent Recommended:	Abundance*s	
0.71 %	0.19 %	
<= 5.00	<= 5.00	
Pass	Pass	

Overall Mass Ratio Precision Test Status
Pass

Instrument Details

Purpose

This section describes the as found system configuration.

Details

System

System ID	GM-12
Manufacturer	Agilent Technologies
Name	8890
Flow Data Input	Manual Data
Temperature Data Input	Manual Data or Other Data Logging

Tested Combination1

Injection Technique	Injection Tower
Inlet	Front
Detector	External
LTM Included?	No

Sampler 1

Manufacturer	Agilent Technologies
Type	Injection Tower
Name	7693A
Model Number	G4513A
Serial Number	CN23125102
Firmware Revision	A.11.07
Usage	Sample Injection
Location	Front
Syringe Volume (µL)	10

Sampler 2

Manufacturer	Agilent Technologies
Type	Tray
Name	7693A
Model Number	G4514A
Serial Number	CN23147049
Firmware Revision	A.12.03
Vial Heater	Not installed

Mainframe 1

Manufacturer	Agilent Technologies
Name	8890
Model Number	G3540A
Serial Number	CN2303A031
Firmware Revision	2.8.1.6
Oven Type	Standard

Inlet 1

Manufacturer	Agilent Technologies
Name	8890
Type	SSL
Location	Front
Carrier Gas	Helium
Control Type	Electronic Pressure Control (EPC)
Purged Inlet	Yes

Detector 1

Manufacturer	Agilent Technologies
Name	Mass Spectrometer
Type	Mass Spectrometer
Location	External

Mass Spectrometer 1	
Manufacturer	Agilent Technologies
Type	SQ
Name	5977C
Model Number	G7077G
Serial Number	US2307MA35
Firmware Revision	6.00.35
High Vacuum System	Turbo Pump
Scouting Run Standard	QFN Std
MS EI Source 1	
Manufacturer	Agilent Technologies
Source Type	EI - Extractor
Number of filaments	2

Electronic Signature

Purpose
This signature page was created and published because the ACE sign-off action was executed, which is valid for the entire document, including attachments. The ACE sign-off is an electronic signature that requires two distinct identification components: unique username and personal password. The Agilent representative who has delivered this service understands the meaning and legal status of an electronic signature. As a trained official operator, the Agilent representative has a unique password and logon to access ACE and electronically sign this document. (Other e-signatures can be applied to this document using a Document Content Management or other suitable method defined in your data access and control procedures.)

Details	
Full Name of Signer:	Supasak Nimsongtham
Logged On User Name:	supasak.nimsongtham@agilent.com
Signature Creation Date:	May 10, 2024
Reason for Signature:	Executed protocol and published this original version of document

Regulatory Disclaimer

This document provides a protocol to verify and record instrument configuration and evidence of proper operation. It has been prepared from our interpretation of applicable regulations as well as industry best practices. The document is designed to provide an important component of a complete compliance package. Validation depends upon many factors and use of this protocol alone does not assure compliance. Agilent Technologies makes no promises or representations as to its sufficiency for any specific regulatory program.

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User Name: supasak.nimsongtham			System Id: GM-12	
Report Generated by Hostname: SCG1115HKC			Print Date: May 10, 2024 2:18:57 PM	
GM-12 Transaction log :				
Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 9, 2024 2:25:18 PM	Audit	SessionCreated	Session	None
May 9, 2024 2:25:18 PM	Start	Configuration	Session	None
May 9, 2024 2:25:18 PM	Audit	Entitlement	Licensing	User is FieldEngineer and does not require an unlock code
May 9, 2024 2:31:20 PM	Audit	EqpLoaded	Session	EQP details for primary technique [Gc] - File path: [ProtocolPacks/Gc/Configurations/02.53/Gc.02.53.eqp], EQP File Name: [Gc.02.53.eqp], EQP Name: [AgilentRecommended], Protocol Revision [Gc.02.53] EQP details for hyphenated technique [GcMs] - File path: [ProtocolPacks/GcMs/Configurations/02.54/GcMs.02.54.eqp], EQP File Name: [GcMs.02.54.eqp], EQP Name: [AgilentRecommended]
May 9, 2024 2:31:23 PM	End	Configuration	Session	None
May 9, 2024 2:31:27 PM	Start	Qualification	Session	QQ
May 9, 2024 2:31:27 PM	Start	Execution	CDS Logon Verification - GC - 8890: - Qualitative test	None
May 9, 2024 2:32:31 PM	End	Execution	CDS Logon Verification - GC - 8890: - Qualitative test	Run Count : 1
May 9, 2024 2:32:35 PM	Start	Execution	System Inspection and Basic Safety and Operation - 8890: - Qualitative Test - No setpoints associated	None

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User Name: supasak.nimsongtham

Report Generated by Hostname: SCG1115HKC

System ID: GM-12

Print Date: May 10, 2024 2:18:57 PM

GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 9, 2024 2:32:44 PM	End	Execution	System Inspection and Basic Safety and Operation - 8890: - Qualitative Test - No setpoints associated	Run Count : 1
May 9, 2024 2:32:47 PM	Start	Execution	Inlet Pressure Accuracy - Front SSL - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
May 9, 2024 2:32:54 PM	End	Execution	Inlet Pressure Accuracy - Front SSL - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count : 1
May 9, 2024 2:33:08 PM	Audit	AccClosed	Session	None
May 9, 2024 2:33:43 PM	Audit	AccRestarted	Session	None
May 9, 2024 2:33:44 PM	Audit	SessionReloaded	Session	None
May 9, 2024 2:33:46 PM	Start	Qualification	Session	QQ
May 9, 2024 2:33:54 PM	Start	Execution	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	None
May 9, 2024 2:34:16 PM	Start	Execution	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	None
May 9, 2024 2:34:29 PM	Audit	AccClosed	Session	None
May 10, 2024 10:19:05 AM	Audit	AccRestarted	Session	None
May 10, 2024 10:19:05 AM	Audit	SessionReloaded	Session	None
May 10, 2024 10:19:08 AM	Start	Qualification	Session	QQ
May 10, 2024 10:19:09 AM	Start	Execution	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	None

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User Name: supasak.nimsongthamSystem Id: GM-12
Report Generated by Hostname: SCG1115HKCPrint Date: May 10, 2024 2:18:57 PM

GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 10, 2024 10:20:08 AM	Start	Execution	GC Oven Temperature Accuracy - 8890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
May 10, 2024 10:24:48 AM	Audit	Data	GC Oven Temperature Accuracy - 8890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
May 10, 2024 10:24:48 AM	End	Execution	GC Oven Temperature Accuracy - 8890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count : 1
May 10, 2024 10:24:50 AM	Start	Execution	GC Oven Temperature Accuracy - 8890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
May 10, 2024 10:25:33 AM	Audit	AccClosed	Session	None
May 10, 2024 10:27:35 AM	Audit	AccRestarted	Session	None
May 10, 2024 10:27:36 AM	Audit	SessionReloaded	Session	None
May 10, 2024 10:27:38 AM	Start	Qualification	Session	OQ
May 10, 2024 10:27:38 AM	Start	Execution	GC Oven Temperature Accuracy - 8890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
May 10, 2024 10:28:03 AM	Audit	Data	GC Oven Temperature Accuracy - 8890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
May 10, 2024 10:28:05 AM	End	Execution	GC Oven Temperature Accuracy - 8890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count : 1

User Name: supasak.nimsongthamSystem Id: GM-12
Report Generated by Hostname: SCG1115HKCPrint Date: May 10, 2024 2:18:57 PM

GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 10, 2024 10:28:06 AM	Start	Execution	GC Oven Temperature Stability - 8890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	None
May 10, 2024 10:51:26 AM	Audit	Data	GC Oven Temperature Stability - 8890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Manual Data Entry
May 10, 2024 10:51:28 AM	End	Execution	GC Oven Temperature Stability - 8890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Run Count : 1
May 10, 2024 10:51:30 AM	Start	Execution	Log Amp - 5977C SQ: - Source: EI - Extractor	None
May 10, 2024 10:55:40 AM	Audit	AccClosed	Session	None
May 10, 2024 10:57:32 AM	Audit	AccRestarted	Session	None
May 10, 2024 10:57:33 AM	Audit	SessionReloaded	Session	None
May 10, 2024 10:57:35 AM	Start	Qualification	Session	OQ
May 10, 2024 10:57:35 AM	Start	Execution	Log Amp - 5977C SQ: - Source: EI - Extractor	None
May 10, 2024 11:00:05 AM	End	Execution	Log Amp - 5977C SQ: - Source: EI - Extractor	Run Count : 1
May 10, 2024 11:00:07 AM	Start	Execution	RFPA - 5977C SQ: - Source: EI - Extractor	None
May 10, 2024 11:01:19 AM	End	Execution	RFPA - 5977C SQ: - Source: EI - Extractor	Run Count : 1
May 10, 2024 11:01:25 AM	Start	Execution	Tune EI - 5977C SQ: - Source: EI - Extractor Filament 1 (Qualitative - No setpoints associated)	None
May 10, 2024 11:01:50 AM	End	Execution	Tune EI - 5977C SQ: - Source: EI - Extractor Filament 1 (Qualitative - No setpoints associated)	Run Count : 1

User Name: supasak.nimsongtham
Report Generated by Hostname: 5CG1115HKC

System Id: GM-12
Print Date: May 10, 2024 2:18:57 PM

GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 10, 2024 11:01:52 AM	Start	Execution	Tune EI - 5977C SQ: - Source: - None EI - Extractor Filament 2 (Qualitative - No setpoints associated)	
May 10, 2024 11:05:40 AM	End	Execution	Tune EI - 5977C SQ: - Source: - Run Count : 1 EI - Extractor Filament 2 (Qualitative - No setpoints associated)	
May 10, 2024 11:05:42 AM	Start	Execution	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor- Part of GCMS System Preparation	None
May 10, 2024 11:06:10 AM	Start	Execution	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	None
May 10, 2024 11:17:54 AM	Start	Execution	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor- Part of GCMS System Preparation	None
May 10, 2024 11:17:56 AM	Start	Execution	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	None
May 10, 2024 11:18:02 AM	Start	Execution	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	None
May 10, 2024 11:33:05 AM	Audit	AccClosed	Session	None
May 10, 2024 1:14:08 PM	Audit	AccRestarted	Session	None
May 10, 2024 1:14:09 PM	Audit	SessionReloaded	Session	None

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User Name: supasak.nimsongtham
Report Generated by Hostname: 5CG1115HKC

System Id: GM-12
Print Date: May 10, 2024 2:18:57 PM

GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 10, 2024 1:14:12 PM	Start	Qualification	Session	OQ
May 10, 2024 1:14:12 PM	Start	Execution	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	None
May 10, 2024 1:15:17 PM	Start	Execution	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor- Part of GCMS System Preparation	None
May 10, 2024 1:15:40 PM	Audit	Data	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor- Part of GCMS System Preparation	Data files Path : D:\GM-12 OQ2024\ScoutingRun\001.D
May 10, 2024 1:15:50 PM	Audit	Reporting	Reintegration	Reintegration Count: 1 -- [Integration Type: Injections; BaselineCorrectionMode: Advanced; InitialSlopeSensitivity: 10; InitialPeakWidth: 0.01; InitialAreaReject: 0; InitialHeightReject: 50; Integration: Off at 0; Integration: On at 4;]
May 10, 2024 1:15:57 PM	Audit	Reporting	Reintegration	Reintegration Count: 2 -- [Integration Type: Injections; BaselineCorrectionMode: Advanced; InitialSlopeSensitivity: 10; InitialPeakWidth: 0.01; InitialAreaReject: 0; InitialHeightReject: 300; Integration: Off at 0; Integration: On at 4;]

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User Name: supasak.nimsongtham			System ID: GM-12	
Report Generated by Hostname: SCG1115HKC			Print Date: May 10, 2024 2:18:57 PM	
GM-12 Transaction log :				
Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 10, 2024 1:16:43 PM	Audit	Reporting	Reintegration	Reintegration Count: 1 - [Integration Type: injections; BaselineCorrectionMode: Advanced; InitialSlopeSensitivity: 10; InitialPeakWidth: 0.01; InitialAreaReject: 0; InitialHeightReject: 200; Integration: Off at 0; Integration: On at 5;]
May 10, 2024 1:16:55 PM	Audit	Reporting	Reintegration	Reintegration Count: 2 - [Integration Type: injections; BaselineCorrectionMode: Advanced; InitialSlopeSensitivity: 10; InitialPeakWidth: 0.01; InitialAreaReject: 0; InitialHeightReject: 200; Integration: Off at 0; Integration: On at 5;]
May 10, 2024 1:17:02 PM	End	Execution	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Run Count : 1
May 10, 2024 1:17:06 PM	Start	Execution	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	None
May 10, 2024 1:21:35 PM	Start	Execution	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	None
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User Name: supasak.nimsongtham

Report Generated by Hostname: SCG1115HKC

System ID: GM-12

Print Date: May 10, 2024 2:18:57 PM

GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 10, 2024 1:21:55 PM	Start	Execution	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	None
May 10, 2024 2:02:45 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : D:\GM-12 OQ2024\MRP002.D
May 10, 2024 2:02:45 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : D:\GM-12 OQ2024\MRP003.D
May 10, 2024 2:02:45 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : D:\GM-12 OQ2024\MRP004.D
May 10, 2024 2:02:45 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : D:\GM-12 OQ2024\MRP005.D
May 10, 2024 2:02:45 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : D:\GM-12 OQ2024\MRP006.D
May 10, 2024 2:02:45 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : D:\GM-12 OQ2024\MRP007.D

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User Name: supasak.nimsongtham
Report Generated by Hostname: SCG1115HKC

System Id: GM-12
Print Date: May 10, 2024 2:18:57 PM

GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 10, 2024 2:03:15 PM	Audit	Reporting	Reintegration	Reintegration Count: 1 -- [Integration Type: injections; BaselineCorrectionMode: Advanced; InitialSlopeSensitivity: 10; InitialPeakWidth: 0.01; InitialAreaReject: 0; InitialHeightReject: 50000; Integration: Off at 0; Integration: On at 2;]
May 10, 2024 2:03:31 PM	End	Execution	Mass Ratio Precision - Injection Tower, Front SSL, SQ - Source: EI - Extractor - L (RSD): <= 5.00%	Run Count : 1
May 10, 2024 2:03:49 PM	End	Qualification	Session	CQ
May 10, 2024 2:03:49 PM	Start	Reporting	Session	None
May 10, 2024 2:16:42 PM	Audit	Reporting	Session	Report Generated : Certificate
May 10, 2024 2:17:28 PM	Audit	Reporting	Session	Report Generated : Report



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รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Workplace	Acrylonitrile, Styrene	DRYCAL FLOWMETER	RYG_FS0208	27-Jan-25	26-Jan-26	12
Workplace		DRYCAL FLOWMETER	BKK_FS0614	9-Sep-24	9-Sep-25	12
Workplace		Air Sampling Pump	RYG_FS0135	7-Jul-25	7-Oct-25	3
Workplace		Air Sampling Pump	RYG_FS0136	7-Jul-25	7-Oct-25	3
Workplace		Air Sampling Pump	RYG_FS0139	6-Jul-25	6-Oct-25	3
Workplace		Air Sampling Pump	RYG_FS0140	7-Jul-25	7-Oct-25	3
Workplace		Air Sampling Pump	RYG_FS0141	7-Jul-25	7-Oct-25	3
Workplace		Air Sampling Pump	RYG_FS0146	6-Jul-25	6-Oct-25	3
Workplace		Air Sampling Pump	RYG_FS0147	7-Jul-25	7-Oct-25	3
Workplace		Air Sampling Pump	RYG_FS0156	7-Jul-25	7-Oct-25	3
Workplace		Air Sampling Pump	RYG_FS0158	7-Jul-25	7-Oct-25	3
Workplace		Air Sampling Pump	RYG_FS0159	7-Jul-25	7-Oct-25	3
Workplace		Air Sampling Pump	RYG_FS0165	7-Jul-25	7-Oct-25	3
Workplace		Air Sampling Pump	RYG_FS0169	7-Jul-25	7-Oct-25	3
Workplace		Air Sampling Pump	RYG_FS0361	6-Jul-25	6-Oct-25	3
Workplace		Air Sampling Pump	RYG_FS0362	6-Jul-25	6-Oct-25	3
Workplace		Air Sampling Pump	RYG_FS0365	7-Jul-25	7-Oct-25	3
Workplace		Air Sampling Pump	RYG_FS0366	6-Jul-25	6-Oct-25	3
Workplace	Acrylonitrile	GC-FID	BKK_EN0126	22-Oct-24	22-Apr-26	18
Workplace	Styrene	GC-MSD	BKK_EN0410	9-May-25	9-May-26	12

INNOVATIVE INSTRUMENT CALIBRATION LAB

INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE

7/139 MOO 13, SOI SUNTINAKORN 11 TAMBON BANG KAE0.

AMPHOE BANG PHU SAMUT PRAKAN PROVINCE 10540 THAILAND.

TEL: (660)2116-5860-1 FAX: (660)2116-7140



บริษัท อินโนวาทึต อิมพวเม้นท์ จำกัด



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Certificate of Calibration

Customer

Name : ALS Laboratory Group Thailand Co., Ltd.

Address : 104 Soi Phatthanakan 40, Phatthanakan Road, Suan Luang,
Bangkok 10250

Certificate No : 25-AFM-023

Request No : Req-2025-0169

Unit Under Calibration Details

Measurement Item : Air Flow Meter

Manufacturer : Mesa Labs

Accuracy : 1% of Reading

Model : 200-510L

Sensor Model : -

Serial Number : 130027

Sensor Serial Number : -

ID : RYG_FS0208

Instrument Status : Used

Location of Calibration : LAB 4 AIR VELOCITY METER

Calibration Environment and Details

Temperature : 23 °C ± 3 °C

Humidity : 55 %RH ± 20 %RH

Barometric Pressure : 1013 hPa ± 10 hPa

Received Date : 21 January 2025

Calibration Date : 27 January 2025

Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator

Reference Standard	Model	Serial Number	Traceble	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	18501010006	Sensidyne	6 August 2025
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	2 August 2025
Temperature meter	GT 11	08000057	Qreborn	1 March 2025
Pressure meter	CPG2400	41000KDU/651882	TPA	21 October 2025

Traceability :

This Certificate is traceable to SI Unit through Sensidyne A2LA Accreditation No. 3943.01

Note :

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %.

