

# ภาคผนวกที่ 5

## เอกสารการสอบเทียบเครื่องมือ

- เอกสาร 5-1 เอกสารสอบเทียบเครื่องมือตรวจวิเคราะห์คุณภาพอากาศ  
เอกสาร 5-2 เอกสารสอบเทียบเครื่องมือตรวจวิเคราะห์ระดับเสียง  
เอกสาร 5-3 เอกสารสอบเทียบเครื่องมือตรวจวิเคราะห์คุณภาพน้ำ

**ตารางสรุปรายการเอกสารการสอบเทียบเครื่องมือตรวจวัดคุณภาพสิ่งแวดล้อม**

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
<b>คุณภาพอากาศ</b>		
- TSP	- High Volume Air Sampler No. B05, B15, B41	- Electronic Balance
- PM <sub>10</sub>	- High Volume PM <sub>10</sub> Air Sampler No. B25, B28, B32	- Electronic Balance
- SO <sub>2</sub>	- Gas Sample box. No. B13, B14 - Rotameter No. L-B1	- Spectrophotometer
- THC	- Personal Pump SKC No. B20 - Rotameter No. L-B1	- THC Analyzer No. B01
- CO	- CO Analyzer No. B01, B02, B03, B08, B13	- CO Analyzer No. B01, B02, B06, B011
- NO <sub>2</sub>	- NO <sub>2</sub> Analyzer No. B02, B14, B15, B19	- NO <sub>2</sub> Analyzer No. B02, B13, B10, B11, B17
<b>ระดับเสียง</b>		
- Leq 24 hr	- Acoustic Calibrator	-
- Lmax	- Sound Level Meter	-
- เสียงรบกวน	No. ACO-B07, B24, B31	
<b>คุณภาพน้ำ</b>		
- pH	-	- pH Meter
- BOD <sub>5</sub>	-	- BOD Analyzer
- TSS	-	- Electronic Balance
- TDS	-	- Electronic Balance
- Settleable Solids	-	- Electronic Balance
- TKN	-	- Electronic Balance
- Sulfide	-	- Electronic Balance
- Grease & Oil	-	- Electronic Balance
- TCB	-	- Incubator
- FCB	-	- Water Bath

## เอกสาร 5-1

เอกสารสอบเทียบเครื่องมือตรวจวิเคราะห์คุณภาพอากาศ



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## High Volume Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard

Model : TE 5025A

S/N : 3611

### Calibration Data

High Volume Air Sampler Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (ft <sup>3</sup> /min)	R <sup>2</sup>
B01	B01	01/11/2023	y = 1.234x-3.561	0.997
B02	B02	02/11/2023	y = 1.168x-0.261	0.999
B03	B03	02/11/2023	y = 1.171x-3.628	0.998
B04	B04	02/11/2023	y = 1.271x-7.126	0.999
B05	B05	03/11/2023	y = 1.223x-6.612	0.998
B06	B06	01/11/2023	y = 1.235x-6.018	0.997
B07	B07	01/11/2023	y = 1.206x-6.272	0.999
B08	B08	01/11/2023	y = 1.280x-8.017	0.996
B09	B09	02/11/2023	y = 1.268x-7.075	0.999
B10	B10	03/11/2023	y = 1.114x+1.255	0.998
B11	B11	03/11/2023	y = 1.147x-2.182	0.999
B12	B12	03/11/2023	y = 1.243x-6.434	0.998
B13	B13	02/11/2023	y = 1.188x-3.203	0.996
B14	B14	02/11/2023	y = 1.241x-6.190	0.998
B15	B15	09/11/2023	y = 1.228x-4.962	0.996
B16	B16	01/11/2023	y = 1.288x-7.889	0.998
B17	B17	01/11/2023	y = 1.194x-2.803	0.999
B18	B18	02/11/2023	y = 1.234x-7.054	0.999
B19	B19	02/11/2023	y = 1.224x-7.673	0.997
B20	B20	01/11/2023	y = 1.194x-5.352	0.998
B21	B21	01/11/2023	y = 1.127x-2.428	0.999
B22	B22	03/11/2023	y = 1.235x-8.410	0.999
B23	B23	03/11/2023	y = 1.198x-5.314	0.997
B24	B24	04/11/2023	y = 1.127x-2.077	0.999
B25	B25	04/11/2023	y = 1.115x+0.218	0.999
B26	B26	04/11/2023	y = 1.240x-6.806	0.996
B27	B27	01/11/2023	y = 1.196x-5.906	0.999
B28	B28	01/11/2023	y = 1.209x-5.372	0.997
B29	B29	01/11/2023	y = 1.251x-4.843	0.996
B30	B30	02/11/2023	y = 1.191x-3.112	0.996
B31	B31	02/11/2023	y = 1.172x-3.363	0.997
B32	B32	01/11/2023	y = 1.245x-4.270	0.999
B33	B33	01/11/2023	y = 1.222x-4.224	0.996
B34	B34	02/11/2023	y = 1.195x-4.827	0.998