Calibration By :
Mr. Noppadon Luangart
Service Calibration Engineer

Approved By :
Mr. Pacit Mathavorn
Calibration Engineer Supervisor

Issue Date : 27 January 2025

Certificate No : 25-AFM-023

Request No : Req-2025-0169

Result of Calibration : Without Adjustment

Temperature (°C)	Pressure (kPa)	STD (cc/min)	UUC (cc/min)	Error (cc/min)	Uncertainty (cc/min)	MPE (cc/min)	Result
22.50	100.90	20	19.854	-0.1	1.3	0.2	Pass1
22.50	100.90	50	49.732	-0.3	3.3	0.5	Pass1
22.60	100.90	101	100.77	-0.2	2.8	1.0	Pass1
22.70	100.90	151	150.23	-0.8	4.2	1.5	Pass1
22.70	100.90	201	200.39	-0.6	5.6	2.0	Pass1
22.70	100.90	301	300.69	-0.3	8.4	3.0	Pass1
22.80	100.90	400	402.96	3.0	11	4.0	Pass1
23.10	100.90	500	504.62	4.6	7.2	5.0	Pass1

Note STD : Standard UUC : Unit Under Calibration
- UUC Reference Condition : At atmospheric pressure and room temperature condition
- Flow Rate was corrected for non-standard operating condition by using equation :

$$Q_{meas} = Q_{ref} \times \frac{P_{ref}}{P_{meas}} \times \frac{T_{meas}}{T_{ref}}$$

where Q = Flow Rate P = Absolute Pressure T = Absolute Temperature
Meas = Measurement Condition ref = Standard Condition

* Indicates non accredited
MPE = Maximum Permissible Error (Specified in Manufacturer's Specifications)
N/A = Not Aavailable, Customer does not require a statement of conformity.

Certificate No : 25-AFM-023

Request No : Req-2025-0169

Decision Rule for Statements of Conformity

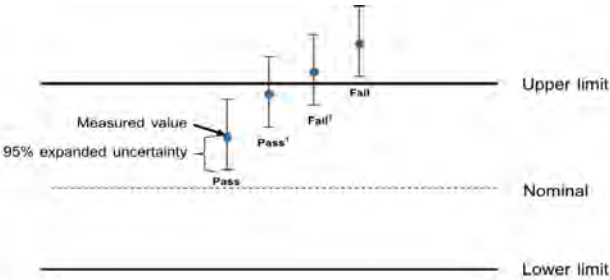
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09/2019; Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

Pass = The measurement result plus the expanded uncertainty with a 95% coverage probability were within the limit.

Pass¹ = The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail¹ = The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

Fail = The measurement result plus the expanded uncertainty with a 95% coverage probability were outside the limit.



End of Certificate

Certificate of Calibration

Customer

Name : ALS Laboratory Group Thailand Co., Ltd.
Address : 104 Soi Phatthanakan 40, Phatthanakan Road, Suan Luang,
Bangkok 10250

Certificate No : 24-AFM-179
Request No : Req-2024-1987

Accuracy : 1% of Reading
Sensor Model : -
Sensor Serial Number : -
Instrument Status : Used

Unit Under Calibration Details

Measurement Item : Air Flow Meter
Manufacturer : MesaLabs
Model : Defender 510-M
Serial Number : I51114
ID : BKK_FS0614
Location of Calibration : LAB 4 AIR VELOCITY METER

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 30 August 2024
Calibration Date : 9 September 2024

Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator

REVIEW BY Morakorn P.
APPROVED BY [Signature]
NEXT CAL. DATE 9/9/25

Reference Standard	Model	Serial Number	Traceble	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	18501010006	Sensidyne	6 August 2025
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	2 August 2025
Temperature meter	GT 11	08000057	Qreborn	1 March 2025
Pressure meter	CPG2400	41000KDU/651882	TPA	9 November 2024

Traceability :
This Certificate is traceable to SI Unit through Sensidyne A2LA Accreditation No, 3943.01

Note :
The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %.

Calibration By : [Signature]
Mr. Noppadon Luangart
Service Calibration Engineer

Approved By : [Signature]
Mr. Pacit Mathavorn
Calibration Engineer Supervisor
Issue Date : 9 September 2024

Certificate No : 24-AFM-179
Request No : Req-2024-1987

Result of Calibration : Without Adjustment

Temperature (°C)	Pressure (kPa)	STD (cc/min)	UUC (cc/min)	Error (cc/min)	Uncertainty (cc/min)	MPE (cc/min)	Result
24.70	100.95	100	100.41	0.4	2.8	1.0	N/A
24.90	100.90	502	500.47	-1.5	7.1	5.0	N/A
24.90	100.97	1003	1001.3	-2	14	10.0	N/A
25.00	100.92	2014	2009.9	-4	29	20.1	N/A
25.20	101.03	3043	3058.3	15	44	30.4	N/A
25.30	101.10	4043	4005.1	-38	57	40.4	N/A
25.50	101.15	5052	5003.9	-48	74	50.5	N/A

Note STD : Standard UUC : Unit Under Calibration
- UUC Reference Condition : At atmospheric pressure and room temperature condition
- Flow Rate was corrected for non-standard operating condition by using equation :

$$Q_{meas} = Q_{ref} \times \frac{P_{ref}}{P_{ref}} \times \frac{T_{meas}}{T_{ref}}$$

where Q = Flow Rate P = Absolute Pressure T = Absolute Temperature
Meas = Measurement Condition ref = Standard Condition

* Indicates non accredited
MPE = Maximum Permissible Error (Specified in Manufacturer's Specifications)
N/A = Not Aavailable, Customer does not require a statement of conformity.

Certificate No : 24-AFM-179

Request No : Req-2024-1987

Decision Rule for Statements of Conformity

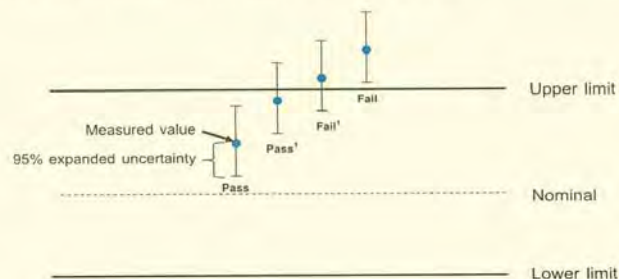
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09/2019: Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

Pass = The measurement result plus the expanded uncertainty with a 95% coverage probability were within the limit.

Pass¹ = The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail¹ = The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

Fail = The measurement result plus the expanded uncertainty with a 95% coverage probability were outside the limit.



End of Certificate

ALS Laboratory Group (Thailand) Co., Ltd.

104 Phatthanakan 40, Phatthanakan Rd.,
Phatthanakan, Suan Luang, Bangkok 10250
T +66 2 760 3000 F +66 2 760 3197



Certificate of Calibration

Certificate No. C-070725-RYG_FS0135

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gillan
Model/Type : GilAir Plus
Equipment ID : RYG_FS0135
Serial No. : 20150410011
Calibration Date : 07-Jul-25
Next calibration date : 07-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L
Equipment ID : RYG_FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M
Equipment ID : BKK_FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	19.4	19.5	19.4	19.4	5%	19 - 21	Passed
50	49.4	49.1	49.5	49.3	5%	48 - 53	Passed
100	99.7	100.0	99.6	99.8	5%	95 - 105	Passed
200	199.8	200.5	198.7	199.7	5%	190 - 210	Passed
High Flow							
500	500.4	502.0	499.9	500.8	3%	485 - 515	Passed
1000	1003.4	1003.3	1001.2	1002.6	3%	970 - 1030	Passed
2000	2001.7	2002.6	2002.1	2002.1	3%	1940 - 2060	Passed
2500	2504.2	2502.5	2508.6	2505.1	3%	2425 - 2575	Passed

END OF REPORT

Calibrated By:

(Mr. Watcharin Pongsamsuan)

RYG Field Services Scientist (1)

Issue date : 08-Jul-25

Approved By:

(Mr. Supot Salameh)

Field Services Section Head



Certificate of Calibration

Certificate No. C-070725-RYG_FS0136

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus

Equipment ID : RYG_FS0136
Serial No. : 20150410012
Calibration Date : 07-Jul-25
Next calibration date : 07-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L

Equipment ID : RYG_FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M

Equipment ID : BKK_FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	19.6	19.5	19.4	19.5	5%	19 - 21	Passed
50	49.6	49.3	48.5	49.1	5%	48 - 53	Passed
100	100.8	101.8	101.5	101.4	5%	95 - 105	Passed
200	201.0	200.8	201.5	201.1	5%	190 - 210	Passed
High Flow							
500	501.0	502.4	500.9	501.4	3%	485 - 515	Passed
1000	1002.4	1003.6	1000.5	1002.2	3%	970 - 1030	Passed
2000	2002.6	1999.4	2001.6	2001.2	3%	1940 - 2060	Passed
2500	2499.5	2502.7	2505.6	2502.6	3%	2425 - 2575	Passed

END OF REPORT

Calibrated By:

(Mr. Amnat Wongsakhen)

RYG Field Services Scientist (1)

Issue date : 08-Jul-25

Approved By:

(Mr. Supot Salamteh)

Field Services Section Head



Certificate of Calibration

Certificate No. C-060725-RYG_FS0139

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus

Equipment ID : RYG_FS0139
Serial No. : 20150510087
Calibration Date : 06-Jul-25
Next calibration date : 06-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L

Equipment ID : RYG_FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M

Equipment ID : BKK_FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	20.6	21.0	20.4	20.7	5%	19 - 21	Passed
50	52.6	51.2	52.3	52.0	5%	48 - 53	Passed
100	101.2	100.5	100.2	100.6	5%	95 - 105	Passed
200	200.1	201.1	201.1	200.8	5%	190 - 210	Passed
High Flow							
500	501.4	502.6	502.0	502.0	3%	485 - 515	Passed
1000	999.0	997.1	998.7	998.3	3%	970 - 1030	Passed
2000	1999.6	1995.6	1998.1	1997.8	3%	1940 - 2060	Passed
2500	2491.2	2495.4	2494.0	2493.5	3%	2425 - 2575	Passed

END OF REPORT

Calibrated By:

(Mr. Nantawat Sarin)

RYG Field Services Scientist (1)

Issue date : 07-Jul-25

Approved By:

(Mr. Supot Salamteh)

Field Services Section Head



Certificate of Calibration

Certificate No. C-070725-RYG_FS0140

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus

Equipment ID : RYG_FS0140
Serial No. : 20150810059
Calibration Date : 07-Jul-25
Next calibration date : 07-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L

Equipment ID : RYG_FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M

Equipment ID : BKK_FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	19.9	19.6	19.6	19.7	5%	19 - 21	Passed
50	49.4	49.3	49.5	49.4	5%	48 - 53	Passed
100	101.1	102.0	101.8	101.6	5%	95 - 105	Passed
200	200.2	200.0	200.4	200.2	5%	190 - 210	Passed
High Flow							
500	501.7	501.5	499.8	501.0	3%	485 - 515	Passed
1000	1001.3	1002.8	1002.5	1002.2	3%	970 - 1030	Passed
2000	2001.6	2002.6	2003.2	2002.5	3%	1940 - 2060	Passed
2500	2502.6	2503.5	2503.6	2503.2	3%	2425 - 2575	Passed

END OF REPORT

Calibrated By:

(Mr. Watcharin Pongsamsuan)

RYG Field Services Scientist (1)

Issue date : 08-Jul-25

Approved By:

(Mr. Supot Salamatheh)

Field Services Section Head



Certificate of Calibration

Certificate No. C-070725-RYG_FS0141

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus

Equipment ID : RYG_FS0141
Serial No. : 20150810060
Calibration Date : 07-Jul-25
Next calibration date : 07-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L

Equipment ID : RYG_FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M

Equipment ID : BKK_FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	20.1	20.0	20.0	20.0	5%	19 - 21	Passed
50	52.1	51.2	50.9	51.4	5%	48 - 53	Passed
100	99.2	98.9	98.6	98.9	5%	95 - 105	Passed
200	201.2	201.8	201.6	201.5	5%	190 - 210	Passed
High Flow							
500	502.5	503.8	507.9	504.7	3%	485 - 515	Passed
1000	1003.0	1001.7	1004.1	1002.9	3%	970 - 1030	Passed
2000	2002.9	2003.8	2002.2	2003.0	3%	1940 - 2060	Passed
2500	2502.6	2507.3	2504.7	2504.9	3%	2425 - 2575	Passed

END OF REPORT

Calibrated By:

(Mr. Watcharin Pongsamsuan)

RYG Field Services Scientist (1)

Issue date : 08-Jul-25

Approved By:

(Mr. Supot Salamatheh)

Field Services Section Head



Certificate of Calibration

Certificate No. C-060725-RYG FS0146

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus

Equipment ID : RYG FS0146
Serial No. : 20150310176
Calibration Date : 06-Jul-25
Next calibration date : 06-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L

Equipment ID : RYG FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M

Equipment ID : BKK FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	20.2	20.5	20.1	20.3	5%	19 - 21	Passed
50	51.5	51.8	52.0	51.8	5%	48 - 53	Passed
100	101.1	102.5	103.2	102.3	5%	95 - 105	Passed
200	204.2	204.6	205.1	204.6	5%	190 - 210	Passed
High Flow							
500	505.2	505.6	506.7	505.8	3%	485 - 515	Passed
1000	1006.5	1006.8	1007.2	1006.8	3%	970 - 1030	Passed
2000	2010.2	2011.5	2012.2	2011.3	3%	1940 - 2060	Passed
2500	2515.2	2516.2	2515.5	2515.6	3%	2425 - 2575	Passed

END OF REPORT

Calibrated By: Suphachai W.

(Mr. Suphachai Wongsurichai)

RYG Field Services Scientist (2)

Issue date : 07-Jul-25

Approved By: Supot S

(Mr. Supot Salamteh)

Field Services Section Head



Certificate of Calibration

Certificate No. C-070725-RYG FS0147

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus

Equipment ID : RYG FS0147
Serial No. : 20150910029
Calibration Date : 07-Jul-25
Next calibration date : 07-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L

Equipment ID : RYG FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M

Equipment ID : BKK FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	20.3	20.5	20.1	20.3	5%	19 - 21	Passed
50	50.5	50.6	51.1	50.7	5%	48 - 53	Passed
100	102.5	102.6	103.2	102.8	5%	95 - 105	Passed
200	205.3	206.8	205.2	205.8	5%	190 - 210	Passed
High Flow							
500	505.6	506.8	505.9	506.1	3%	485 - 515	Passed
1000	1006.5	1006.7	1006.8	1006.7	3%	970 - 1030	Passed
2000	2006.8	2007.5	2008.1	2007.5	3%	1940 - 2060	Passed
2500	2508.3	2509.2	2510.2	2509.2	3%	2425 - 2575	Passed

END OF REPORT

Calibrated By: Suphachai W.

(Mr. Suphachai Wongsurichai)

RYG Field Services Scientist (2)

Issue date : 08-Jul-25

Approved By: Supot S

(Mr. Supot Salamteh)

Field Services Section Head



Certificate of Calibration

Certificate No. C-070725-RYG FS0156

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus
Equipment ID : RYG FS0156
Serial No. : 20150910028
Calibration Date : 07-Jul-25
Next calibration date : 07-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L
Equipment ID : RYG FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M
Equipment ID : BKK FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	20.1	20.3	20.5	20.3	5%	19 - 21	Passed
50	50.8	51.3	51.6	51.2	5%	48 - 53	Passed
100	102.1	102.5	102.4	102.3	5%	95 - 105	Passed
200	208.6	209.1	209.3	209.0	5%	190 - 210	Passed
High Flow							
500	508.6	509.5	510.1	509.4	3%	485 - 515	Passed
1000	1012.5	1013.5	1014.2	1013.4	3%	970 - 1030	Passed
2000	2004.5	2005.6	2005.9	2005.3	3%	1940 - 2060	Passed
2500	2512.3	2513.5	2514.2	2513.3	3%	2425 - 2575	Passed

END OF REPORT

Calibrated By: Suphachai W.

(Mr. Suphachai Wongsurichai)

RYG Field Services Scientist (2)

Issue date : 08-Jul-25

Approved By: Supot S

(Mr. Supot Salamteh)

Field Services Section Head



Certificate of Calibration

Certificate No. C-070725-RYG FS0158

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus
Equipment ID : RYG FS0158
Serial No. : 20150910030
Calibration Date : 07-Jul-25
Next calibration date : 07-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L
Equipment ID : RYG FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M
Equipment ID : BKK FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	19.9	19.7	19.9	19.8	5%	19 - 21	Passed
50	51.4	51.8	52.8	52.0	5%	48 - 53	Passed
100	102.3	102.4	101.7	102.1	5%	95 - 105	Passed
200	207.7	206.8	207.2	207.2	5%	190 - 210	Passed
High Flow							
500	510.5	511.3	511.4	511.1	3%	485 - 515	Passed
1000	1013.7	1014.4	1013.9	1014.0	3%	970 - 1030	Passed
2000	2002.9	2005.4	2004.0	2004.1	3%	1940 - 2060	Passed
2500	2510.7	2500.9	2501.2	2504.3	3%	2425 - 2575	Passed

END OF REPORT

Calibrated By: Watcharin Pongsamsuan

(Mr. Watcharin Pongsamsuan)

RYG Field Services Scientist (1)

Issue date : 08-Jul-25

Approved By: Supot S

(Mr. Supot Salamteh)

Field Services Section Head



Certificate of Calibration

Certificate No. C-070725-RYG FS0159

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus

Equipment ID : RYG FS0159
Serial No. : 20150910031
Calibration Date : 07-Jul-25
Next calibration date : 07-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L

Equipment ID : RYG FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M

Equipment ID : BKK FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	19.3	20.2	20.6	20.0	5%	19 - 21	Passed
50	49.2	51.4	51.9	50.8	5%	48 - 53	Passed
100	100.1	100.0	99.9	100.0	5%	95 - 105	Passed
200	204.3	201.3	201.4	202.3	5%	190 - 210	Passed
High Flow							
500	503.4	501.2	502.4	502.3	3%	485 - 515	Passed
1000	1002.4	1003.1	1001.2	1002.2	3%	970 - 1030	Passed
2000	2002.3	2001.7	2007.3	2003.8	3%	1940 - 2060	Passed
2500	2502.2	2499.3	2500.3	2500.6	3%	2425 - 2575	Passed

END OF REPORT

Calibrated By:

(Mr. Amnat Wongsakhen)

RYG Field Services Scientist (1)

Issue date : 08-Jul-25

Approved By:

(Mr. Supot Salamteh)

Field Services Section Head



Certificate of Calibration

Certificate No. C-070725-RYG FS0165

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus

Equipment ID : RYG FS0165
Serial No. : 20150910037
Calibration Date : 07-Jul-25
Next calibration date : 07-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L

Equipment ID : RYG FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M

Equipment ID : BKK FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	19.1	21.1	19.7	20.0	5%	19 - 21	Passed
50	50.0	50.1	49.6	49.9	5%	48 - 53	Passed
100	100.4	101.1	101.0	100.8	5%	95 - 105	Passed
200	200.3	200.6	200.4	200.4	5%	190 - 210	Passed
High Flow							
500	500.1	500.2	500.4	500.2	3%	485 - 515	Passed
1000	1001.3	1002.1	1002.6	1002.0	3%	970 - 1030	Passed
2000	2010.1	2010.3	2010.4	2010.3	3%	1940 - 2060	Passed
2500	2501.0	2498.2	2499.2	2499.5	3%	2425 - 2575	Passed

END OF REPORT

Calibrated By:

(Mr. Amnat Wongsakhen)

RYG Field Services Scientist (1)

Issue date : 08-Jul-25

Approved By:

(Mr. Supot Salamteh)

Field Services Section Head



Certificate of Calibration

Certificate No. C-070725-RYG FS0169

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus

Equipment ID : RYG FS0169
Serial No. : 20150910041
Calibration Date : 07-Jul-25
Next calibration date : 07-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L

Equipment ID : RYG FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M

Equipment ID : BKK FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	19.0	19.1	19.4	19.2	5%	19 - 21	Passed
50	50.0	50.0	50.1	50.0	5%	48 - 53	Passed
100	101.1	101.3	101.4	101.3	5%	95 - 105	Passed
200	198.5	198.2	198.2	198.3	5%	190 - 210	Passed
High Flow							
500	501.6	505.5	503.9	503.7	3%	485 - 515	Passed
1000	1002.5	1001.9	1002.8	1002.4	3%	970 - 1030	Passed
2000	2002.3	2000.9	2001.2	2001.5	3%	1940 - 2060	Passed
2500	2502.6	2501.3	2499.8	2501.2	3%	2425 - 2575	Passed

END OF REPORT

Calibrated By:

(Mr. Amnat Wongsakhen)

RYG Field Services Scientist (1)

Issue date : 08-Jul-25

Approved By:

(Mr. Supot Salamteh)

Field Services Section Head



Certificate of Calibration

Certificate No. C-060725-RYG FS0361

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus

Equipment ID : RYG FS0361
Serial No. : 20180610054
Calibration Date : 06-Jul-25
Next calibration date : 06-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L

Equipment ID : RYG FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M

Equipment ID : BKK FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	19.7	19.2	19.3	19.4	5%	19 - 21	Passed
50	51.1	51.8	50.9	51.3	5%	48 - 53	Passed
100	99.6	99.8	99.0	99.5	5%	95 - 105	Passed
200	198.9	199.1	198.7	198.9	5%	190 - 210	Passed
High Flow							
500	500.7	499.7	501.5	500.6	3%	485 - 515	Passed
1000	1004.8	1000.8	999.8	1001.8	3%	970 - 1030	Passed
2000	2001.6	2000.8	2002.3	2001.6	3%	1940 - 2060	Passed
2500	2499.7	2500.6	2501.2	2500.5	3%	2425 - 2575	Passed

END OF REPORT

Calibrated By:

(Mr. Amnat Wongsakhen)

RYG Field Services Scientist (1)

Issue date : 07-Jul-25

Approved By:

(Mr. Supot Salamteh)

Field Services Section Head



Certificate of Calibration

Certificate No. C-060725-RYG FS0362

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus

Equipment ID : RYG FS0362
Serial No. : 20180610055
Calibration Date : 06-Jul-25
Next calibration date : 06-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L

Equipment ID : RYG FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M

Equipment ID : BKK FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	19.8	19.9	20.1	19.9	5%	19 - 21	Passed
50	50.2	50.8	51.2	50.7	5%	48 - 53	Passed
100	99.6	99.9	100.2	99.9	5%	95 - 105	Passed
200	202.1	202.6	203.1	202.6	5%	190 - 210	Passed
High Flow							
500	503.2	503.5	503.9	503.5	3%	485 - 515	Passed
1000	1001.2	1002.2	1002.6	1002.0	3%	970 - 1030	Passed
2000	2003.5	2003.8	2004.2	2003.8	3%	1940 - 2060	Passed
2500	2508.6	2509.1	2509.6	2509.1	3%	2425 - 2575	Passed

END OF REPORT

Calibrated By: Suphachai W.

(Mr. Suphachai Wongsurichai)

RYG Field Services Scientist (2)

Issue date : 07-Jul-25

Approved By: Supot S

(Mr. Supot Salamteh)

Field Services Section Head



Certificate of Calibration

Certificate No. C-070725-RYG FS0365

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus

Equipment ID : RYG FS0365
Serial No. : 20180610058
Calibration Date : 07-Jul-25
Next calibration date : 07-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L

Equipment ID : RYG FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M

Equipment ID : BKK FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	19.8	19.5	19.9	19.7	5%	19 - 21	Passed
50	49.5	51.8	50.7	50.7	5%	48 - 53	Passed
100	104.6	104.5	104.3	104.5	5%	95 - 105	Passed
200	199.8	203.4	201.6	201.6	5%	190 - 210	Passed
High Flow							
500	505.6	506.4	505.9	506.0	3%	485 - 515	Passed
1000	1001.7	1003.5	1000.7	1002.0	3%	970 - 1030	Passed
2000	2004.6	2008.6	2005.3	2006.2	3%	1940 - 2060	Passed
2500	2517.7	2511.5	2514.2	2514.5	3%	2425 - 2575	Passed

END OF REPORT

Calibrated By: นันทพงษ์

(Mr. Natchapon Thamklang)

RYG Field Services Scientist (1)

Issue date : 08-Jul-25

Approved By: Supot S

(Mr. Supot Salamteh)

Field Services Section Head

ALS Laboratory Group (Thailand) Co., Ltd.

104 Phatthanakan 40, Phatthanakan Rd.,
Phatthanakan, Suan Luang, Bangkok 10250
T +66 2 760 3000 F +66 2 760 3197



Certificate of Calibration

Certificate No. C-060725-RYG FS0366

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus

Equipment ID : RYG_FS0366
Serial No. : 20180610059
Calibration Date : 06-Jul-25
Next calibration date : 06-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L

Equipment ID : RYG_FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M

Equipment ID : BKK_FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	20.1	19.8	21.0	20.3	5%	19 - 21	Passed
50	49.7	49.5	49.1	49.4	5%	48 - 53	Passed
100	98.9	98.9	99.0	98.9	5%	95 - 105	Passed
200	201.6	202.3	202.8	202.2	5%	190 - 210	Passed
High Flow							
500	509.6	511.2	506.1	509.0	3%	485 - 515	Passed
1000	999.6	997.1	998.4	998.4	3%	970 - 1030	Passed
2000	2003.8	2003.1	2002.4	2003.1	3%	1940 - 2060	Passed
2500	2518.0	2514.8	2517.5	2516.8	3%	2425 - 2575	Passed

END OF REPORT

Calibrated By:

(Mr. Nantawat Sarin)

RYG Field Services Scientist (1)

Issue date : 07-Jul-25

Approved By:

(Mr. Supot Salamteh)

Field Services Section Head

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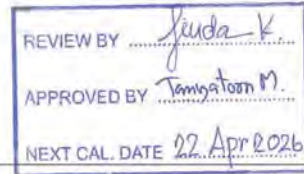
Agilent CrossLab Compliance Services

Certificate of System Qualification

GC-OQ

System ID: GC-6_CN11461066
Organization Name: ALS Laboratory Group (Thailand) Co., Ltd.
Organization Location: 104 Soi 40 Phatthanakan Rd, Khwang Suan Luang, Khet Suan Luang, Bangkok 10250

Date: October 22, 2024 9:27:05 AM
EQP Name: AgilentRecommended
EQP Revision: GC.02.53
Overall Qualification Status: Pass



CDS Logon Verification - GC

Logon: Saenguthai Tarak

Overall CDS Logon Verification - GC Test Status

Pass

System Inspection and Basic Safety and Operation

Name: 7890

Setpoint Status: Pass

Overall System Inspection and Basic Safety and Operation Test Status

Pass

Inlet Pressure Decay

Name: 7890

Front SSL

Setpoint Status: Pass

Pressure: 25.0 psi

Pressure Change: 0.0 psi /5 minutes

Agilent Recommended: >= -2.0 and <= 0.5

Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

Overall Inlet Pressure Decay Test Status

Pass

Inlet Pressure Accuracy

Name: 7890
Front SSL

Setpoint Status: Pass

Inlet Pressure: Setpoint 25.0 psi Actual 25.07 psi
Accuracy: 0.1 psi
Agilent Recommended: ≤ 1.2

Overall Inlet Pressure Accuracy Test Status

Pass

Inlet Pressure Decay

Name: 7890
Back SSL

Setpoint Status: Pass

Pressure: 25.0 psi
Pressure Change: 0.0 psi /5 minutes
Agilent Recommended: ≥ -2.0 and ≤ 0.5

Overall Inlet Pressure Decay Test Status

Pass

Inlet Pressure Accuracy

Name: 7890
Back SSL

Setpoint Status: Pass

Inlet Pressure: Setpoint 25.0 psi Actual 25.06 psi
Accuracy: 0.1 psi
Agilent Recommended: ≤ 1.2

Overall Inlet Pressure Accuracy Test Status

Pass

Detector Flow Accuracy

Name: 7890
Front FID

Setpoint Status: Pass

Flow Type: Fuel
Setpoint: 30.0 mL/min Measured Flow: 28.8 mL/min
Accuracy: 1.2 mL/min
Agilent Recommended: ≤ 10.0 % setpoint (3.0 mL/min)
Limit is percentage of setpoint or 0.5 mL/minute, whichever is largest.

Setpoint Status: Pass

Flow Type: Oxidizer
Setpoint: 400.0 mL/min Measured Flow: 392 mL/min
Accuracy: 8.0 mL/min
Agilent Recommended: ≤ 10.0 % setpoint (40.0 mL/min)
Limit is percentage of setpoint or 0.5 mL/minute, whichever is largest.

Setpoint Status: Pass

Flow Type: Makeup
Setpoint: 25.0 mL/min Measured Flow: 25.4 mL/min
Accuracy: 0.4 mL/min
Agilent Recommended: ≤ 10.0 % setpoint (2.5 mL/min)
Limit is percentage of setpoint or 0.5 mL/minute, whichever is largest.

Overall Detector Flow Accuracy Test Status

Pass

Detector Flow Accuracy

Name: 7890
Back FID

Setpoint Status: Pass

Flow Type: Fuel
Setpoint: 30.0 mL/min Measured Flow: 30.8 mL/min

Accuracy: 0.8 mL/min
Agilent Recommended: ≤ 10.0 % setpoint (3.0 mL/min)

Limit is percentage of setpoint or 0.5 ml/minute, whichever is largest.

Setpoint Status: Pass

Flow Type: Oxidizer
Setpoint: 400.0 mL/min Measured Flow: 393 mL/min

Accuracy: 7.0 mL/min
Agilent Recommended: ≤ 10.0 % setpoint (40.0 mL/min)

Limit is percentage of setpoint or 0.5 ml/minute, whichever is largest.

Setpoint Status: Pass

Flow Type: Makeup
Setpoint: 25.0 mL/min Measured Flow: 25.2 mL/min

Accuracy: 0.2 mL/min
Agilent Recommended: ≤ 10.0 % setpoint (2.5 mL/min)

Limit is percentage of setpoint or 0.5 ml/minute, whichever is largest.

Overall Detector Flow Accuracy Test Status

Pass

GC Oven Temperature Accuracy

Name: 7890

Date: October 22, 2024 9:27:05 AM

System ID: GC-6_CN11461068

Setpoint Status: Pass

Zone: Oven

Setpoint/Actual

Temperature: 230.0 230.3 °C

Accuracy: 0.3 °C

Agilent Recommended: ≥ -1.0 % setpoint in K (-5.0 °C)

≤ 1.0 % setpoint in K (5.0 °C)

Setpoint Status: Pass

Zone: Oven

Setpoint/Actual

Temperature: 100.0 100.0 °C

Accuracy: 0.0 °C

Agilent Recommended: ≥ -1.0 % setpoint in K (-3.7 °C)

≤ 1.0 % setpoint in K (3.7 °C)

Overall GC Oven Temperature Accuracy Test Status

Pass

GC Oven Temperature Stability

Name: 7890

Setpoint Status: Pass

Setpoint/Average

Temperature: 100.0 100.0167 °C

Stability: 0.1 °C

Agilent Recommended: ≤ 0.5

Overall GC Oven Temperature Stability Test Status

Pass

Scouting Run

Tested Combination1 Front SSL / Front FID

Injection Tower

Name: 7693A

Date: October 22, 2024 9:27:05 AM

System ID: GC-6_CN11461068

Setpoint Status: Completed

Injection Volume on Column: 1.0 uL

Overall Scouting Run Status

Completed

Noise and Drift

Tested Combination1 Front SSL / Front FID

Name: 7890

Setpoint Status: Pass

Base Signal: 14.05 pA

ASTM Noise		Drift	
pA		pA/Hr	
0.05		0.03	
Agilent Recommended: <= 0.10		Agilent Recommended: <= 2.50	
Status: Pass		Status: Pass	

Overall Noise and Drift Test Status

Pass

Injection Precision

Tested Combination1 Front SSL / Front FID

Name: 7693A

Setpoint Status: Pass

Injection Volume on Column: 1.0 uL

Area RSD: 0.30 % Retention Time RSD: 0.63 %

Agilent Recommended: <= 3.00 <= 1.00

Overall Injection Precision Test Status

Pass

Signal to Noise

Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

Tested Combination1 Front SSL / Front FID

Injection Tower

Name: 7890

Setpoint Status: Pass

Signal to Noise: 11078525

Agilent Recommended: >= 300000

Overall Signal to Noise Test Status

Pass

Scouting Run

Tested Combination2 Back SSL / Back FID

Injection Tower

Name: 7693A

Setpoint Status: Completed

Injection Volume on Column: 1.0 uL

Overall Scouting Run Status

Completed

Noise and Drift

Tested Combination2 Back SSL / Back FID

Name: 7890

Setpoint Status: Pass

Base Signal: 13.79 pA

ASTM Noise		Drift	
pA		pA/Hr	
0.05		0.01	
Agilent Recommended: <= 0.10		Agilent Recommended: <= 2.50	
Status: Pass		Status: Pass	

Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

Overall Noise and Drift Test Status

Pass

Injection Precision

Tested Combination2	Back	SSL	/ Back	FID
Name:	7693A			
Setpoint Status:	Pass			
Injection Volume on Column:	1.0	uL		
Area RSD:	1.06	%	Retention Time RSD:	0.93 %
Agilent Recommended:	<=	3.00	<=	1.00

Overall Injection Precision Test Status

Pass

Signal to Noise

Tested Combination2	Back	SSL	/ Back	FID
	Injection Tower			
Name:	7890			
Setpoint Status:	Pass			
Signal to Noise:	1771221			
Agilent Recommended:	>=	300000		

Overall Signal to Noise Test Status

Pass

Instrument Details

Purpose

This section describes the as found system configuration.

Details

System	
System ID	GC-6_CN11461066
Manufacturer	Agilent Technologies
Name	7890
Flow Data Input	Manual Data
Temperature Data Input	Manual Data or Other Data Logging
Tested Combination1	
Injection Technique	Injection Tower
Sampler Identifier	Sampler 1
Inlet	Front
Detector	Front
LTM Included?	No
Tested Combination2	
Injection Technique	Injection Tower
Sampler Identifier	Sampler 2
Inlet	Back
Detector	Back
LTM Included?	No
Sampler 1	
Manufacturer	Agilent Technologies
Type	Injection Tower
Name	7693A
Model Number	G4513A
Serial Number	CNCN10340103
Firmware Revision	A.11.06
Usage	Sample Injection
Location	Front
Syringe Volume (uL)	10

Sampler 2

Manufacturer	Agilent Technologies
Type	Injection Tower
Name	7693A
Model Number	G4513A
Serial Number	CN16280128
Firmware Revision	A.11.06
Usage	Sample Injection
Location	Back
Syringe Volume (µL)	10

Sampler 3

Manufacturer	Agilent Technologies
Type	Tray
Name	7693A
Model Number	G4514A
Serial Number	CN15380030
Firmware Revision	A.11.03
Vial Heater	Not installed

Mainframe 1

Manufacturer	Agilent Technologies
Name	7890
Model Number	G3440A
Serial Number	CN11461066
Firmware Revision	A.01.16
Oven Type	Standard

Inlet 1

Manufacturer	Agilent Technologies
Name	7890
Type	SSL
Location	Front
Carrier Gas	Helium
Control Type	Electronic Pressure Control (EPC)
Purged Inlet	Yes

Inlet 2

Manufacturer	Agilent Technologies
Name	7890
Type	SSL
Location	Back
Carrier Gas	Helium
Control Type	Electronic Pressure Control (EPC)
Purged Inlet	Yes

Detector 1

Manufacturer	Agilent Technologies
Name	7890
Type	FID
Adapter	Capillary
Control Type	Electronic Pressure Control (EPC)
Location	Front
Makeup Gas	Nitrogen

Detector 2

Manufacturer	Agilent Technologies
Name	7890
Type	FID
Adapter	Capillary
Control Type	Electronic Pressure Control (EPC)
Location	Back
Makeup Gas	Nitrogen

Electronic Signature

Purpose

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Signature Creation Date: October 22, 2024
Reason for Signature: Executed protocol and published this original version of document

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This document provides a protocol to verify and record instrument configuration and evidence of proper operation. It has been prepared from our interpretation of applicable regulations as well as industry best practices. The document is designed to provide an important component of a complete compliance package. Validation depends upon many factors and use of this protocol alone does not assure compliance. Agilent Technologies makes no promises or representations as to its sufficiency for any specific regulatory program.