Calibrated by :

*Adul Dangklom*

(Mr. Adul Dangklom)

Approved by :

*Peera Detudom*

(Mr. Peera Detudom)



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### High Volume Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard

Model : TE 5025A

S/N : 3611

#### Calibration Data

High Volume Air Sampler Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (ft <sup>3</sup> /min)	R <sup>2</sup>
B35	B35	01/11/2023	y = 1.247x-5.373	0.999
B36	B36	02/11/2023	y = 1.190x-2.630	0.995
B37	B37	01/11/2023	y = 1.188x-2.249	0.999
B38	B38	01/11/2023	y = 1.191x-5.051	0.995
B39	B39	01/11/2023	y = 1.230x-3.335	0.995
B40	B40	02/11/2023	y = 1.172x-2.695	0.998
B41	B41	02/11/2023	y = 1.169x-2.206	0.998
B42	B42	02/11/2023	y = 1.212x-5.591	0.998
B43	B43	03/11/2023	y = 1.223x-3.058	0.997
B44	B44	01/11/2023	y = 1.194x-2.207	0.996
R01	R01	08/11/2023	y = 1.199x-4.374	0.998
R02	R02	06/11/2023	y = 1.229x-6.243	0.999
R03	R03	08/11/2023	y = 1.239x-7.264	0.998
R04	R04	09/11/2023	y = 1.182x-3.161	0.998
R05	R05	09/11/2023	y = 1.141x-2.095	0.997
R06	R06	03/11/2023	y = 1.155x-2.543	0.997
R07	R07	09/11/2023	y = 1.057x+1.380	0.999
R08	R08	02/11/2023	y = 1.230x-6.615	0.997
R09	R09	04/11/2023	y = 1.188x-1.331	0.997
R10	R10	04/11/2023	y = 1.213x-3.571	0.998
R11	R11	01/11/2023	y = 1.136x-2.259	0.999
R12	R12	01/11/2023	y = 1.145x-3.404	0.998
R13	R13	02/11/2023	y = 1.076x-0.153	0.999
R14	R14	02/11/2023	y = 1.166x+1.197	0.996
R15	R15	09/11/2023	y = 1.171x-4.139	0.997
R16	R16	09/11/2023	y = 1.142x-3.462	0.999
R17	R17	01/11/2023	y = 1.169x-3.932	0.998
R18	R18	01/11/2023	y = 1.192x-4.280	0.998
R19	R19	01/11/2023	y = 1.158x-4.004	0.996
R20	R20	02/11/2023	y = 1.191x-4.426	0.997

Calibrated by :

*Adul Dangklom*

(Mr.Adul Dangklom)

Approved by :

*Peera Detudom*

(Mr. Peera Detudom)



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## High Volume PM-10 Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard

Model : TE 5025A

S/N : 3611


### Calibration Data

High Volume PM-10 Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (ft <sup>3</sup> /min)	R <sup>2</sup>
B01	B01	02/11/2023	y = 1.172x-0.179	0.999
B02	B02	01/11/2023	y = 1.108x+0.767	0.996
B03	B03	01/11/2023	y = 1.168x-2.165	0.997
B04	B04	01/11/2023	y = 1.197x-5.349	0.996
B05	B05	01/11/2023	y = 1.177x-3.382	0.995
B06	B06	02/11/2023	y = 1.152x-2.276	0.997
B07	B07	02/11/2023	y = 1.176x-3.160	0.995
B08	B08	01/11/2023	y = 1.188x-2.024	0.997
B09	B09	04/11/2023	y = 1.214x-4.707	0.998
B10	B10	04/11/2023	y = 1.171x-3.867	0.996
B11	B11	04/11/2023	y = 1.174x-3.317	0.998
B12	B12	01/11/2023	y = 1.164x-0.858	0.995
B13	B13	01/11/2023	y = 1.192x-4.277	0.997
B14	B14	01/11/2023	y = 1.196x-2.988	0.996
B15	B15	01/11/2023	y = 1.071x+1.858	0.998
B16	B16	02/11/2023	y = 1.138x+1.430	0.996
B17	B17	02/11/2023	y = 1.170x-3.070	0.997
B18	B18	03/11/2023	y = 1.185x-2.290	0.996
B19	B19	03/11/2023	y = 1.115x+0.036	0.999
B20	B20	02/11/2023	y = 1.142x-1.044	0.998
B21	B21	02/11/2023	y = 1.140x+0.437	0.998
B22	B22	01/11/2023	y = 1.222x-5.445	0.997
B23	B23	01/11/2023	y = 1.177x-2.100	0.998
B24	B24	01/11/2023	y = 1.182x-1.803	0.999
B25	B25	01/11/2023	y = 1.183x-3.859	0.998
B26	B26	02/11/2023	y = 1.154x-0.753	0.998
B27	B27	03/11/2023	y = 1.210x-6.901	0.996
B28	B28	02/11/2023	y = 1.186x-4.520	0.999
B29	B29	01/11/2023	y = 1.164x-4.898	0.998
B30	B30	01/11/2023	y = 1.163x-2.469	0.996
B31	B31	01/11/2023	y = 1.146x+1.014	0.999
B32	B32	01/11/2023	y = 1.157x-1.372	0.997
B33	B33	02/11/2023	y = 1.197x-3.867	0.998
B34	B34	01/11/2023	y = 1.133x+2.326	0.996