Warranty

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User Name: saengulhai.tarak
Report Generated by Hostname: LAPTOP-CO3SKOMV
System ID: GC-6_CN11461086
Print Date: October 22, 2024 9:27:06 AM

2024_ALS_GC-6_CN11461086_OQHW Transaction Log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2024 3:16:06 PM	Audit	SessionCreated	Session	None
October 21, 2024 3:16:07 PM	Start	Configuration	Session	None
October 21, 2024 3:16:07 PM	Audit	Entitlement	Licensing	User is Nonpaying and does not require an unlock code
October 21, 2024 3:22:40 PM	Audit	EqpLoaded	Session	EOP details for primary technique [Gc] - File path: [ProtocolPacks/Gc/Configurations/02.53/Gc.02.53.eop], EOP File Name: [Gc.02.53.eop], EOP Name: [AgilentRecommended], Protocol Revision :[Gc.02.53]
October 21, 2024 3:22:44 PM	End	Configuration	Session	None
October 21, 2024 3:32:47 PM	Start	Qualification	Session	OQ
October 21, 2024 3:22:48 PM	Start	Execution	CDS Logon Verification - GC-7890: - Qualitative test	None
October 21, 2024 3:23:36 PM	End	Execution	CDS Logon Verification - GC-7890: - Qualitative test	Run Count: 1
October 21, 2024 3:23:46 PM	Start	Execution	System Inspection and Basic Safety and Operation - 7890: - Qualitative Test - No setpoints associated	None
October 21, 2024 3:23:59 PM	End	Execution	System Inspection and Basic Safety and Operation - 7890: - Qualitative Test - No setpoints associated	Run Count: 1

User Name: saenguthai.larak
Report Generated by Hostname: LAPTOP-CQ3SKQMV

System Id: GC-6_CN11461066
Print Date: October 22, 2024 9:27:06 AM

2024_ALS_GC-6_CN11461066_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2024 3:24:01 PM	Start	Execution	Inlet Pressure Decay - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and <= 0.5 psi	None
October 21, 2024 3:25:26 PM	End	Execution	Inlet Pressure Decay - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and <= 0.5 psi	Run Count : 1
October 21, 2024 3:25:28 PM	Start	Execution	Inlet Pressure Accuracy - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
October 21, 2024 3:25:32 PM	End	Execution	Inlet Pressure Accuracy - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count : 1
October 21, 2024 3:25:50 PM	Start	Execution	Inlet Pressure Decay - Back SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and <= 0.5 psi	None
October 21, 2024 3:26:01 PM	End	Execution	Inlet Pressure Decay - Back SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and <= 0.5 psi	Run Count : 1
October 21, 2024 3:26:05 PM	Start	Execution	Inlet Pressure Accuracy - Back SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
October 21, 2024 3:26:10 PM	End	Execution	Inlet Pressure Accuracy - Back SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count : 1
October 21, 2024 3:26:12 PM	Start	Execution	Detector Flow Accuracy - Front FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	None

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Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

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User Name: saenguthai.larak
Report Generated by Hostname: LAPTOP-CQ3SKQMV

System Id: GC-6_CN11461066
Print Date: October 22, 2024 9:27:06 AM

2024_ALS_GC-6_CN11461066_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2024 3:26:50 PM	Audit	Data	Detector Flow Accuracy - Front FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 21, 2024 3:26:53 PM	End	Execution	Detector Flow Accuracy - Front FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
October 21, 2024 3:26:54 PM	Start	Execution	Detector Flow Accuracy - Front FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	None
October 21, 2024 3:27:10 PM	Audit	Data	Detector Flow Accuracy - Front FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 21, 2024 3:27:13 PM	End	Execution	Detector Flow Accuracy - Front FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
October 21, 2024 3:26:11 PM	Start	Execution	Detector Flow Accuracy - Front FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	None
October 21, 2024 3:29:27 PM	Audit	Data	Detector Flow Accuracy - Front FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 21, 2024 3:29:29 PM	End	Execution	Detector Flow Accuracy - Front FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
October 21, 2024 3:29:30 PM	Start	Execution	Detector Flow Accuracy - Back FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	None
October 21, 2024 3:29:47 PM	Audit	Data	Detector Flow Accuracy - Back FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 21, 2024 3:29:52 PM	End	Execution	Detector Flow Accuracy - Back FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Run Count : 1

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Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

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User Name: saenguthai.tarak
Report Generated by Hostname: LAPTOP-CQ3SKQMV

System Id: GC-6_CN11461066
Print Date: October 22, 2024 9:27:06 AM

2024_ALS_GC-6_CN11461066_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2024 3:29:54 PM	Start	Execution	Detector Flow Accuracy - Back FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint.	None
October 21, 2024 3:30:07 PM	Audit	Data	Detector Flow Accuracy - Back FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 21, 2024 3:30:08 PM	End	Execution	Detector Flow Accuracy - Back FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
October 21, 2024 3:30:11 PM	Start	Execution	Detector Flow Accuracy - Back FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	None
October 21, 2024 3:30:34 PM	Audit	Data	Detector Flow Accuracy - Back FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 21, 2024 3:30:37 PM	End	Execution	Detector Flow Accuracy - Back FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
October 21, 2024 3:30:38 PM	Start	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
October 21, 2024 3:31:55 PM	Audit	Data	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
October 21, 2024 3:31:57 PM	End	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count : 1

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Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

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User Name: saenguthai.tarak
Report Generated by Hostname: LAPTOP-CQ3SKQMV

System Id: GC-6_CN11461066
Print Date: October 22, 2024 8:27:06 AM

2024_ALS_GC-6_CN11461066_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2024 3:31:59 PM	Start	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
October 21, 2024 3:34:37 PM	Audit	Data	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
October 21, 2024 3:34:39 PM	End	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count : 1
October 21, 2024 3:34:42 PM	Start	Execution	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	None
October 21, 2024 3:38:05 PM	Audit	Data	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Manual Data Entry
October 21, 2024 3:39:07 PM	End	Execution	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Run Count : 1
October 21, 2024 3:39:33 PM	Start	Execution	GC Scouting Run - Injection Tower, Front SSL, Front FID: - Part of System Preparation - No limits associated	None
October 21, 2024 3:40:12 PM	Audit	AccClosed	Session	None
October 22, 2024 8:55:47 AM	Audit	AccRestarted	Session	None
October 22, 2024 8:55:50 AM	Audit	SessionReloaded	Session	None
October 22, 2024 8:56:02 AM	Start	Qualification	Session	OQ

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Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

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User Name: saenguthai.larak
Report Generated by Hostname: LAPTOP-CQ3SKOMV

System ID: GC-6_CN11461066
Print Date: October 22, 2024 9:27:06 AM

2024_ALS_GC-6_CN11461066_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 22, 2024 8:55:02 AM	Start	Execution	GC Scouting Run - Injection Tower, Front SSL, Front FID: - Part of System Preparation - No limits associated	None
October 22, 2024 8:56:48 AM	Audit	Data	GC Scouting Run - Injection Tower, Front SSL, Front FID: - Part of System Preparation - No limits associated	Data files Path : G:\Data\Front\Front_SC10.D\FID1A.ch
October 22, 2024 8:57:25 AM	End	Execution	GC Scouting Run - Injection Tower, Front SSL, Front FID: - Part of System Preparation - No limits associated	Run Count : 1
October 22, 2024 8:57:39 AM	Start	Execution	Noise and Drift - Front FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	None
October 22, 2024 8:58:03 AM	Audit	Data	Noise and Drift - Front FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	Data files Path : G:\Data\Front\Front_ND10.D\FID1A.ch
October 22, 2024 8:58:37 AM	End	Execution	Noise and Drift - Front FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	Run Count : 1
October 22, 2024 8:58:40 AM	Start	Execution	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	None
October 22, 2024 8:59:06 AM	Audit	Data	Data Manager	Data Manager was in a data verification state but the user chose to start over

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Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

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User Name: saenguthai.larak
Report Generated by Hostname: LAPTOP-CQ3SKOMV

System ID: GC-6_CN11461066
Print Date: October 22, 2024 9:27:06 AM

2024_ALS_GC-6_CN11461066_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 22, 2024 9:01:43 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Front\Front_IP0105.D\FID1A.ch
October 22, 2024 9:01:43 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Front\Front_IP0106.D\FID1A.ch
October 22, 2024 9:01:43 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Front\Front_IP0107.D\FID1A.ch
October 22, 2024 9:01:43 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Front\Front_IP0108.D\FID1A.ch
October 22, 2024 9:01:43 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Front\Front_IP0109.D\FID1A.ch
October 22, 2024 9:01:43 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Front\Front_IP0110.D\FID1A.ch
October 22, 2024 9:02:11 AM	End	Execution	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Run Count : 1
October 22, 2024 9:02:16 AM	Start	Execution	Signal to Noise - Injection Tower, Front SSL, Front FID: - Detector FID - L: >= 300000	None
October 22, 2024 9:02:34 AM	Audit	Data	Signal to Noise - Injection Tower, Front SSL, Front FID: - Detector FID - L: >= 300000	Data files Path : G:\Data\Front\Front_SN01.D\FID1A.ch

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Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

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User Name: saenguthai.tarak
Report Generated by Hostname: LAPTOP-CQ3SKOMV

System ID: GC-6_CN11461066
Print Date: October 22, 2024 9:27:06 AM

2024_ALS_GC-6_CN11461066_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 22, 2024 9:02:54 AM	End	Execution	Signal to Noise - Injection Tower, Front SSL, Front FID: - Detector FID - L: >= 300000	Run Count: 1
October 22, 2024 9:03:00 AM	Start	Execution	GC Scouting Run - Injection Tower, Back SSL, Back FID: - Part of System Preparation - No limits associated	None
October 22, 2024 9:03:31 AM	Audit	Data	GC Scouting Run - Injection Tower, Back SSL, Back FID: - Part of System Preparation - No limits associated	Data files Path : G:\Data\Back\Back_SC01.D\FID2B.ch
October 22, 2024 9:04:00 AM	End	Execution	GC Scouting Run - Injection Tower, Back SSL, Back FID: - Part of System Preparation - No limits associated	Run Count: 1
October 22, 2024 9:04:06 AM	Start	Execution	Noise and Drift - Back FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	None
October 22, 2024 9:08:58 AM	Audit	Data	Noise and Drift - Back FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	Data files Path : G:\Data\Back\Back_NO013.D\FID2B.ch
October 22, 2024 9:09:13 AM	End	Execution	Noise and Drift - Back FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	Run Count: 1
October 22, 2024 9:09:26 AM	Start	Execution	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	None

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Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

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User Name: saenguthai.tarak
Report Generated by Hostname: LAPTOP-CQ3SKOMV

System ID: GC-6_CN11461066
Print Date: October 22, 2024 9:27:06 AM

2024_ALS_GC-6_CN11461066_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 22, 2024 9:10:44 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Back\Back_IP0111.D\FID2B.ch
October 22, 2024 9:10:44 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Back\Back_IP0112.D\FID2B.ch
October 22, 2024 9:10:44 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Back\Back_IP0113.D\FID2B.ch
October 22, 2024 9:10:44 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Back\Back_IP0114.D\FID2B.ch
October 22, 2024 9:10:44 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Back\Back_IP0115.D\FID2B.ch
October 22, 2024 9:10:44 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Back\Back_IP0116.D\FID2B.ch
October 22, 2024 9:11:15 AM	End	Execution	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Run Count: 1
October 22, 2024 9:11:23 AM	Start	Execution	Signal to Noise - Injection Tower, Back SSL, Back FID: - Detector FID - L: >= 300000	None
October 22, 2024 9:11:45 AM	Audit	Data	Signal to Noise - Injection Tower, Back SSL, Back FID: - Detector FID - L: >= 300000	Data files Path : G:\Data\Back\Back_SN01.D\FID2B.ch

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Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

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User Name: saongat(hai).tarak
Report Generated by Hostname: LAPTOP-CQ3SKOMV

System ID: GC-6_CN11461066
Print Date: October 22, 2024 9:27:05 AM

2024_ALS_GC-6_CN11461066_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 22, 2024 9:12:08 AM	End	Execution	Signal to Noise - Injection Tower, Back SSL, Back FID - Detector FID - L: >= 300000	Run Count: 1
October 22, 2024 9:12:15 AM	End	Qualification	Session	OQ
October 22, 2024 9:12:15 AM	Start	Reporting	Session	None
October 22, 2024 9:24:09 AM	Audit	Reporting	Session	Report Generated: Certificate
October 22, 2024 9:25:56 AM	Audit	Reporting	Session	Report Generated: Report

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Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

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Certificate of System Qualification

GC-OQ + GCMS-OQ

System ID: GM-12
Organization Name: ALS Laboratory Groups (Thailand) Co Ltd.
Organization Location: 104 Phattanakani 40 Phattanakani Rd Bangkok 10250
Date: May 9, 2025 3:29:14 PM
EQP Name: AgilentRecommended , AgilentRecommended
EQP Revision: GC.02.53, GCMS.02.54
Overall Qualification Status: Pass

REVIEW BY Suchada T.
APPROVED BY Tongstorn M.
NEXT CAL. DATE 9 May 26

CDS Logon Verification - GC

Logon: asbkk.env03

Overall CDS Logon Verification - GC Test Status

Pass

System Inspection and Basic Safety and Operation

Name: 8890

Setpoint Status: Pass

Overall System Inspection and Basic Safety and Operation Test Status

Pass

Inlet Pressure Accuracy

Name: 8890

Front SSL

Setpoint Status: Pass

	Setpoint	Actual
Inlet Pressure:	25.0 psi	24.8 psi
Accuracy:		0.2 psi
Agilent Recommended:		<= 1.2

Date: May 9, 2025 3:29:14 PM
System ID: GM-12

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Overall Inlet Pressure Accuracy Test Status

Pass

GC Oven Temperature Accuracy

Name: 8890

Setpoint Status: Pass

Zone: Oven

Setpoint/Actual
Temperature: 230.0 230.1 °C

Accuracy: 0.1 °C

Agilent Recommended: >= -1.0 % setpoint in K (-5.0 °C)

<= 1.0 % setpoint in K (5.0 °C)

Setpoint Status: Pass

Zone: Oven

Setpoint/Actual
Temperature: 100.0 100.1 °C

Accuracy: 0.1 °C

Agilent Recommended: >= -1.0 % setpoint in K (-3.7 °C)

<= 1.0 % setpoint in K (3.7 °C)

Overall GC Oven Temperature Accuracy Test Status

Pass

GC Oven Temperature Stability

Name: 8890

Setpoint Status: Pass

Setpoint/Average
Temperature: 100.0 100.1167 °C

Stability: 0.1 °C

Agilent Recommended: <= 0.5

Overall GC Oven Temperature Stability Test Status

Pass

Log Amp

Tested Combination1 Front SSL / External SQ

Name: 5977C

Setpoint Status: Pass

Overall Log Amp Test Status

Pass

RFPA

Tested Combination1 Front SSL / External SQ

Name: 5977C

Setpoint Status: Pass

Amu: 1050 m/z Drift After Five Minutes: 1 mV RFP Voltage: 497 mV

Agilent Recommended: >= -100 and <= 100 <= 1100

Overall RFPA Test Status

Pass

Tune EI

Tested Combination1 Front SSL / External SQ

Name: 5977C

Setpoint Status: Pass

Filament: 1

Setpoint Status: Pass

Filament: 2

Overall Tune EI Test Status

Pass

Scouting Run

Tested Combination1	Front	SSL	/ External	SQ
	Injection Tower			
Name:	7693A			
Source:	EI - Extractor			
Setpoint Status:	Completed			
Injection Volume on Column:	1.0 uL			
Overall Scouting Run Status	Completed			

Instrument Detection Limit

Tested Combination1	Front	SSL	/ External	SQ
	Injection Tower			
Name:	7693A			
Source:	EI - Extractor			
Setpoint Status:	Pass			
Injection Volume on Column:	1.0 uL			
Minimum RSD:	Area		Retention Time	
	1.27 %		0.01 %	
Agilent Recommended:	<= 5.00		<= 1.00	
Status:	Pass		Pass	
Instrument Detection Limit:	4.28135 fg			
Agilent Recommended:	<= 16.82500			
Status:	Pass			
Overall Instrument Detection Limit Test Status	Pass			

Mass Ratio Precision

Tested Combination1	Front	SSL	/ External	SQ
	Injection Tower			
Name:	7693A			
Source:	EI - Extractor			
Setpoint Status:	Pass			
Injection Volume on Column:	1.0 uL			
	Area Mass 1		Mass Ratio	
	Abundance*s			
RSD:	2.17 %		0.50 %	
Agilent Recommended:	<= 5.00		<= 5.00	
	Pass		Pass	

Overall Mass Ratio Precision Test Status

Pass

NOTE: This test's 1 comment(s) and 0 deviation(s) are available in the Attachments section.

Instrument Details

Purpose

This section describes the as found system configuration.

Details

Tested Combination1

Injection Technique	Injection Tower
Inlet	Front
Detector	External
LTM Included?	No

Sampler 1

Manufacturer	Agilent Technologies
Type	Injection Tower
Name	7693A
Model Number	G4513A
Serial Number	CN23125102
Firmware Revision	A.11.07
Usage	Sample Injection
Location	Front
Syringe Volume (µL)	10

Sampler 2

Manufacturer	Agilent Technologies
Type	Tray
Name	7693A
Model Number	G4514A
Serial Number	CN23147049
Firmware Revision	A.12.03
Vial Heater	Not installed

Mainframe 1

Manufacturer	Agilent Technologies
Name	8890
Model Number	G3540A
Serial Number	CN2303A031
Firmware Revision	2.B.1.6
Oven Type	Standard

Inlet 1

Manufacturer	Agilent Technologies
Name	8890
Type	SSL
Location	Front
Carrier Gas	Helium
Control Type	Electronic Pressure Control (EPC)
Purged Inlet	Yes

Mass Spectrometer 1

Manufacturer	Agilent Technologies
Type	SQ
Name	5977C
Model Number	G7077C
Serial Number	US2307MA35
Firmware Revision	6.00.35
Rough Pump	Wet Mechanical Vacuum Pump
High Vacuum System	Turbo Pump
Scouting Run Standard	OFN Std

Electronic Signature

Purpose

This signature page was created and published because the ACE sign-off action was executed, which is valid for the entire document, including attachments. The ACE sign-off is an electronic signature that requires two distinct identification components: unique username and personal password. The Agilent representative who has delivered this service understands the meaning and legal status of an electronic signature. As a trained official operator, the Agilent representative has a unique password and login to access ACE and electronically sign this document. (Other e-signatures can be applied to this document using a Document Content Management or other suitable method defined in your data access and control procedures.)

Details

Full Name of Signer:	Phuwanai Yoktragul
Logged On User Name:	phuwanai.yoktragul@agilent.com
Signature Creation Date:	May 9, 2025
Reason for Signature:	Executed protocol and published this original version of document

ACE Self Qualification Status

The installed version of ACE used to deliver this service passed qualification; the results conform with expected values. The self qualification summary report is available in the session folder location SDS\ClearStore\AceSelfQualification.

Regulatory Disclaimer

This document provides a protocol to verify and record instrument configuration and evidence of proper operation. It has been prepared from our interpretation of applicable regulations as well as industry best practices. The document is designed to provide an important component of a complete compliance package. Validation depends upon many factors and use of this protocol alone does not assure compliance. Agilent Technologies makes no promises or representations as to its sufficiency for any specific regulatory program.

Warranty

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User Name: phuwanai.yoktragul				System Id: GM-12
Report Generated by Hostname: 5CG9217CJG				Print Date: May 9, 2025 3:29:17 PM
OQ2025_GM-12 Transaction log :				
Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 8, 2025 2:38:52 PM	Audit	SessionCreated	Session	Host Name: 5CG9217CJG, Drive Serial Number: BC4F1A47
May 8, 2025 2:38:52 PM	start	Configuration	Session	None
May 8, 2025 2:38:52 PM	Audit	Entitlement	Licensing	User is FieldEngineer and does not require an unlock code
May 8, 2025 2:41:01 PM	Audit	EqplLoaded	Session	EQP details for primary technique [Gc] - File path: [ProtocolPacks\Gc\Configuration\02.53\Gc.02.53.eqp], EQP File Name: [Gc.02.53.eqp], EQP Name: [AgilentRecommended], Protocol Revision: [Gc.02.53] EQP details for hyphenated technique [GcMs] - File path: [ProtocolPacks\GcMs\Configurations\02.54\GcMs.02.54.eqp], EQP File Name: [GcMs.02.54.eqp], EQP Name: [AgilentRecommended]
May 8, 2025 2:41:05 PM	End	Configuration	Session	None
May 8, 2025 2:41:09 PM	start	Qualification	Session	OQ
May 8, 2025 2:41:10 PM	start	Execution	CDS Logon Verification - GC - 8890 - Qualitative test	None
May 8, 2025 2:42:42 PM	End	Execution	CDS Logon Verification - GC - 8890 - Qualitative test	Run Count: 1
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User Name: phuwanai.yoktragul
Report Generated by Hostname: 5CG9217CJG

System Id: GM-12
Print Date: May 9, 2025 3:29:17 PM

OQ2025_GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 8, 2025 2:43:00 PM	start	Execution	System Inspection and Basic Safety and Operation - 8890; - Qualitative Test - No setpoints associated	None
May 8, 2025 2:43:16 PM	End	Execution	System Inspection and Basic Safety and Operation - 8890; - Qualitative Test - No setpoints associated	Run Count : 1
May 8, 2025 2:43:21 PM	start	Execution	Inlet Pressure Accuracy - Front SSL; - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
May 8, 2025 2:44:22 PM	End	Execution	Inlet Pressure Accuracy - Front SSL; - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count : 1
May 8, 2025 2:44:28 PM	start	Execution	GC Oven Temperature Accuracy - 8890; - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
May 8, 2025 2:52:02 PM	Audit	Data	GC Oven Temperature Accuracy - 8890; - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
May 8, 2025 2:52:05 PM	End	Execution	GC Oven Temperature Accuracy - 8890; - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count : 1
May 8, 2025 2:52:13 PM	start	Execution	GC Oven Temperature Accuracy - 8890; - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
May 8, 2025 3:01:36 PM	Audit	Data	GC Oven Temperature Accuracy - 8890; - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry

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User Name: phuwanai.yoktragul
Report Generated by Hostname: 5CG9217CJG

System Id: GM-12
Print Date: May 9, 2025 3:29:17 PM

OQ2025_GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 8, 2025 3:01:39 PM	End	Execution	GC Oven Temperature Accuracy - 8890; - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count : 1
May 8, 2025 3:01:42 PM	start	Execution	GC Oven Temperature Stability - 8890; - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	None
May 8, 2025 3:20:17 PM	Audit	Data	GC Oven Temperature Stability - 8890; - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Manual Data Entry
May 8, 2025 3:20:19 PM	End	Execution	GC Oven Temperature Stability - 8890; - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Run Count : 1
May 8, 2025 3:20:42 PM	start	Execution	Log Amp - 5977C SQ; - Source: EI - Extractor	None
May 8, 2025 3:25:45 PM	End	Execution	Log Amp - 5977C SQ; - Source: EI - Extractor	Run Count : 1
May 8, 2025 3:25:48 PM	start	Execution	RFPD - 5977C SQ; - Source: EI - Extractor	None
May 8, 2025 3:36:10 PM	End	Execution	RFPD - 5977C SQ; - Source: EI - Extractor	Run Count : 1
May 8, 2025 3:36:50 PM	start	Execution	Tune EI - 5977C SQ; - Source: EI - Extractor Filament 1 (Qualitative - No setpoints associated)	None
May 8, 2025 3:43:21 PM	End	Execution	Tune EI - 5977C SQ; - Source: EI - Extractor Filament 1 (Qualitative - No setpoints associated)	Run Count : 1
May 8, 2025 3:43:27 PM	start	Execution	Tune EI - 5977C SQ; - Source: EI - Extractor Filament 2 (Qualitative - No setpoints associated)	None

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User Name: phuwanai.yoktragul
Report Generated by Hostname: SCG9217CJG

System Id: GM-12
Print Date: May 9, 2025 3:29:17 PM

OQ2025_GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 8, 2025 3:45:57 PM	End	Execution	Tune EI - 5977C-SQ: - Source: - Run Count : 1 EI - Extractor Filament 2 (Qualitative - No setpoints associated)	
May 8, 2025 3:46:04 PM	Audit	AccClosed	Session	None
May 9, 2025 9:33:04 AM	Audit	AccRestarted	Session	Host Name: SCG9217CJG, Drive Serial Number: BCAF1A47
May 9, 2025 9:33:06 AM	Audit	SessionReloaded	Session	None
May 9, 2025 9:33:59 AM	start	Qualification	Session	OQ
May 9, 2025 9:34:19 AM	start	Execution	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor- Part of GCMS System Preparation	None
May 9, 2025 9:35:36 AM	start	Execution	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	None
May 9, 2025 9:39:00 AM	start	Execution	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor- Part of GCMS System Preparation	None
May 9, 2025 9:39:03 AM	start	Execution	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	None
May 9, 2025 9:43:57 AM	start	Execution	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor- Part of GCMS System Preparation	None

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Date: May 9, 2025 3:29:14 PM
System ID: GM-12

User Name: phuwanai.yoktragul
Report Generated by Hostname: SCG9217CJG

System Id: GM-12
Print Date: May 9, 2025 3:29:17 PM

OQ2025_GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 9, 2025 10:04:26 AM	start	Execution	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	None
May 9, 2025 10:04:28 AM	start	Execution	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor- Part of GCMS System Preparation	None
May 9, 2025 1:12:30 PM	start	Execution	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	None
May 9, 2025 3:02:09 PM	start	Execution	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor- Part of GCMS System Preparation	None
May 9, 2025 3:03:52 PM	Audit	Data	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor- Part of GCMS System Preparation	Data files Path : C:\Users\yoktragul\Downloads VALS_OQ2025\OQ2025\OQ2 025\SC_OPN.D
May 9, 2025 3:04:25 PM	Audit	Reporting	Reintegration	Reintegration Count: 1 -- [Integration Type: Injection,Baseline Correction Mode: Advanced,Initial Slope Sensitivity: 10,Initial Peak Width: 0.01,Initial Area Reject: 0,Initial Height Reject: 150,Integration: Off at 0,Integration: On at 4]

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Date: May 9, 2025 3:29:14 PM
System ID: GM-12

User Name: phuwanai.yoktragu
Report Generated by Hostname: 5CG9217CJG

System Id: GM-12
Print Date: May 9, 2025 3:29:17 PM

OQ2025_GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 9, 2025 3:04:39 PM	Audit	Reporting	Reintegration	Reintegration Count: 2 - [Integration Type: Injection; Baseline Correction Mode: Advanced; Initial Slope Sensitivity: 10; Initial Peak Width: 0.01; Initial Area Reject: 0; Initial Height Reject: 100; Integration: Off at 0; Integration: On at 4]
May 9, 2025 3:04:46 PM	Audit	Reporting	Reintegration	Reintegration Count: 3 - [Integration Type: Injection; Baseline Correction Mode: Advanced; Initial Slope Sensitivity: 10; Initial Peak Width: 0.02; Initial Area Reject: 0; Initial Height Reject: 100; Integration: Off at 0; Integration: On at 4]
May 9, 2025 3:05:17 PM	End	Execution	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - Part of GCMS System Preparation	Run Count : 1
May 9, 2025 3:05:21 PM	start	Execution	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	None
May 9, 2025 3:07:51 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : C:\Users\yoktragu\Downloads\VALS_OQ2025\OQ2025\IDL2.D

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Date: May 9, 2025 3:29:14 PM
System ID: GM-12

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User Name: phuwanai.yoktragu
Report Generated by Hostname: 5CG9217CJG

System Id: GM-12
Print Date: May 9, 2025 3:29:17 PM

OQ2025_GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 9, 2025 3:07:51 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : C:\Users\yoktragu\Downloads\VALS_OQ2025\OQ2025\IDL3.D
May 9, 2025 3:07:51 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : C:\Users\yoktragu\Downloads\VALS_OQ2025\OQ2025\IDL4.D
May 9, 2025 3:07:51 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : C:\Users\yoktragu\Downloads\VALS_OQ2025\OQ2025\IDL5.D
May 9, 2025 3:07:51 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : C:\Users\yoktragu\Downloads\VALS_OQ2025\OQ2025\IDL6.D
May 9, 2025 3:07:51 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : C:\Users\yoktragu\Downloads\VALS_OQ2025\OQ2025\IDL7.D
May 9, 2025 3:07:51 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : C:\Users\yoktragu\Downloads\VALS_OQ2025\OQ2025\IDL8.D
May 9, 2025 3:07:51 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : C:\Users\yoktragu\Downloads\VALS_OQ2025\OQ2025\IDL9.D

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Date: May 9, 2025 3:29:14 PM
System ID: GM-12

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User Name: phuwanai.yoktragul
Report Generated by Hostname: SCG9217CJG

System Id: GM-12
Print Date: May 9, 2025 3:29:17 PM

OQ2025_GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 9, 2025 3:07:51 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : C:\Users\yoktragul\Downloads\VALS_OQ2025\OQ2025\IDL10.D
May 9, 2025 3:07:51 PM	Audit	Data	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Data files Path : C:\Users\yoktragul\Downloads\VALS_OQ2025\OQ2025\IDL11.D
May 9, 2025 3:08:43 PM	Audit	Reporting	Reintegration	Reintegration Count: 1 - [Integration Type: Injection; Baseline Correction Mode: Advanced; Initial Slope Sensitivity: 10; Initial Peak Width: 0.01; Initial Area Reject: 0; Initial Height Reject: 50; Integration: Off at 0; Integration: On at 4.6]
May 9, 2025 3:09:07 PM	Audit	Reporting	Reintegration	Reintegration Count: 2 - [Integration Type: Injection; Baseline Correction Mode: Advanced; Initial Slope Sensitivity: 10; Initial Peak Width: 0.01; Initial Area Reject: 0; Initial Height Reject: 200; Integration: Off at 0; Integration: On at 4.6]
May 9, 2025 3:10:29 PM	End	Execution	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Run Count : 1

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Date: May 9, 2025 3:29:14 PM
System ID: GM-12

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User Name: phuwanai.yoktragul
Report Generated by Hostname: SCG9217CJG

System Id: GM-12
Print Date: May 9, 2025 3:29:17 PM

OQ2025_GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 9, 2025 3:11:01 PM	start	Execution	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	None
May 9, 2025 3:12:51 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : C:\Users\yoktragul\Downloads\VALS_OQ2025\OQ2025\MRP5.D
May 9, 2025 3:12:51 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : C:\Users\yoktragul\Downloads\VALS_OQ2025\OQ2025\MRP6.D
May 9, 2025 3:12:51 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : C:\Users\yoktragul\Downloads\VALS_OQ2025\OQ2025\MRP7.D
May 9, 2025 3:12:51 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : C:\Users\yoktragul\Downloads\VALS_OQ2025\OQ2025\MRP8.D
May 9, 2025 3:12:51 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : C:\Users\yoktragul\Downloads\VALS_OQ2025\OQ2025\MRP9.D
May 9, 2025 3:12:51 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : C:\Users\yoktragul\Downloads\VALS_OQ2025\OQ2025\MRP10.D

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Date: May 9, 2025 3:29:14 PM
System ID: GM-12

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User Name: phuwanai.yoktragulSystem id: GM-12
Report Generated by Hostname: 5CG9217CJGPrint Date: May 9, 2025 3:29:17 PM

OQ2025_GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 9, 2025 2:13:49 PM	Audit	Reporting	Reintegration	Reintegration Count: 1 -- [Integration Type: Injection;Baseline Correction Mode: Advanced;Initial Slope Sensitivity: 10;Initial Peak Width: 0.01;Initial Area Reject: 0;Initial Height Reject: 50000;Integration: Off at 0;Integration: On at 2]
May 9, 2025 3:15:04 PM	End	Execution	Mass Ratio Precision - Injection Tower, Front SST, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Run Count : 1
May 9, 2025 3:16:15 PM	End	Qualification	Session	OQ
May 9, 2025 3:16:15 PM	start	Reporting	Session	None
May 9, 2025 3:26:19 PM	Audit	Reporting	Session	Report Generated : Certificate
May 9, 2025 3:27:20 PM	Audit	Reporting	Session	Report Generated : Report
May 9, 2025 3:28:25 PM	Audit	Reporting	Session	Report Generated : Report with Certificate



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รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Workplace	Acrylonitrile / Styrene	DRYCAL FLOWMETER	RYG_FS0208	27-Jan-25	26-Jan-26	12
Workplace		DRYCAL FLOWMETER	BKK_FS0614	9-Sep-24	9-Sep-25	12
Workplace		Air Sampling Pump	RYG_FS0369	7-Jul-25	7-Oct-25	3
Workplace		Air Sampling Pump	RYG_FS0677	2-Jul-25	2-Oct-25	3
Workplace		Air Sampling Pump	RYG_FS0737	2-Jul-25	2-Oct-25	3
Workplace		Air Sampling Pump	RYG_FS0736	2-Jul-25	2-Oct-25	3
Workplace		Air Sampling Pump	RYG_FS0735	2-Jul-25	2-Oct-25	3
Workplace		Air Sampling Pump	RYG_FS0741	2-Jul-25	2-Oct-25	3
Workplace	Acrylonitrile	GC-FID	BKK_EN0126	22-Oct-24	22-Apr-26	18
Workplace	Styrene	GC-MSD	BKK_EN0410	10-May-24	10-Nov-25	12

INNOVATIVE INSTRUMENT CALIBRATION LAB

INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE

7/139 MOO 13, SOI SUNTINAKORN 11 TAMBON BANG KAE0.

AMPHOE BANG PHU SAMUT PRAKAN PROVINCE 10540 THAILAND.

TEL: (660-2)116-5860-1 FAX: (660-2)116-7140



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Certificate of Calibration

Customer

Name : ALS Laboratory Group Thailand Co., Ltd.

Address : 104 Soi Phatthanakan 40, Phatthanakan Road, Suan Luang,
Bangkok 10250

Certificate No : 25-AFM-023

Request No : Req-2025-0169

Unit Under Calibration Details

Measurement Item : Air Flow Meter

Manufacturer : Mesa Labs

Accuracy : 1% of Reading

Model : 200-510L

Sensor Model : -

Serial Number : 130027

Sensor Serial Number : -

ID : RYG_FS0208

Instrument Status : Used

Location of Calibration : LAB 4 AIR VELOCITY METER

Calibration Environment and Details

Temperature : 23 °C ± 3 °C

Humidity : 55 %RH ± 20 %RH

Barometric Pressure : 1013 hPa ± 10 hPa

Received Date : 21 January 2025

Calibration Date : 27 January 2025

Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator

Reference Standard	Model	Serial Number	Traceble	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	18501010006	Sensidyne	6 August 2025
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	2 August 2025
Temperature meter	GT 11	08000057	Qreborn	1 March 2025
Pressure meter	CPG2400	41000KDU/651882	TPA	21 October 2025

Traceability :

This Certificate is traceable to SI Unit through Sensidyne A2LA Accreditation No. 3943.01

Note :

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %.

Calibration By :
Mr. Noppadon Luangart
Service Calibration Engineer

Approved By :
Mr. Pacit Mathavorn
Calibration Engineer Supervisor
Issue Date : 27 January 2025

Certificate No : 25-AFM-023
Request No : Req-2025-0169

Result of Calibration : Without Adjustment

Temperature (^o C)	Pressure (kPa)	STD (cc/min)	UUC (cc/min)	Error (cc/min)	Uncertainty (cc/min)	MPE (cc/min)	Result
22.50	100.90	20	19.854	-0.1	1.3	0.2	Pass1
22.50	100.90	50	49.732	-0.3	3.3	0.5	Pass1
22.60	100.90	101	100.77	-0.2	2.8	1.0	Pass1
22.70	100.90	151	150.23	-0.8	4.2	1.5	Pass1
22.70	100.90	201	200.39	-0.6	5.6	2.0	Pass1
22.70	100.90	301	300.69	-0.3	8.4	3.0	Pass1
22.80	100.90	400	402.96	3.0	11	4.0	Pass1
23.10	100.90	500	504.62	4.6	7.2	5.0	Pass1

Note STD : Standard UUC : Unit Under Calibration
- UUC Reference Condition : At atmospheric pressure and room temperature condition
- Flow Rate was corrected for non-standard operating condition by using equation :

$$Q_{meas} = Q_{ref} \times \frac{P_{ref}}{P_{meas}} \times \frac{T_{meas}}{T_{ref}}$$

where Q = Flow Rate P = Absolute Pressure T = Absolute Temperature
Meas = Measurement Condition ref = Standard Condition

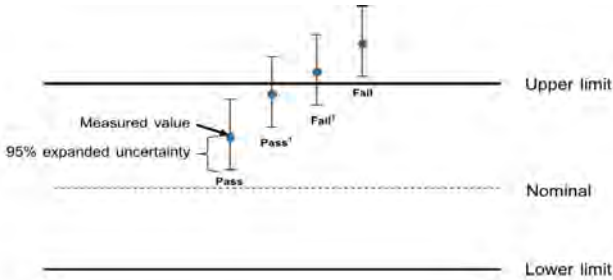
* Indicates non accredited
MPE = Maximum Permissible Error (Specified in Manufacturer's Specifications)
N/A = Not Aavailable, Customer does not require a statement of conformity.