Calibrated by :

  
(Mr. Abdul Dangklom)

Approved by :

  
(Mr. Peera Detudom)



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### High Volume PM-10 Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard

Model : TE 5025A

S/N : 3611


#### Calibration Data

High Volume PM-10 Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (ft <sup>3</sup> /min)	R <sup>2</sup>
R01	R01	01/11/2023	y = 1.166x-2.827	0.999
R02	R02	01/11/2023	y = 1.140x+0.079	0.998
R03	R03	02/11/2023	y = 1.176x-2.983	0.999
R04	R04	01/11/2023	y = 1.155x-3.417	0.996
R05	R05	01/11/2023	y = 1.193x-5.553	0.998
R06	R06	08/11/2023	y = 1.173x-2.245	0.998
R07	R07	08/11/2023	y = 1.183x-3.521	0.999
R08	R08	06/11/2023	y = 1.195x-5.732	0.997
R09	R09	01/11/2023	y = 1.161x-3.857	0.995
R10	R10	09/11/2023	y = 1.181x-4.105	0.998
R11	R11	09/11/2023	y = 1.155x-0.430	0.996
R12	R12	09/11/2023	y = 1.196x-4.411	0.999
R13	R13	09/11/2023	y = 1.188x-3.031	0.996
R14	R14	01/11/2023	y = 1.167x-2.357	0.998
R15	R15	02/11/2023	y = 1.186x-3.860	0.998
R16	R16	02/11/2023	y = 1.187x-2.636	0.999
R17	R17	02/11/2023	y = 1.169x-3.318	0.996
R18	R18	03/11/2023	y = 1.190x-4.826	0.997
R19	R19	01/11/2023	y = 1.152x-2.131	0.996
R20	R20	01/11/2023	y = 1.183x-4.568	0.997

Calibrated by :

  
(Mr. Adul Dangklom)

Approved by :

  
(Mr. Peera Detudom)



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## Gas Sampler Box Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Dry Cal DCL-ML

S/N : 136164

### Calibration Data

Gas Sampler		Calibration Data					
No.	Rotameter	Date	Setting (Constant Flow) (ml/min)	Actual Flow Rate (ml/min)			
				Sampling Line A		Sampling Line B	
				Normal Condition	Standard Condition	Normal Condition	Standard Condition
B01	2 (A&B)	01/12/2023	200	200.5	200.4	200.7	200.6
B02	2 (A&B)	02/12/2023	200	200.7	200.6	200.4	200.3
B03	2 (A&B)	02/12/2023	200	200.6	200.5	200.9	200.8
B04	2 (A&B)	01/12/2023	200	200.9	200.8	200.7	200.6
B05	2 (A&B)	01/12/2023	200	200.5	200.4	200.9	200.8
B06	2 (A&B)	02/12/2023	200	200.8	200.7	200.5	200.4
B07	2 (A&B)	04/12/2023	200	200.6	200.5	200.8	200.7
B08	2 (A&B)	04/12/2023	200	200.7	200.6	200.4	200.3
B09	2 (A&B)	01/12/2023	200	200.5	200.4	200.9	200.8
B10	2 (A&B)	02/12/2023	200	200.6	200.5	200.8	200.7
B11	2 (A&B)	04/12/2023	200	200.7	200.6	200.5	200.4
B12	2 (A&B)	04/12/2023	200	200.5	200.4	200.8	200.7
B13	2 (A&B)	02/12/2023	200	200.4	200.3	200.6	200.5
B14	2 (A&B)	01/12/2023	200	200.5	200.4	200.7	200.6
B15	2 (A&B)	04/12/2023	200	200.3	200.2	200.5	200.4
B16	2 (A&B)	02/12/2023	200	200.8	200.7	200.6	200.5
B17	2 (A&B)	01/12/2023	200	200.5	200.4	200.7	200.6

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)



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### Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