Certificate No : 25-AFM-023
Request No : Req-2025-0169

Decision Rule for Statements of Conformity

The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09/2019; Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

Pass = The measurement result plus the expanded uncertainty with a 95% coverage probability were within the limit.
Pass¹ = The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.
Fail¹ = The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.
Fail = The measurement result plus the expanded uncertainty with a 95% coverage probability were outside the limit.



End of Certificate



Certificate of Calibration

Customer

Name : ALS Laboratory Group Thailand Co., Ltd.
Address : 104 Soi Phatthanakan 40, Phatthanakan Road, Suan Luang,
Bangkok 10250

Certificate No : 24-AFM-179
Request No : Req-2024-1987

Unit Under Calibration Details

Measurement Item : Air Flow Meter
Manufacturer : MesaLabs
Model : Defender 510-M
Serial Number : I51114
ID : BKK_FS0614
Location of Calibration : LAB 4 AIR VELOCITY METER
Accuracy : 1% of Reading
Sensor Model : -
Sensor Serial Number : -
Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 30 August 2024
Calibration Date : 9 September 2024



Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator

Reference Standard	Model	Serial Number	Traceble	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	18501010006	Sensidyne	6 August 2025
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	2 August 2025
Temperature meter	GT 11	08000057	Qreborn	1 March 2025
Pressure meter	CPG2400	41000KDU/651882	TPA	9 November 2024

Traceability :

This Certificate is traceable to SI Unit through Sensidyne A2LA Accreditation No, 3943.01

Note :

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %.

Calibration By : Mr. Noppadon Luangart
Service Calibration Engineer

Approved By : Mr. Pacit Mathavorn
Calibration Engineer Supervisor

Issue Date : 9 September 2024



Certificate No : 24-AFM-179
Request No : Req-2024-1987

Result of Calibration : Without Adjustment

Temperature (°C)	Pressure (kPa)	STD (cc/min)	UUC (cc/min)	Error (cc/min)	Uncertainty (cc/min)	MPE (cc/min)	Result
24.70	100.95	100	100.41	0.4	2.8	1.0	N/A
24.90	100.90	502	500.47	-1.5	7.1	5.0	N/A
24.90	100.97	1003	1001.3	-2	14	10.0	N/A
25.00	100.92	2014	2009.9	-4	29	20.1	N/A
25.20	101.03	3043	3058.3	15	44	30.4	N/A
25.30	101.10	4043	4005.1	-38	57	40.4	N/A
25.50	101.15	5052	5003.9	-48	74	50.5	N/A

Note : STD : Standard UUC : Unit Under Calibration
- UUC Reference Condition : At atmospheric pressure and room temperature condition
- Flow Rate was corrected for non-standard operating condition by using equation :

$$Q_{meas} = Q_{ref} \times \frac{P_{ref}}{P_{meas}} \times \frac{T_{meas}}{T_{ref}}$$

where Q = Flow Rate P = Absolute Pressure T = Absolute Temperature
Meas = Measurement Condition ref = Standard Condition

* Indicates non accredited
MPE = Maximum Permissible Error (Specified in Manufacturer's Specifications)
N/A = Not Aavailable, Customer does not require a statement of conformity.

Certificate No : 24-AFM-179

Request No : Req-2024-1987

Decision Rule for Statements of Conformity

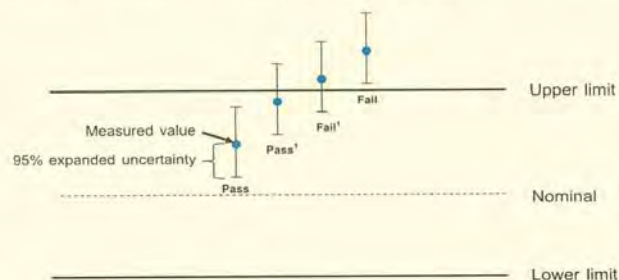
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09/2019: Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

Pass = The measurement result plus the expanded uncertainty with a 95% coverage probability were within the limit.

Pass¹ = The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail¹ = The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

Fail = The measurement result plus the expanded uncertainty with a 95% coverage probability were outside the limit.



End of Certificate

Certificate of Calibration

Certificate No. C-070725-RYG_FS0369

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gillan
Model/Type : GilAir Plus
Equipment ID : RYG_FS0369
Serial No. : 20180610062
Calibration Date : 07-Jul-25
Next calibration date : 07-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L
Equipment ID : RYG_FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M
Equipment ID : BKK_FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)	
	1	2	3					
Low Flow								
20	19.8	20.2	20.7	20.2	5%	19 - 21	Passed	
50	50.1	50.2	49.9	50.1	5%	48 - 53	Passed	
100	100.0	99.7	100.4	100.0	5%	95 - 105	Passed	
200	199.0	199.1	198.6	198.9	5%	190 - 210	Passed	
High Flow								
500	501.9	501.2	500.9	501.3	3%	485 - 515	Passed	
1000	1003.4	1002.4	1001.2	1002.3	3%	970 - 1030	Passed	
2000	2002.2	1999.5	2000.2	2000.6	3%	1940 - 2060	Passed	
2500	2503.4	2501.3	2502.7	2502.5	3%	2425 - 2575	Passed	

END OF REPORT

Calibrated By:

(Mr. Amnat Wongsakhen)

RYG Field Services Scientist (1)

Issue date : 08-Jul-25

Approved By:

(Mr. Supot Salamteh)

Field Services Section Head



Certificate of Calibration

Certificate No. C-020725-RYG_FS0677

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus
Equipment ID : RYG_FS0677
Serial No. : 20230810013
Calibration Date : 02-Jul-25
Next calibration date : 02-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L
Equipment ID : RYG_FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M
Equipment ID : BKK_FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	19.7	19.8	19.7	19.7	5%	19 - 21	Passed
50	50.2	50.4	50.1	50.2	5%	48 - 53	Passed
100	101.7	101.9	101.9	101.8	5%	95 - 105	Passed
200	202.8	202.0	202.3	202.4	5%	190 - 210	Passed
High Flow							
500	502.4	501.6	502.5	502.2	3%	485 - 515	Passed
1000	1001.8	1005.6	1000.1	1002.5	3%	970 - 1030	Passed
2000	2002.2	2001.9	2003.4	2002.5	3%	1940 - 2060	Passed
2500	2500.5	2502.0	2500.3	2500.9	3%	2425 - 2575	Passed

END OF REPORT

Calibrated By:

(Mr. Amnat Wongsakhen)

RYG Field Services Scientist (1)

Issue date : 03-Jul-25

Approved By:

(Mr. Supot Salamteh)

Field Services Section Head



Certificate of Calibration

Certificate No. C-020725-RYG_FS0737

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus
Equipment ID : RYG_FS0737
Serial No. : 20241110175
Calibration Date : 02-Jul-25
Next calibration date : 02-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L
Equipment ID : RYG_FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M
Equipment ID : BKK_FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	19.4	19.6	19.5	19.5	5%	19 - 21	Passed
50	50.0	49.8	50.2	50.0	5%	48 - 53	Passed
100	100.6	100.6	100.5	100.6	5%	95 - 105	Passed
200	199.4	199.9	200.0	199.8	5%	190 - 210	Passed
High Flow							
500	506.9	507.7	508.8	507.8	3%	485 - 515	Passed
1000	1009.8	1004.4	1013.1	1009.1	3%	970 - 1030	Passed
2000	2006.4	2004.6	2003.3	2004.8	3%	1940 - 2060	Passed
2500	2506.5	2508.6	2503.4	2506.2	3%	2425 - 2575	Passed

END OF REPORT

Calibrated By:

(Mr. Nantawat Sarin)

RYG Field Services Scientist (1)

Issue date : 03-Jul-25

Approved By:

(Mr. Supot Salamteh)

Field Services Section Head



Certificate of Calibration

Certificate No. C-020725-RYG FS0736

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus
Equipment ID : RYG FS0736
Serial No. : 20241110174
Calibration Date : 02-Jul-25
Next calibration date : 02-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L
Equipment ID : RYG FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M
Equipment ID : BKK FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	20.7	20.9	20.7	20.8	5%	19 - 21	Passed
50	50.0	49.3	49.7	49.7	5%	48 - 53	Passed
100	100.4	100.2	100.0	100.2	5%	95 - 105	Passed
200	198.2	198.7	198.0	198.3	5%	190 - 210	Passed
High Flow							
500	499.4	497.6	498.3	498.4	3%	485 - 515	Passed
1000	1009.5	1003.3	1005.0	1005.9	3%	970 - 1030	Passed
2000	1996.1	1994.3	1995.9	1995.4	3%	1940 - 2060	Passed
2500	2503.4	2499.6	2500.4	2501.1	3%	2425 - 2575	Passed

END OF REPORT

Calibrated By:

(Mr. Nantawat Sarin)

RYG Field Services Scientist (1)

Issue date : 03-Jul-25

Approved By:

(Mr. Supot Salamteh)

Field Services Section Head



Certificate of Calibration

Certificate No. C-020725-RYG FS0735

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus
Equipment ID : RYG FS0735
Serial No. : 20241110173
Calibration Date : 02-Jul-25
Next calibration date : 02-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L
Equipment ID : RYG FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M
Equipment ID : BKK FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	19.4	19.2	19.1	19.2	5%	19 - 21	Passed
50	50.8	50.9	51.0	50.9	5%	48 - 53	Passed
100	101.9	101.6	101.5	101.7	5%	95 - 105	Passed
200	199.7	199.6	199.7	199.7	5%	190 - 210	Passed
High Flow							
500	500.8	503.0	501.7	501.8	3%	485 - 515	Passed
1000	1000.4	999.6	1002.6	1000.9	3%	970 - 1030	Passed
2000	2012.2	2015.0	2008.8	2012.0	3%	1940 - 2060	Passed
2500	2493.7	2494.5	2498.6	2495.6	3%	2425 - 2575	Passed

END OF REPORT

Calibrated By:

(Mr. Nantawat Sarin)

RYG Field Services Scientist (1)

Issue date : 03-Jul-25

Approved By:

(Mr. Supot Salamteh)

Field Services Section Head

ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Phatthanakan, Suan Luang, Bangkok 10250
T +66 2 760 3000 F +66 2 760 3197



Certificate of Calibration

Certificate No. C-020725-RYG FS0741

Air Sampling Pump Detail

Equipment name : Personal Air Sampling Pump
Brand : Gilian
Model/Type : GilAir Plus
Equipment ID : RYG_FS0741
Serial No. : 20241110179
Calibration Date : 02-Jul-25
Next calibration date : 02-Oct-25

Reference Standard Low Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-L
Equipment ID : RYG_FS0208
Serial No. : 130027
Calibration Date : 27-Jan-25
Due Date : 26-Jan-26

Reference Standard High Flow Meter

Equipment name : Air Flow Meter
Brand : MesaLabs
Model/Type : Defender 510-M
Equipment ID : BKK_FS0614
Serial No. : 151114
Calibration Date : 9-Sep-24
Due Date : 9-Sep-25

Calibration Data

Air Sampling Pump setting (cc/min)	Reference Std. Flow Reading (cc/min)			Avg. (cc/min)	%Error acceptance	Acceptable range (cc/min)	Evaluation (Pass/ Fail)
	1	2	3				
Low Flow							
20	19.4	19.6	19.8	19.6	5%	19 - 21	Passed
50	48.9	48.7	48.3	48.6	5%	48 - 53	Passed
100	100.4	99.6	100.5	100.2	5%	95 - 105	Passed
200	201.3	199.1	202.0	200.8	5%	190 - 210	Passed
High Flow							
500	501.0	501.9	502.0	501.6	3%	485 - 515	Passed
1000	1005.6	1006.2	1006.7	1006.2	3%	970 - 1030	Passed
2000	2010.2	2012.3	2011.5	2011.3	3%	1940 - 2060	Passed
2500	2513.2	2514.5	2515.3	2514.3	3%	2425 - 2575	Passed

END OF REPORT

Calibrated By: *Nantawat Sarin*

(Mr. Nantawat Sarin)

RYG Field Services Scientist (1)

Issue date : 03-Jul-25

Approved By: *Supot Salamteh*

(Mr. Supot Salamteh)

Field Services Section Head

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Agilent CrossLab Compliance Services

Certificate of System Qualification

GC-OQ

System ID: GC-6_CN11461066
Organization Name: ALS Laboratory Group (Thailand) Co., Ltd.
Organization Location: 104 Soi 40 Phatthanakan Rd,Khwang Suan Luang, Khet Suan Luang, Bangkok 10250

Date: October 22, 2024 9:27:05 AM
EQP Name: AgilentRecommended
EQP Revision: GC.02.53
Overall Qualification Status: Pass

REVIEW BY *Juda K*
APPROVED BY *Tamratom M.*
NEXT CAL. DATE *22 Apr 2026*

CDS Logon Verification - GC

Logon: Saenguthai Tarak

Overall CDS Logon Verification - GC Test Status

Pass

System Inspection and Basic Safety and Operation

Name: 7890

Setpoint Status: Pass

Overall System Inspection and Basic Safety and Operation Test Status

Pass

Inlet Pressure Decay

Name: 7890

Front SSL

Setpoint Status: Pass

Pressure: 25.0 psi

Pressure Change: 0.0 psi /5 minutes

Agilent Recommended: >= -2.0 and <= 0.5

Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

Overall Inlet Pressure Decay Test Status

Pass

Inlet Pressure Accuracy

Name: 7890
Front SSL

Setpoint Status: Pass

Inlet Pressure: Setpoint 25.0 psi Actual 25.07 psi
Accuracy: 0.1 psi
Agilent Recommended: ≤ 1.2

Overall Inlet Pressure Accuracy Test Status

Pass

Inlet Pressure Decay

Name: 7890
Back SSL

Setpoint Status: Pass

Pressure: 25.0 psi
Pressure Change: 0.0 psi /5 minutes
Agilent Recommended: ≥ -2.0 and ≤ 0.5

Overall Inlet Pressure Decay Test Status

Pass

Inlet Pressure Accuracy

Name: 7890
Back SSL

Setpoint Status: Pass

Inlet Pressure: Setpoint 25.0 psi Actual 25.06 psi
Accuracy: 0.1 psi
Agilent Recommended: ≤ 1.2

Overall Inlet Pressure Accuracy Test Status

Pass

Detector Flow Accuracy

Name: 7890
Front FID

Setpoint Status: Pass

Flow Type: Fuel
Setpoint: 30.0 mL/min Measured Flow: 28.8 mL/min
Accuracy: 1.2 mL/min
Agilent Recommended: ≤ 10.0 % setpoint (3.0 mL/min)
Limit is percentage of setpoint or 0.5 mL/minute, whichever is largest.

Setpoint Status: Pass

Flow Type: Oxidizer
Setpoint: 400.0 mL/min Measured Flow: 392 mL/min
Accuracy: 8.0 mL/min
Agilent Recommended: ≤ 10.0 % setpoint (40.0 mL/min)
Limit is percentage of setpoint or 0.5 mL/minute, whichever is largest.

Setpoint Status: Pass

Flow Type: Makeup
Setpoint: 25.0 mL/min Measured Flow: 25.4 mL/min
Accuracy: 0.4 mL/min
Agilent Recommended: ≤ 10.0 % setpoint (2.5 mL/min)
Limit is percentage of setpoint or 0.5 mL/minute, whichever is largest.

Overall Detector Flow Accuracy Test Status

Pass

Detector Flow Accuracy

Name: 7890
Back FID

Setpoint Status: Pass

Flow Type: Fuel
Setpoint: 30.0 mL/min Measured Flow: 30.8 mL/min

Accuracy: 0.8 mL/min
Agilent Recommended: ≤ 10.0 % setpoint (3.0 mL/min)

Limit is percentage of setpoint or 0.5 ml/minute, whichever is largest.

Setpoint Status: Pass

Flow Type: Oxidizer
Setpoint: 400.0 mL/min Measured Flow: 393 mL/min

Accuracy: 7.0 mL/min
Agilent Recommended: ≤ 10.0 % setpoint (40.0 mL/min)

Limit is percentage of setpoint or 0.5 ml/minute, whichever is largest.

Setpoint Status: Pass

Flow Type: Makeup
Setpoint: 25.0 mL/min Measured Flow: 25.2 mL/min

Accuracy: 0.2 mL/min
Agilent Recommended: ≤ 10.0 % setpoint (2.5 mL/min)

Limit is percentage of setpoint or 0.5 ml/minute, whichever is largest.