#### Environmental Conditions

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

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (ml/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)			y	R <sup>2</sup>
					1	2	3	1	2	3		
B01	SKC	224-PCXR4	262101	02/10/2023	1,000	1,500	2,000	997	1,494	1,995	0.998x - 5.198	1.000
B02	SKC	224-PCXR4	626166	02/10/2023	1,000	1,500	2,000	995	1,491	1,987	0.995x - 0.239	1.000
B03	SKC	224-PCXR4	612968	02/10/2023	1,000	1,500	2,000	994	1,498	1,996	1.004x - 17.211	0.999
B04	SKC	224-PCXR4	602804	03/10/2023	1,000	1,500	2,000	1,001	1,502	1,997	0.999x - 3.961	1.000
B05	SKC	224-PCXR4	612693	03/10/2023	1,000	1,500	2,000	1,000	1,500	1,998	1.008x - 19.564	0.999
B06	SKC	224-PCXR4	262188	04/10/2023	1,000	1,500	2,000	999	1,497	1,998	1.005x - 13.275	1.000
B07	SKC	224-PCXR4	626262	04/10/2023	1,000	1,500	2,000	997	1,491	1,992	0.995x + 0.103	1.000
B08	SKC	224-PCXR4	626100	03/10/2023	1,000	1,500	2,000	995	1,490	1,994	0.999x - 3.162	1.000
B09	SKC	224-PCXR4	626479	04/10/2023	1,000	1,500	2,000	1,012	1,500	2,001	0.998x + 1.604	0.999
B10	SKC	224-PCXR4	091950	05/10/2023	1,000	1,500	2,000	992	1,486	1,994	1.002x - 11.842	1.000
B11	SKC	224-PCXR8	564315	05/10/2023	1,000	1,500	2,000	993	1,501	1,996	1.010x - 26.335	0.999
B12	SKC	224-PCXR4	034656	05/10/2023	1,000	1,500	2,000	1,000	1,496	1,998	1.007x - 17.721	0.999
B13	SKC	224-PCXR4	602073	04/10/2023	1,000	1,500	2,000	1,000	1,488	1,987	0.986x + 13.398	1.000
B14	SKC	224-PCXR4	626313	04/10/2023	1,000	1,500	2,000	996	1,493	1,996	0.999x - 2.380	1.000
B15	SKC	224-PCXR4	626474	06/10/2023	1,000	1,500	2,000	1,000	1,498	1,998	1.007x - 16.567	0.999
B16	SKC	224-PCXR4	626477	06/10/2023	1,000	1,500	2,000	1,001	1,498	1,999	1.010x - 21.673	0.999
B17	SKC	224-PCXR4	626860	06/10/2023	1,000	1,500	2,000	1,000	1,492	1,998	0.997x - 1.859	1.000
B18	SKC	224-PCXR4	691484	03/10/2023	1,000	1,500	2,000	995	1,494	1,992	1.000x - 5.493	1.000
B19	SKC	224-PCXR4	691599	02/10/2023	1,000	1,500	2,000	991	1,500	1,998	1.015x - 32.922	0.999
B20	SKC	224-PCXR4	691587	02/10/2023	1,000	1,500	2,000	1,001	1,496	1,999	1.010x - 23.222	0.999
B21	SKC	224-PCXR4	691531	03/10/2023	1,000	1,500	2,000	994	1,491	1,997	1.004x - 12.881	1.000
B22	SKC	224-PCXR4	691654	03/10/2023	1,000	1,500	2,000	991	1,492	1,994	1.002x - 9.860	1.000
B23	SKC	224-PCXR4	798393	02/10/2023	1,000	1,500	2,000	991	1,498	1,997	1.014x - 33.810	0.999
B24	SKC	224-PCXR4	626363	02/10/2023	1,000	1,500	2,000	1,001	1,499	2,001	1.011x - 23.676	0.999
B25	SKC	224-PCXR4	798489	04/10/2023	1,000	1,500	2,000	996	1,497	1,989	0.991x + 6.619	1.000
B26	SKC	224-PCXR4	798479	05/10/2023	1,000	1,500	2,000	996	1,492	1,990	0.996x - 1.146	1.000
B27	SKC	224-PCXR4	691673	09/10/2023	1,000	1,500	2,000	989	1,506	1,998	1.016x - 34.646	0.999
B28	SKC	224-PCXR4	691570	09/10/2023	1,000	1,500	2,000	992	1,487	1,996	1.006x - 16.996	1.000
B29	SKC	224-PCXR4	626472	09/10/2023	1,000	1,500	2,000	998	1,495	1,992	0.997x - 0.693	1.000
B30	SKC	224-PCXR4	691489	03/10/2023	1,000	1,500	2,000	993	1,490	1,990	0.999x - 7.320	1.000
B31	SKC	224-PCXR4	691509	03/10/2023	1,000	1,500	2,000	1,001	1,497	1,997	1.007x - 18.788	0.999
B32	SKC	224-PCXR4	091567	04/10/2023	1,000	1,500	2,000	998	1,499	1,996	1.009x - 22.780	0.999
B33	SKC	224-PCXR4	091756	05/10/2023	1,000	1,500	2,000	1,000	1,489	1,994	0.995x - 0.223	1.000
B34	SKC	224-PCXR4	612962	05/10/2023	1,000	1,500	2,000	992	1,501	1,997	1.013x - 31.362	0.999
B35	SKC	224-PCXR4	602682	03/10/2023	1,000	1,500	2,000	998	1,496	1,998	0.998x - 7.157	0.999
B36	SKC	224-PCXR4	626164	07/10/2023	1,000	1,500	2,000	995	1,487	1,990	0.991x + 3.901	1.000
B37	SKC	224-PCXR4	626256	02/10/2023	1,000	1,500	2,000	990	1,500	1,993	1.000x - 6.520	1.000
B38	SKC	224-PCXR4	626167	03/10/2023	1,000	1,500	2,000	989	1,498	1,995	1.015x - 35.470	0.999
B39	SKC	224-PCXR4	034637	09/10/2023	1,000	1,500	2,000	991	1,495	1,994	1.004x - 14.572	1.000
B40	SKC	224-PCXR4	798349	07/10/2023	1,000	1,500	2,000	999	1,497	1,996	1.008x - 21.526	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

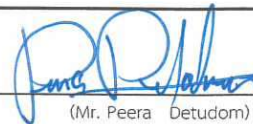
Rotameter Data			Calibration Data								
No.	Brand	Model	Date	Flow Rate (mL/min)						Value From Calibration Curve	
				Flow Rate (Reading)			Actual (Q std.)				
				1	2	3	1	2	3	y	R <sup>2</sup>
L-B01	Dwyer	VFA-21	02/10/2023	50	100	200	50.2	100.3	202.6	0.997x + 0.475	0.999
L-B02	Dwyer	VFA-21	03/10/2023	50	100	200	50.5	98.9	201.1	1.001x - 0.121	1.000
L-B03	Dwyer	VFA-21	02/10/2023	50	100	200	50.1	100.7	200.2	1.007x - 1.206	0.999
L-B04	Dwyer	VFA-21	04/10/2023	50	100	200	50.4	99.6	201.9	1.006x - 0.142	1.000
L-B05	Dwyer	VFA-21	03/10/2023	50	100	200	49.7	101.1	197.7	0.997x - 0.218	1.000
L-B06	Dwyer	VFA-21	05/10/2023	50	100	200	50.3	101.5	200.1	1.003x - 0.332	0.999
L-B07	Dwyer	VFA-21	04/10/2023	50	100	200	50.9	100.4	202.4	0.990x + 2.441	1.000
L-B08	Dwyer	VFA-21	05/10/2023	50	100	200	50.7	99.8	197.9	1.005x - 1.343	0.999
L-B09	Dwyer	VFA-21	03/10/2023	50	100	200	50.2	100.3	203.0	1.007x + 0.375	1.000
L-B10	Dwyer	VFA-21	07/10/2023	50	100	200	49.5	99.4	200.3	1.009x - 1.182	1.000

Calibrated by :



(Mr. Adul Dangklom)

Approved by :



(Mr. Peera Detudom)



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# CALIBRATION REPORT

## NON-DISPERSIVE INFRARED CO ANALYZER

DATE : 16 July 2023

BRAND : API

MODEL : 300E

NO. CO-B02

SERIAL NO. 965

### Calibrator (Dilution System)

Brand : API

Model : 700

Last Cal. Date : 06 September 2022

Serial No. : 421

### Reference Standard Gas

Standard Gas : Carbon Monoxide (CO)

Cylinder No. : D196045

Certified Date : 16 April 2022

Expired Date : 15 April 2024

Cylinder Conc. : 4,570 PPM

### CALIBRATING CONDITION

Pressure 1011 mmbar

Temp. 24.6 °C

% RH 48

### CALIBRATION SETTING

Span	Initial Reading (Before Adj.),PPM			Final Reading (After Adj.),PPM
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response
Zero	0	-0.10	-	0
CO Span	40.00	39.97	-0.075	40.00

### API Model 300E CO Analyzer Check list

Parameter	Observed Value	Units	Nominal Range
RANGE	50	PPM	0-1000 ppm
STABILITY	0.10	PPM	< 1 ppm with zero air
CO MEASURE	4015.5	mV	2500-4800 mV
CO REFERENCE	3949.2	mV	2500-4800 mV
MEASURE/REFERENCE RATIO	1.179	-	1.1-1.3 w/zero air
SAMPLE PRESSURE	28.5	In-Hg-A	~2" < ambient absolute pressure
SAMPLE FLOW	812	cc/min	800 ± 10%
SAMPLE TEMPERATURE	48.3	°C	48 ± 4
BENCH TEMPERATURE	48.1	°C	48 ± 2
WHEEL TEMPERATURE	68.3	°C	68 ± 2
BOX TEMPERATURE	30.8	°C	Ambient temp + 7 ± 10
PHOTO-DRIVE	3030.4	mV	250 mV to 4750 mV
SLOPE	1.017	-	1.0 ± 0.3
OFFSET	0.2	-	0 ± 0.3