Overall Detector Flow Accuracy Test Status

Pass

GC Oven Temperature Accuracy

Name: 7890

Date: October 22, 2024 9:27:05 AM

System ID: GC-6_CN11461068

Setpoint Status: Pass

Zone: Oven

Setpoint/Actual

Temperature: 230.0 230.3 °C

Accuracy: 0.3 °C

Agilent Recommended: ≥ -1.0 % setpoint in K (-5.0 °C)

≤ 1.0 % setpoint in K (5.0 °C)

Setpoint Status: Pass

Zone: Oven

Setpoint/Actual

Temperature: 100.0 100.0 °C

Accuracy: 0.0 °C

Agilent Recommended: ≥ -1.0 % setpoint in K (-3.7 °C)

≤ 1.0 % setpoint in K (3.7 °C)

Overall GC Oven Temperature Accuracy Test Status

Pass

GC Oven Temperature Stability

Name: 7890

Setpoint Status: Pass

Setpoint/Average

Temperature: 100.0 100.0167 °C

Stability: 0.1 °C

Agilent Recommended: ≤ 0.5

Overall GC Oven Temperature Stability Test Status

Pass

Scouting Run

Tested Combination1 Front SSL / Front FID

Injection Tower

Name: 7693A

Date: October 22, 2024 9:27:05 AM

System ID: GC-6_CN11461068

Setpoint Status: Completed

Injection Volume on Column: 1.0 uL

Overall Scouting Run Status

Completed

Noise and Drift

Tested Combination1 Front SSL / Front FID

Name: 7890

Setpoint Status: Pass

Base Signal: 14.05 pA

ASTM Noise		Drift	
pA		pA/Hr	
0.05		0.03	
Agilent Recommended: <= 0.10		Agilent Recommended: <= 2.50	
Status: Pass		Status: Pass	

Overall Noise and Drift Test Status

Pass

Injection Precision

Tested Combination1 Front SSL / Front FID

Name: 7693A

Setpoint Status: Pass

Injection Volume on Column: 1.0 uL

Area RSD: 0.30 % Retention Time RSD: 0.63 %

Agilent Recommended: <= 3.00 Agilent Recommended: <= 1.00

Overall Injection Precision Test Status

Pass

Signal to Noise

Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

Tested Combination1 Front SSL / Front FID

Injection Tower

Name: 7890

Setpoint Status: Pass

Signal to Noise: 11078525

Agilent Recommended: >= 300000

Overall Signal to Noise Test Status

Pass

Scouting Run

Tested Combination2 Back SSL / Back FID

Injection Tower

Name: 7693A

Setpoint Status: Completed

Injection Volume on Column: 1.0 uL

Overall Scouting Run Status

Completed

Noise and Drift

Tested Combination2 Back SSL / Back FID

Name: 7890

Setpoint Status: Pass

Base Signal: 13.79 pA

ASTM Noise		Drift	
pA		pA/Hr	
0.05		0.01	
Agilent Recommended: <= 0.10		Agilent Recommended: <= 2.50	
Status: Pass		Status: Pass	

Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

Overall Noise and Drift Test Status

Pass

Injection Precision

Tested Combination2	Back	SSL	/ Back	FID
Name:	7693A			
Setpoint Status:	Pass			
Injection Volume on Column:	1.0	uL		
Area RSD:	1.06	%	Retention Time RSD:	0.93 %
Agilent Recommended:	<=	3.00	<=	1.00

Overall Injection Precision Test Status

Pass

Signal to Noise

Tested Combination2	Back	SSL	/ Back	FID
	Injection Tower			
Name:	7890			
Setpoint Status:	Pass			
Signal to Noise:	1771221			
Agilent Recommended:	>=	300000		

Overall Signal to Noise Test Status

Pass

Instrument Details

Purpose

This section describes the as found system configuration.

Details

System

System ID	GC-6_CN11461066
Manufacturer	Agilent Technologies
Name	7890
Flow Data Input	Manual Data
Temperature Data Input	Manual Data or Other Data Logging

Tested Combination1

Injection Technique	Injection Tower
Sampler Identifier	Sampler 1
Inlet	Front
Detector	Front
LTM Included?	No

Tested Combination2

Injection Technique	Injection Tower
Sampler Identifier	Sampler 2
Inlet	Back
Detector	Back
LTM Included?	No

Sampler 1

Manufacturer	Agilent Technologies
Type	Injection Tower
Name	7693A
Model Number	G4513A
Serial Number	CNCN10340103
Firmware Revision	A.11.06
Usage	Sample Injection
Location	Front
Syringe Volume (uL)	10

Sampler 2

Manufacturer	Agilent Technologies
Type	Injection Tower
Name	7693A
Model Number	G4513A
Serial Number	CN16280128
Firmware Revision	A.11.06
Usage	Sample Injection
Location	Back
Syringe Volume (µL)	10

Sampler 3

Manufacturer	Agilent Technologies
Type	Tray
Name	7693A
Model Number	G4514A
Serial Number	CN15380030
Firmware Revision	A.11.03
Vial Heater	Not installed

Mainframe 1

Manufacturer	Agilent Technologies
Name	7890
Model Number	G3440A
Serial Number	CN11461066
Firmware Revision	A.01.16
Oven Type	Standard

Inlet 1

Manufacturer	Agilent Technologies
Name	7890
Type	SSL
Location	Front
Carrier Gas	Helium
Control Type	Electronic Pressure Control (EPC)
Purged Inlet	Yes

Inlet 2

Manufacturer	Agilent Technologies
Name	7890
Type	SSL
Location	Back
Carrier Gas	Helium
Control Type	Electronic Pressure Control (EPC)
Purged Inlet	Yes

Detector 1

Manufacturer	Agilent Technologies
Name	7890
Type	FID
Adapter	Capillary
Control Type	Electronic Pressure Control (EPC)
Location	Front
Makeup Gas	Nitrogen

Detector 2

Manufacturer	Agilent Technologies
Name	7890
Type	FID
Adapter	Capillary
Control Type	Electronic Pressure Control (EPC)
Location	Back
Makeup Gas	Nitrogen

Electronic Signature

Purpose

This signature page was created and published because the ACE sign-off action was executed, which is valid for the entire document, including attachments. The ACE sign-off is an electronic signature that requires two distinct identification components: unique username and personal password. The Agilent representative who has delivered this service understands the meaning and legal status of an electronic signature. As a trained official operator, the Agilent representative has a unique password and logon to access ACE and electronically sign this document. (Other e-signatures can be applied to this document using a Document Content Management or other suitable method defined in your data access and control procedures.)

Details

Full Name of Signer: Saengulhai Tarak
Logged On User Name: saengulhai.tarak@non.agilent.com
Signature Creation Date: October 22, 2024
Reason for Signature: Executed protocol and published this original version of document

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User Name: saengulhai.tarak
Report Generated by Hostname: LAPTOP-CO3SKOMV
System ID: GC-6_CN11461086
Print Date: October 22, 2024 9:27:06 AM

2024_ALS_GC-6_CN11461086_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2024 3:16:06 PM	Audit	SessionCreated	Session	None
October 21, 2024 3:16:07 PM	Start	Configuration	Session	None
October 21, 2024 3:16:07 PM	Audit	Entitlement	Licensing	User is Nonpaying and does not require an unlock code
October 21, 2024 3:22:40 PM	Audit	EqpLoaded	Session	EOP details for primary technique [Gc] - File path: [ProtocolPacks/Gc/Configurations/02.53/Gc.02.53.eop], EOP File Name: [Gc.02.53.eop], EOP Name: [AgilentRecommended], Protocol Revision :[Gc.02.53]
October 21, 2024 3:22:44 PM	End	Configuration	Session	None
October 21, 2024 3:32:47 PM	Start	Qualification	Session	OQ
October 21, 2024 3:22:48 PM	Start	Execution	CDS Logon Verification - GC-7890: - Qualitative test	None
October 21, 2024 3:23:36 PM	End	Execution	CDS Logon Verification - GC-7890: - Qualitative test	Run Count: 1
October 21, 2024 3:23:45 PM	Start	Execution	System Inspection and Basic Safety and Operation - 7890: - Qualitative Test - No setpoints associated	None
October 21, 2024 3:23:59 PM	End	Execution	System Inspection and Basic Safety and Operation - 7890: - Qualitative Test - No setpoints associated	Run Count: 1

User Name: saenguthai.larak
Report Generated by Hostname: LAPTOP-CQ3SKQMV

System Id: GC-6_CN11461066
Print Date: October 22, 2024 9:27:06 AM

2024_ALS_GC-6_CN11461066_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2024 3:24:01 PM	Start	Execution	Inlet Pressure Decay - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and <= 0.5 psi	None
October 21, 2024 3:25:26 PM	End	Execution	Inlet Pressure Decay - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and <= 0.5 psi	Run Count : 1
October 21, 2024 3:25:28 PM	Start	Execution	Inlet Pressure Accuracy - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
October 21, 2024 3:25:32 PM	End	Execution	Inlet Pressure Accuracy - Front SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count : 1
October 21, 2024 3:25:50 PM	Start	Execution	Inlet Pressure Decay - Back SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and <= 0.5 psi	None
October 21, 2024 3:26:01 PM	End	Execution	Inlet Pressure Decay - Back SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: >= -2.0 psi and <= 0.5 psi	Run Count : 1
October 21, 2024 3:26:05 PM	Start	Execution	Inlet Pressure Accuracy - Back SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
October 21, 2024 3:26:10 PM	End	Execution	Inlet Pressure Accuracy - Back SSL: - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count : 1
October 21, 2024 3:26:12 PM	Start	Execution	Detector Flow Accuracy - Front FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	None

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User Name: saenguthai.larak
Report Generated by Hostname: LAPTOP-CQ3SKQMV

System Id: GC-6_CN11461066
Print Date: October 22, 2024 9:27:06 AM

2024_ALS_GC-6_CN11461066_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2024 3:26:50 PM	Audit	Data	Detector Flow Accuracy - Front FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 21, 2024 3:26:53 PM	End	Execution	Detector Flow Accuracy - Front FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
October 21, 2024 3:26:54 PM	Start	Execution	Detector Flow Accuracy - Front FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	None
October 21, 2024 3:27:10 PM	Audit	Data	Detector Flow Accuracy - Front FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 21, 2024 3:27:13 PM	End	Execution	Detector Flow Accuracy - Front FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
October 21, 2024 3:26:11 PM	Start	Execution	Detector Flow Accuracy - Front FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	None
October 21, 2024 3:29:27 PM	Audit	Data	Detector Flow Accuracy - Front FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 21, 2024 3:29:29 PM	End	Execution	Detector Flow Accuracy - Front FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
October 21, 2024 3:29:30 PM	Start	Execution	Detector Flow Accuracy - Back FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	None
October 21, 2024 3:29:47 PM	Audit	Data	Detector Flow Accuracy - Back FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 21, 2024 3:29:52 PM	End	Execution	Detector Flow Accuracy - Back FID: - Type : Fuel - S: 30.0 mL/min - L: <= 10.0% setpoint	Run Count : 1

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Date: October 22, 2024 9:27:05 AM
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User Name: saenguthai.tarak
Report Generated by Hostname: LAPTOP-CQ3SKQMV

System Id: GC-6_CN11461066
Print Date: October 22, 2024 9:27:06 AM

2024_ALS_GC-6_CN11461066_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2024 3:29:54 PM	Start	Execution	Detector Flow Accuracy - Back FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint.	None
October 21, 2024 3:30:07 PM	Audit	Data	Detector Flow Accuracy - Back FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 21, 2024 3:30:08 PM	End	Execution	Detector Flow Accuracy - Back FID: - Type : Oxidizer - S: 400.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
October 21, 2024 3:30:11 PM	Start	Execution	Detector Flow Accuracy - Back FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	None
October 21, 2024 3:30:34 PM	Audit	Data	Detector Flow Accuracy - Back FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Manual Data Entry
October 21, 2024 3:30:37 PM	End	Execution	Detector Flow Accuracy - Back FID: - Type : Makeup - S: 25.0 mL/min - L: <= 10.0% setpoint	Run Count : 1
October 21, 2024 3:30:38 PM	Start	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
October 21, 2024 3:31:55 PM	Audit	Data	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
October 21, 2024 3:31:57 PM	End	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count : 1

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Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

User Name: saenguthai.tarak
Report Generated by Hostname: LAPTOP-CQ3SKQMV

System Id: GC-6_CN11461066
Print Date: October 22, 2024 8:27:06 AM

2024_ALS_GC-6_CN11461066_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 21, 2024 3:31:59 PM	Start	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
October 21, 2024 3:34:37 PM	Audit	Data	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
October 21, 2024 3:34:39 PM	End	Execution	GC Oven Temperature Accuracy - 7890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count : 1
October 21, 2024 3:34:42 PM	Start	Execution	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	None
October 21, 2024 3:38:05 PM	Audit	Data	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Manual Data Entry
October 21, 2024 3:39:07 PM	End	Execution	GC Oven Temperature Stability - 7890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Run Count : 1
October 21, 2024 3:39:33 PM	Start	Execution	GC Scouting Run - Injection Tower, Front SSL, Front FID: - Part of System Preparation - No limits associated	None
October 21, 2024 3:40:12 PM	Audit	AccClosed	Session	None
October 22, 2024 8:55:47 AM	Audit	AccRestarted	Session	None
October 22, 2024 8:55:50 AM	Audit	SessionReloaded	Session	None
October 22, 2024 8:56:02 AM	Start	Qualification	Session	OQ

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Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

User Name: saenguthai.larak
Report Generated by Hostname: LAPTOP-CQ3SKOMV

System ID: GC-6_CN11461066
Print Date: October 22, 2024 9:27:06 AM

2024_ALS_GC-6_CN11461066_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 22, 2024 8:55:02 AM	Start	Execution	GC Scouting Run - Injection Tower, Front SSL, Front FID: - Part of System Preparation - No limits associated	None
October 22, 2024 8:56:48 AM	Audit	Data	GC Scouting Run - Injection Tower, Front SSL, Front FID: - Part of System Preparation - No limits associated	Data files Path : G:\Data\Front\Front_SC10.D\FID1A.ch
October 22, 2024 8:57:25 AM	End	Execution	GC Scouting Run - Injection Tower, Front SSL, Front FID: - Part of System Preparation - No limits associated	Run Count : 1
October 22, 2024 8:57:39 AM	Start	Execution	Noise and Drift - Front FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	None
October 22, 2024 8:58:03 AM	Audit	Data	Noise and Drift - Front FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	Data files Path : G:\Data\Front\Front_ND10.D\FID1A.ch
October 22, 2024 8:58:37 AM	End	Execution	Noise and Drift - Front FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	Run Count : 1
October 22, 2024 8:58:40 AM	Start	Execution	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	None
October 22, 2024 8:59:06 AM	Audit	Data	Data Manager	Data Manager was in a data verification state but the user chose to start over

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Date: October 22, 2024 9:27:05 AM
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User Name: saenguthai.larak
Report Generated by Hostname: LAPTOP-CQ3SKOMV

System ID: GC-6_CN11461066
Print Date: October 22, 2024 9:27:06 AM

2024_ALS_GC-6_CN11461066_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 22, 2024 9:01:43 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Front\Front_IP0105.D\FID1A.ch
October 22, 2024 9:01:43 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Front\Front_IP0106.D\FID1A.ch
October 22, 2024 9:01:43 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Front\Front_IP0107.D\FID1A.ch
October 22, 2024 9:01:43 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Front\Front_IP0108.D\FID1A.ch
October 22, 2024 9:01:43 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Front\Front_IP0109.D\FID1A.ch
October 22, 2024 9:01:43 AM	Audit	Data	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Front\Front_IP0110.D\FID1A.ch
October 22, 2024 9:02:11 AM	End	Execution	Injection Precision - Injection Tower, Front SSL, Front FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Run Count : 1
October 22, 2024 9:02:16 AM	Start	Execution	Signal to Noise - Injection Tower, Front SSL, Front FID: - Detector FID - L: >= 300000	None
October 22, 2024 9:02:34 AM	Audit	Data	Signal to Noise - Injection Tower, Front SSL, Front FID: - Detector FID - L: >= 300000	Data files Path : G:\Data\Front\Front_SN01.D\FID1A.ch

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Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

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User Name: saenguthai.tarak
Report Generated by Hostname: LAPTOP-CQ3SKOMV

System ID: GC-6_CN11461066
Print Date: October 22, 2024 9:27:06 AM

2024_ALS_GC-6_CN11461066_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 22, 2024 9:02:54 AM	End	Execution	Signal to Noise - Injection Tower, Front SSL, Front FID: - Detector FID - L: >= 300000	Run Count: 1
October 22, 2024 9:03:00 AM	Start	Execution	GC Scouting Run - Injection Tower, Back SSL, Back FID: - Part of System Preparation - No limits associated	None
October 22, 2024 9:03:31 AM	Audit	Data	GC Scouting Run - Injection Tower, Back SSL, Back FID: - Part of System Preparation - No limits associated	Data files Path : G:\Data\Back\Back_SC01.D\FID2B.ch
October 22, 2024 9:04:00 AM	End	Execution	GC Scouting Run - Injection Tower, Back SSL, Back FID: - Part of System Preparation - No limits associated	Run Count: 1
October 22, 2024 9:04:06 AM	Start	Execution	Noise and Drift - Back FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	None
October 22, 2024 9:08:58 AM	Audit	Data	Noise and Drift - Back FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	Data files Path : G:\Data\Back\Back_NO013.D\FID2B.ch
October 22, 2024 9:09:13 AM	End	Execution	Noise and Drift - Back FID: - Detector FID - L (Noise): <= 0.10 pA - L (Drift): <= 2.50 pA/hour	Run Count: 1
October 22, 2024 9:09:26 AM	Start	Execution	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	None

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Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

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User Name: saenguthai.tarak
Report Generated by Hostname: LAPTOP-CQ3SKOMV

System ID: GC-6_CN11461066
Print Date: October 22, 2024 9:27:06 AM

2024_ALS_GC-6_CN11461066_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 22, 2024 9:10:44 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Back\Back_IP0111.D\FID2B.ch
October 22, 2024 9:10:44 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Back\Back_IP0112.D\FID2B.ch
October 22, 2024 9:10:44 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Back\Back_IP0113.D\FID2B.ch
October 22, 2024 9:10:44 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Back\Back_IP0114.D\FID2B.ch
October 22, 2024 9:10:44 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Back\Back_IP0115.D\FID2B.ch
October 22, 2024 9:10:44 AM	Audit	Data	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Data files Path : G:\Data\Back\Back_IP0116.D\FID2B.ch
October 22, 2024 9:11:15 AM	End	Execution	Injection Precision - Injection Tower, Back SSL, Back FID: - GC - L (Area): <= 3.00% - L (Ret. Time): <= 1.00%	Run Count: 1
October 22, 2024 9:11:23 AM	Start	Execution	Signal to Noise - Injection Tower, Back SSL, Back FID: - Detector FID - L: >= 300000	None
October 22, 2024 9:11:45 AM	Audit	Data	Signal to Noise - Injection Tower, Back SSL, Back FID: - Detector FID - L: >= 300000	Data files Path : G:\Data\Back\Back_SN01.D\FID2B.ch

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Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

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User Name: saongat(hai).tarak
Report Generated by Hostname: LAPTOP-CQ3SKOMV

System Id: GC-6_CN11461066
Print Date: October 22, 2024 9:27:05 AM

2024_ALS_GC-6_CN11461066_OQHW Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
October 22, 2024 9:12:08 AM	End	Execution	Signal to Noise - Injection Tower, Back SSL, Back FID - Detector FID - L: >= 300000	Run Count: 1
October 22, 2024 9:12:15 AM	End	Qualification	Session	OQ
October 22, 2024 9:12:15 AM	Start	Reporting	Session	None
October 22, 2024 9:24:09 AM	Audit	Reporting	Session	Report Generated: Certificate
October 22, 2024 9:25:56 AM	Audit	Reporting	Session	Report Generated: Report

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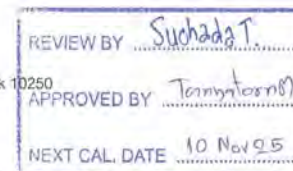
Date: October 22, 2024 9:27:05 AM
System ID: GC-6_CN11461066