Calibrated by :

Adul Dangklom

(Mr.Adul Dangklom)

Approved by :

Peera Detudom

(Mr.Peera Detudom)



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# CALIBRATION REPORT

## NON-DISPERSIVE INFRARED CO ANALYZER

DATE : 07 August 2023

BRAND : API

MODEL : 300E

NO. CO-B06

SERIAL NO. 3117

### Calibrator (Dilution System)

Brand : API

Model : 700

Last Cal. Date : 06 September 2022

Serial No. : 421

### Reference Standard Gas

Standard Gas : Carbon Monoxide (CO)

Cylinder No. : D196045

Certified Date : 16 April 2022

Expired Date : 15 April 2024

Cylinder Conc. : 4,570 PPM

### CALIBRATING CONDITION

Pressure 1011 mmbar

Temp. 24.5 °C

% RH 49

### CALIBRATION SETTING

Span Set Point	Initial Reading (Before Adj.),PPM			Final Reading (After Adj.),PPM
	Expected Concentration	Analyzer Response	%Dif	Analyzer Response
Zero	0	0.11	-	0
CO Span	40.00	40.08	0.200	40.00

### API Model 300E CO Analyzer Check list

Parameter	Observed Value	Units	Nominal Range
RANGE	50	PPM	0-1000 ppm
STABILITY	0.10	PPM	< 1 ppm with zero air
CO MEASURE	4015.3	mV	2500-4800 mV
CO REFERENCE	3948.9	mV	2500-4800 mV
MEASURE/REFERENCE RATIO	1.180	-	1.1-1.3 w/zero air
SAMPLE PRESSURE	28.4	In-Hg-A	~2" < ambient absolute pressure
SAMPLE FLOW	808	cc/min	800 ± 10%
SAMPLE TEMPERATURE	48.2	°C	48 ± 4
BENCH TEMPERATURE	48.0	°C	48 ± 2
WHEEL TEMPERATURE	68.3	°C	68 ± 2
BOX TEMPERATURE	30.8	°C	Ambient temp + 7 ± 10
PHOTO-DRIVE	3018.2	mV	250 mV to 4750 mV
SLOPE	1.017	-	1.0 ± 0.3
OFFSET	0.2	-	0 ± 0.3

Calibrated by : Adul Dangklom  
(Mr.Adul Dangklom)

Approved by : Peera Detudom  
(Mr.Peera Detudom)



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# CALIBRATION REPORT

## NON-DISPERSIVE INFRARED CO ANALYZER

DATE : 10 September 2023

BRAND : API

MODEL : 300E

NO. CO-B02

SERIAL NO. 965

### Calibrator (Dilution System)

Brand : API

Model : 700

Last Cal. Date : 08 August 2023

Serial No. : 911

### Reference Standard Gas

Standard Gas : Carbon Monoxide (CO)

Cylinder No. : D196045

Certified Date : 16 April 2022

Expired Date : 15 April 2024

Cylinder Conc. : 4,570 PPM

### CALIBRATING CONDITION

Pressure 1011 mmbar

Temp. 24.6 °C

% RH 49

### CALIBRATION SETTING

Span Set Point	Initial Reading (Before Adj.), PPM			Final Reading (After Adj.), PPM
	Expected Concentration	Analyzer Response	% Dif	Analyzer Response
Zero	0	-0.10	-	0
CO Span	40.00	39.94	-0.150	40.00

### API Model 300E CO Analyzer Check list

Parameter	Observed Value	Units	Nominal Range
RANGE	50	PPM	0-1000 ppm
STABILITY	0.10	PPM	< 1 ppm with zero air
CO MEASURE	4015.9	mV	2500-4800 mV
CO REFERENCE	3949.2	mV	2500-4800 mV
MEASURE/REFERENCE RATIO	1.180	-	1.1-1.3 w/zero air
SAMPLE PRESSURE	28.4	In-Hg-A	~2" < ambient absolute pressure
SAMPLE FLOW	808	cc/min	800 ± 10%
SAMPLE TEMPERATURE	48.3	°C	48 ± 4
BENCH TEMPERATURE	48.1	°C	48 ± 2
WHEEL TEMPERATURE	68.5	°C	68 ± 2
BOX TEMPERATURE	30.8	°C	Ambient temp + 7 ± 10
PHOTO-DRIVE	3037.1	mV	250 mV to 4750 mV
SLOPE	1.017	-	1.0 ± 0.3
OFFSET	0.2	-	0 ± 0.3

Calibrated by : Adul Dangklom  
(Mr. Adul Dangklom)

Approved by : Peera Detudom  
(Mr. Peera Detudom)



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## CALIBRATION REPORT

### NON-DISPERSIVE INFRARED CO ANALYZER

DATE : 08 October 2023

BRAND : API

MODEL : 300E

NO. CO-B01

SERIAL NO. 782

#### Calibrator (Dilution System)

Brand : API

Model : 700

Last Cal. Date : 08 August 2023

Serial No. : 911

#### Reference Standard Gas

Standard Gas : Carbon Monoxide (CO)

Cylinder No. : D196045

Certified Date : 16 April 2022

Expired Date : 15 April 2024

Cylinder Conc. : 4,570 PPM

#### CALIBRATING CONDITION

Pressure 1011 mmbar

Temp. 24.6 °C

% RH 48

#### CALIBRATION SETTING

Span Set Point	Initial Reading (Before Adj.),PPM			Final Reading (After Adj.),PPM
	Expected Concentration	Analyzer Response	%Dif	Analyzer Response
Zero	0	0.11	-	0
CO Span	40.00	40.06	0.150	40.00

#### API Model 300E CO Analyzer Check list

Parameter	Observed Value	Units	Nominal Range
RANGE	50	PPM	0-1000 ppm
STABILITY	0.10	PPM	< 1 ppm with zero air
CO MEASURE	4014.9	mV	2500-4800 mV
CO REFERENCE	3948.2	mV	2500-4800 mV
MEASURE/REFERENCE RATIO	1.180	-	1.1-1.3 w/zero air
SAMPLE PRESSURE	28.4	In-Hg-A	~2" < ambient absolute pressure
SAMPLE FLOW	805	cc/min	800 ± 10%
SAMPLE TEMPERATURE	48.5	°C	48 ± 4
BENCH TEMPERATURE	48.2	°C	48 ± 2
WHEEL TEMPERATURE	68.4	°C	68 ± 2
BOX TEMPERATURE	30.8	°C	Ambient temp + 7 ± 10
PHOTO-DRIVE	3039.2	mV	250 mV to 4750 mV
SLOPE	1.017	-	1.0 ± 0.3
OFFSET	0.1	-	0 ± 0.3

Calibrated by : Adul Dangklom  
(Mr.Adul Dangklom)

Approved by : Peera Detudom  
(Mr.Peera Detudom)



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## CALIBRATION REPORT

### NON-DISPERSIVE INFRARED CO ANALYZER

DATE : 08 October 2023

BRAND : API

MODEL : 300E

NO. CO-B01

SERIAL NO. 782

#### Calibrator (Dilution System)

Brand : API

Model : 700

Last Cal. Date : 08 August 2023

Serial No. : 911

#### Reference Standard Gas

Standard Gas : Carbon Monoxide (CO)

Cylinder No. : D196045

Certified Date : 16 April 2022

Expired Date : 15 April 2024

Cylinder Conc. : 4,570 PPM

#### CALIBRATING CONDITION

Pressure 1011 mmbar

Temp. 24.6 °C

% RH 48

#### CALIBRATION SETTING

Span Set Point	Initial Reading (Before Adj.),PPM			Final Reading (After Adj.),PPM
	Expected Concentration	Analyzer Response	%Dif	Analyzer Response
Zero	0	0.11	-	0
CO Span	40.00	40.06	0.150	40.00

#### API Model 300E CO Analyzer Check list

Parameter	Observed Value	Units	Nominal Range
RANGE	50	PPM	0-1000 ppm
STABILITY	0.10	PPM	< 1 ppm with zero air
CO MEASURE	4014.9	mV	2500-4800 mV
CO REFERENCE	3948.2	mV	2500-4800 mV
MEASURE/REFERENCE RATIO	1.180	-	1.1-1.3 w/zero air
SAMPLE PRESSURE	28.4	In-Hg-A	~2" < ambient absolute pressure
SAMPLE FLOW	805	cc/min	800 ± 10%
SAMPLE TEMPERATURE	48.5	°C	48 ± 4
BENCH TEMPERATURE	48.2	°C	48 ± 2
WHEEL TEMPERATURE	68.4	°C	68 ± 2
BOX TEMPERATURE	30.8	°C	Ambient temp + 7 ± 10
PHOTO-DRIVE	3039.2	mV	250 mV to 4750 mV
SLOPE	1.017	-	1.0 ± 0.3
OFFSET	0.1	-	0 ± 0.3

Calibrated by : Adul Dangklom  
(Mr.Adul Dangklom)

Approved by : Peera Detudom  
(Mr.Peera Detudom)