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Certificate of System Qualification

GC-OQ + GCMS-OQ

System ID: GM-12
Organization Name: ALS Laboratory Group (Thailand) Co Ltd.
Organization Location: 104 Phattanakan 40 Phatthanakan Rd Bangkok 10250
Date: May 10, 2024 2:18:55 PM
EQP Name: AgilentRecommended , AgilentRecommended
EQP Revision: GC.02.53, GCMS.02.54
Overall Qualification Status: Pass



CDS Logon Verification - GC

Logon: asbkk.env03

Overall CDS Logon Verification - GC Test Status

Pass

System Inspection and Basic Safety and Operation

Name: 8890

Setpoint Status: Pass

Overall System Inspection and Basic Safety and Operation Test Status

Pass

Inlet Pressure Accuracy

Name: 8890

Front SSL

Setpoint Status: Pass

	Setpoint	Actual
Inlet Pressure:	25.0 psi	25.0 psi
Accuracy:		0.0 psi
Agilent Recommended:	<=	1.2

Date: May 10, 2024 2:18:55 PM
System ID: GM-12

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Overall Inlet Pressure Accuracy Test Status

Pass

GC Oven Temperature Accuracy

Name: 8890

Setpoint Status: Pass

Zone: Oven

Setpoint/Actual
Temperature: 230.0 229.1 °C

Accuracy: -0.9 °C

Agilent Recommended: >= -1.0 % setpoint in K (-5.0 °C)
<= 1.0 % setpoint in K (5.0 °C)

Setpoint Status: Pass

Zone: Oven

Setpoint/Actual
Temperature: 100.0 101.1 °C

Accuracy: 1.1 °C

Agilent Recommended: >= -1.0 % setpoint in K (-3.7 °C)
<= 1.0 % setpoint in K (3.7 °C)

Overall GC Oven Temperature Accuracy Test Status

Pass

GC Oven Temperature Stability

Name: 8890

Setpoint Status: Pass

Setpoint/Average
Temperature: 100.0 100.9 °C

Stability: 0.0 °C

Agilent Recommended: <= 0.5

Overall GC Oven Temperature Stability Test Status

Pass

Log Amp

Tested Combination1 Front SSL / External SQ

Name: 5977C

Setpoint Status: Pass

Overall Log Amp Test Status

Pass

RFPA

Tested Combination1 Front SSL / External SQ

Name: 5977C

Setpoint Status: Pass

Amu: 1050 m/z Drift After Five Minutes: 4 mV RFPA Voltage: 482 mV

Agilent Recommended: >= -100 and <= 100 <= 1100

Overall RFPA Test Status

Pass

Tune EI

Tested Combination1 Front SSL / External SQ

Name: 5977C

Setpoint Status: Pass

Filament: 1

Setpoint Status: Pass

Filament: 2

Overall Tune EI Test Status

Pass

Scouting Run

Tested Combination1	Front	SSL	/ External	SQ
Injection Tower				
Name:	7693A			
Source:	EI - Extractor			

Setpoint Status:	Completed
Injection Volume on Column:	1.0 uL

Overall Scouting Run Status
Completed

Instrument Detection Limit				
Tested Combination1	Front	SSL	/ External	SQ
Injection Tower				
Name:	7693A			
Source:	EI - Extractor			

Setpoint Status:	Pass	
Injection Volume on Column:	1.0 uL	
Minimum RSD:	Area	Retention Time
	0.72 %	0.01 %
Agilent Recommended:	<= 5.00	<= 1.00
Status:	Pass	Pass
Instrument Detection Limit:	2.41164 fg	
Agilent Recommended:	<= 15.82500	
Status:	Pass	

Overall Instrument Detection Limit Test Status
Pass

Mass Ratio Precision

Tested Combination1	Front	SSL	/ External	SQ
Injection Tower				
Name:	7693A			
Source:	EI - Extractor			

Setpoint Status:	Pass
Injection Volume on Column:	1.0 uL

RSD:	Area Mass 1	Mass Ratio
	Abundance*s	
	0.71 %	0.19 %
Agilent Recommended:	<= 5.00	<= 5.00
	Pass	Pass

Overall Mass Ratio Precision Test Status
Pass

Instrument Details

Purpose

This section describes the as found system configuration.

Details

System

System ID	GM-12
Manufacturer	Agilent Technologies
Name	8890
Flow Data Input	Manual Data
Temperature Data Input	Manual Data or Other Data Logging

Tested Combination1

Injection Technique	Injection Tower
Inlet	Front
Detector	External
LTM Included?	No

Sampler 1

Manufacturer	Agilent Technologies
Type	Injection Tower
Name	7693A
Model Number	G4513A
Serial Number	CN23125102
Firmware Revision	A.11.07
Usage	Sample Injection
Location	Front
Syringe Volume (µL)	10

Sampler 2

Manufacturer	Agilent Technologies
Type	Tray
Name	7693A
Model Number	G4514A
Serial Number	CN23147049
Firmware Revision	A.12.03
Vial Heater	Not installed

Mainframe 1

Manufacturer	Agilent Technologies
Name	8890
Model Number	G3540A
Serial Number	CN2303A031
Firmware Revision	2.8.1.6
Oven Type	Standard

Inlet 1

Manufacturer	Agilent Technologies
Name	8890
Type	SSL
Location	Front
Carrier Gas	Helium
Control Type	Electronic Pressure Control (EPC)
Purged Inlet	Yes

Detector 1

Manufacturer	Agilent Technologies
Name	Mass Spectrometer
Type	Mass Spectrometer
Location	External

Mass Spectrometer 1	
Manufacturer	Agilent Technologies
Type	SQ
Name	5977C
Model Number	G7077G
Serial Number	US2307MA35
Firmware Revision	6.00.35
High Vacuum System	Turbo Pump
Scouting Run Standard	OFN Std
MS EI Source 1	
Manufacturer	Agilent Technologies
Source Type	EI - Extractor
Number of filaments	2

Electronic Signature

Purpose
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Details	
Full Name of Signer:	Supasak Nimsongtham
Logged On User Name:	supasak.nimsongtham@agilent.com
Signature Creation Date:	May 10, 2024
Reason for Signature:	Executed protocol and published this original version of document

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User Name: supasak.nimsongtham			System Id: GM-12	
Report Generated by Hostname: SCG1115HKC			Print Date: May 10, 2024 2:18:57 PM	
GM-12 Transaction log :				
Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 9, 2024 2:25:19 PM	Audit	SessionCreated	Session	None
May 9, 2024 2:25:19 PM	Start	Configuration	Session	None
May 9, 2024 2:25:19 PM	Audit	Entitlement	Licensing	User is FieldEngineer and does not require an unlock code
May 9, 2024 2:31:20 PM	Audit	EqpLoaded	Session	EQP details for primary technique [Gc] - File path: [ProtocolPacks/Gc/Configurations/02.53/Gc.02.53.eqp], EQP File Name: [Gc.02.53.eqp], EQP Name: [AgilentRecommended], Protocol Revision [Gc.02.53] EQP details for hyphenated technique [GcMs] - File path: [ProtocolPacks/GcMs/Configurations/02.54/GcMs.02.54.eqp], EQP File Name: [GcMs.02.54.eqp], EQP Name: [AgilentRecommended]
May 9, 2024 2:31:23 PM	End	Configuration	Session	None
May 9, 2024 2:31:27 PM	Start	Qualification	Session	QQ
May 9, 2024 2:31:27 PM	Start	Execution	CDS Logon Verification - GC - 8890: - Qualitative test	None
May 9, 2024 2:32:31 PM	End	Execution	CDS Logon Verification - GC - 8890: - Qualitative test	Run Count : 1
May 9, 2024 2:32:35 PM	Start	Execution	System Inspection and Basic Safety and Operation - 8890: - Qualitative Test - No setpoints associated	None

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User Name: supasak.nimsongtham

Report Generated by Hostname: SCG1115HKC

System ID: GM-12

Print Date: May 10, 2024 2:18:57 PM

GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 9, 2024 2:32:44 PM	End	Execution	System Inspection and Basic Safety and Operation - 8890: - Qualitative Test - No setpoints associated	Run Count : 1
May 9, 2024 2:32:47 PM	Start	Execution	Inlet Pressure Accuracy - Front SSL - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	None
May 9, 2024 2:32:54 PM	End	Execution	Inlet Pressure Accuracy - Front SSL - Pressure Controlled Inlet - S: 25.0 psi - L: <= 1.2 psi	Run Count : 1
May 9, 2024 2:33:08 PM	Audit	AccClosed	Session	None
May 9, 2024 2:33:43 PM	Audit	AccRestarted	Session	None
May 9, 2024 2:33:44 PM	Audit	SessionReloaded	Session	None
May 9, 2024 2:33:46 PM	Start	Qualification	Session	QQ
May 9, 2024 2:33:54 PM	Start	Execution	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	None
May 9, 2024 2:34:16 PM	Start	Execution	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	None
May 9, 2024 2:34:29 PM	Audit	AccClosed	Session	None
May 10, 2024 10:19:05 AM	Audit	AccRestarted	Session	None
May 10, 2024 10:19:05 AM	Audit	SessionReloaded	Session	None
May 10, 2024 10:19:08 AM	Start	Qualification	Session	QQ
May 10, 2024 10:19:09 AM	Start	Execution	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	None

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User Name: supasak.nimsongtham
Report Generated by Hostname: SCG1115HKC

System Id: GM-12
Print Date: May 10, 2024 2:18:57 PM

GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 10, 2024 10:20:08 AM	Start	Execution	GC Oven Temperature Accuracy - 8890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
May 10, 2024 10:24:48 AM	Audit	Data	GC Oven Temperature Accuracy - 8890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
May 10, 2024 10:24:48 AM	End	Execution	GC Oven Temperature Accuracy - 8890: - Temperature : Oven - S: 230.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count : 1
May 10, 2024 10:24:50 AM	Start	Execution	GC Oven Temperature Accuracy - 8890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
May 10, 2024 10:25:33 AM	Audit	AccClosed	Session	None
May 10, 2024 10:27:35 AM	Audit	AccRestarted	Session	None
May 10, 2024 10:27:36 AM	Audit	SessionReloaded	Session	None
May 10, 2024 10:27:38 AM	Start	Qualification	Session	OQ
May 10, 2024 10:27:38 AM	Start	Execution	GC Oven Temperature Accuracy - 8890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	None
May 10, 2024 10:28:03 AM	Audit	Data	GC Oven Temperature Accuracy - 8890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
May 10, 2024 10:28:05 AM	End	Execution	GC Oven Temperature Accuracy - 8890: - Temperature : Oven - S: 100.0°C - L: >= -1.0 AND <= 1.0 % setpoint in K	Run Count : 1

User Name: supasak.nimsongtham
Report Generated by Hostname: SCG1115HKC

System Id: GM-12
Print Date: May 10, 2024 2:18:57 PM

GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 10, 2024 10:28:06 AM	Start	Execution	GC Oven Temperature Stability - 8890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	None
May 10, 2024 10:51:26 AM	Audit	Data	GC Oven Temperature Stability - 8890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Manual Data Entry
May 10, 2024 10:51:28 AM	End	Execution	GC Oven Temperature Stability - 8890: - Temperature : Oven - S: 100.0°C - L: <= 0.5°C	Run Count : 1
May 10, 2024 10:51:30 AM	Start	Execution	Log Amp - 5977C SQ: - Source: EI - Extractor	None
May 10, 2024 10:55:40 AM	Audit	AccClosed	Session	None
May 10, 2024 10:57:32 AM	Audit	AccRestarted	Session	None
May 10, 2024 10:57:33 AM	Audit	SessionReloaded	Session	None
May 10, 2024 10:57:35 AM	Start	Qualification	Session	OQ
May 10, 2024 10:57:35 AM	Start	Execution	Log Amp - 5977C SQ: - Source: EI - Extractor	None
May 10, 2024 11:00:05 AM	End	Execution	Log Amp - 5977C SQ: - Source: EI - Extractor	Run Count : 1
May 10, 2024 11:00:07 AM	Start	Execution	RFPA - 5977C SQ: - Source: EI - Extractor	None
May 10, 2024 11:01:19 AM	End	Execution	RFPA - 5977C SQ: - Source: EI - Extractor	Run Count : 1
May 10, 2024 11:01:25 AM	Start	Execution	Tune EI - 5977C SQ: - Source: EI - Extractor Filament 1 (Qualitative - No setpoints associated)	None
May 10, 2024 11:01:50 AM	End	Execution	Tune EI - 5977C SQ: - Source: EI - Extractor Filament 1 (Qualitative - No setpoints associated)	Run Count : 1

User Name: supasak.nimsongtham

Report Generated by Hostname: 5CG1115HKC

System Id: GM-12

Print Date: May 10, 2024 2:18:57 PM

GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 10, 2024 11:01:52 AM	Start	Execution	Tune EI - 5977C SQ: - Source: - None EI - Extractor Filament 2 (Qualitative - No setpoints associated)	
May 10, 2024 11:05:40 AM	End	Execution	Tune EI - 5977C SQ: - Source: - Run Count : 1 EI - Extractor Filament 2 (Qualitative - No setpoints associated)	
May 10, 2024 11:05:42 AM	Start	Execution	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor- Part of GCMS System Preparation	None
May 10, 2024 11:06:10 AM	Start	Execution	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	None
May 10, 2024 11:17:54 AM	Start	Execution	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor- Part of GCMS System Preparation	None
May 10, 2024 11:17:56 AM	Start	Execution	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	None
May 10, 2024 11:18:02 AM	Start	Execution	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	None
May 10, 2024 11:33:05 AM	Audit	AccClosed	Session	None
May 10, 2024 1:14:08 PM	Audit	AccRestarted	Session	None
May 10, 2024 1:14:09 PM	Audit	SessionReloaded	Session	None

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User Name: supasak.nimsongtham

Report Generated by Hostname: 5CG1115HKC

System Id: GM-12

Print Date: May 10, 2024 2:18:57 PM

GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 10, 2024 1:14:12 PM	Start	Qualification	Session	OQ
May 10, 2024 1:14:12 PM	Start	Execution	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	None
May 10, 2024 1:15:17 PM	Start	Execution	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor- Part of GCMS System Preparation	None
May 10, 2024 1:15:40 PM	Audit	Data	Scouting Run - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor- Part of GCMS System Preparation	Data files Path : D:\GM-12 OQ2024\ScoutingRun\001.D
May 10, 2024 1:15:50 PM	Audit	Reporting	Reintegration	Reintegration Count: 1 -- [Integration Type: Injections; BaselineCorrectionMode: Advanced; InitialSlopeSensitivity: 10; InitialPeakWidth: 0.01; InitialAreaReject: 0; InitialHeightReject: 50; Integration: Off at 0; Integration: On at 4;]
May 10, 2024 1:15:57 PM	Audit	Reporting	Reintegration	Reintegration Count: 2 -- [Integration Type: Injections; BaselineCorrectionMode: Advanced; InitialSlopeSensitivity: 10; InitialPeakWidth: 0.01; InitialAreaReject: 0; InitialHeightReject: 300; Integration: Off at 0; Integration: On at 4;]

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User Name: supasak.nimsongtham			System ID: GM-12	
Report Generated by Hostname: SCG1115HKC			Print Date: May 10, 2024 2:18:57 PM	
GM-12 Transaction log :				
Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 10, 2024 1:16:43 PM	Audit	Reporting	Reintegration	Reintegration Count: 1 - [Integration Type: injections; BaselineCorrectionMode: Advanced; InitialSlopeSensitivity: 10; InitialPeakWidth: 0.01; InitialAreaReject: 0; InitialHeightReject: 200; Integration: Off at 0; Integration: On at 5;]
May 10, 2024 1:16:55 PM	Audit	Reporting	Reintegration	Reintegration Count: 2 - [Integration Type: injections; BaselineCorrectionMode: Advanced; InitialSlopeSensitivity: 10; InitialPeakWidth: 0.01; InitialAreaReject: 0; InitialHeightReject: 200; Integration: Off at 0; Integration: On at 5;]
May 10, 2024 1:17:02 PM	End	Execution	Instrument Detection Limit - Injection Tower, Front SSL, SQ: - Source: - EI - Extractor - RSD L (Area): <= 5.00% - RSD L (Ret. Time): <= 1.00%	Run Count : 1
May 10, 2024 1:17:06 PM	Start	Execution	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	None
May 10, 2024 1:21:35 PM	Start	Execution	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	None
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User Name: supasak.nimsongtham

Report Generated by Hostname: SCG1115HKC

System ID: GM-12

Print Date: May 10, 2024 2:18:57 PM

GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 10, 2024 1:21:55 PM	Start	Execution	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	None
May 10, 2024 2:02:45 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : D:\GM-12 OQ2024\MRP002.D
May 10, 2024 2:02:45 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : D:\GM-12 OQ2024\MRP003.D
May 10, 2024 2:02:45 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : D:\GM-12 OQ2024\MRP004.D
May 10, 2024 2:02:45 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : D:\GM-12 OQ2024\MRP005.D
May 10, 2024 2:02:45 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : D:\GM-12 OQ2024\MRP006.D
May 10, 2024 2:02:45 PM	Audit	Data	Mass Ratio Precision - Injection Tower, Front SSL, SQ: - Source: EI - Extractor - L (RSD): <= 5.00%	Data files Path : D:\GM-12 OQ2024\MRP007.D

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User Name: supasak.nimsongtham
Report Generated by Hostname: SCG1115HKC

System Id: GM-12
Print Date: May 10, 2024 2:18:57 PM

GM-12 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
May 10, 2024 2:03:15 PM	Audit	Reporting	Reintegration	Reintegration Count: 1 -- [Integration Type: injections; BaselineCorrectionMode: Advanced; InitialSlopeSensitivity: 10; InitialPeakWidth: 0.01; InitialAreaReject: 0; InitialHeightReject: 50000; Integration: Off at 0; Integration: On at 2;]
May 10, 2024 2:03:31 PM	End	Execution	Mass Ratio Precision - Injection Tower, Front SSL, SQ - Source: EI - Extractor - L (RSD): <= 5.00%	Run Count : 1
May 10, 2024 2:03:49 PM	End	Qualification	Session	CQ
May 10, 2024 2:03:49 PM	Start	Reporting	Session	None
May 10, 2024 2:16:42 PM	Audit	Reporting	Session	Report Generated : Certificate
May 10, 2024 2:17:28 PM	Audit	Reporting	Session	Report Generated : Report