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CALIBRATION REPORT					
NON-DISPERSIVE INFRARED CO ANALYZER					
DATE :	05 November 2023	BRAND :	Thermo	MODEL :	48C
NO.	CO-B11	SERIAL NO.	401304262		
Calibrator (Dilution System)					
Brand : API			Model : 700		
Last Cal. Date : 30 October 2023			Serial No. : 421		
Reference Standard Gas					
Standard Gas : Carbon Monoxide (CO)			Cylinder No. : D196045		
Certified Date : 16 April 2022		Expired Date : 15 April 2024		Cylinder Conc. : 4,570 PPM	
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.5	°C
% RH 49					
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPM			Final Reading (After Adj.),PPM	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	
Zero	0	-0.10	-	0	
CO Span	40.00	39.96	-0.100	40.00	
INSTRUMENT STATUS					
CHAMBER TEMP	47.5 °C		FLOW	1.5 LPM	
PRESSURE	730.6 mm Hg		MOTOR SPEED	100.00%	

Calibrated by : Adul Dangklom  
(Mr.Adul Dangklom)

Approved by : Peera Detudom  
(Mr.Peera Detudom)



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CALIBRATION REPORT							
NON-DISPERSIVE INFRARED CO ANALYZER							
DATE :	20 December 2023	BRAND :	API	MODEL :	300E		
NO.	CO-B06	SERIAL NO.	3117				
Calibrator (Dilution System)							
Brand : Teledyne			Model : 700E				
Last Cal. Date : 30 October 2023			Serial No. : 201-S				
Reference Standard Gas							
Standard Gas : Carbon Monoxide (CO)			Cylinder No. : D196045				
Certified Date : 16 April 2022		Expired Date : 15 April 2024		Cylinder Conc. : 4,570 PPM			
CALIBRATING CONDITION							
Pressure	1011	mmbar	Temp.	24.6	°C	% RH	49
CALIBRATION SETTING							
Span	Initial Reading (Before Adj.),PPM			Final Reading (After Adj.),PPM			
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response			
Zero	0	0.10	-	0			
CO Span	40.00	39.93	-0.175	40.00			
API Model 300E CO Analyzer Check list							
Parameter	Observed Value	Units	Nominal Range				
RANGE	50	PPM	0-1000 ppm				
STABILITY	0.10	PPM	< 1 ppm with zero air				
CO MEASURE	4016.5	mV	2500-4800 mV				
CO REFERENCE	3947.8	mV	2500-4800 mV				
MEASURE/REFERENCE RATIO	1.180	-	1.1-1.3 w/zero air				
SAMPLE PRESSURE	28.6	In-Hg-A	~2" < ambient absolute pressure				
SAMPLE FLOW	806	cc/min	800 ± 10%				
SAMPLE TEMPERATURE	48.4	°C	48 ± 4				
BENCH TEMPERATURE	48.2	°C	48 ± 2				
WHEEL TEMPERATURE	68.4	°C	68 ± 2				
BOX TEMPERATURE	30.6	°C	Ambient temp + 7 ± 10				
PHOTO-DRIVE	3025.6	mV	250 mV to 4750 mV				
SLOPE	1.017	-	1.0 ± 0.3				
OFFSET	0.2	-	0 ± 0.3				

Calibrated by : Adul Dangklom  
(Mr.Adul Dangklom)

Approved by : Peera Detudom  
(Mr.Peera Detudom)



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

## CALIBRATION REPORT

### CHEMILUMINESCENT NO / NO<sub>2</sub> / NO<sub>x</sub> ANALYZER

DATE : 16 July 2023 BRAND : API MODEL : 200A  
NO. NOX-B02 SERIAL NO. 2409

#### Calibrator (Dilution System)

Brand : API Model : 700  
Last Cal. Date : 04 August 2022 Serial No. : 911

#### Reference Standard Gas

Standard Gas : Nitric Oxide (NO) Cylinder No. : D636192  
Certified Date : 20 April 2022 Expired Date : 20 April 2024 Cylinder Conc. : 49.1 ppm

#### CALIBRATING CONDITION

Pressure 1011 mmbar Temp. 24.6 °C % RH 48

#### CALIBRATION SETTING

Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.10	-	0	-
NO Span	400	400.1	0.025	400.0	1.007
NO <sub>x</sub> Span	400	400.2	0.050	400.0	1.010

#### API Model 200A NO<sub>x</sub> Analyzer Check List

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	500 standard
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air
SAMPLE FLOW	511	cc/min	500 ± 50
OZONE FLOW	79	cc/min	80 ± 15
PMT	102.9	mV	-20 - 150
AZERO	93.7	mV	-20 - 150
HVPS	670	V	420 - 900 constant
RCCELL TEMP	50.3	°C	50 ± 1
BOX TEMP	29.1	°C	8 - 48
PMT TEMP	7.2	°C	7 ± 2
MOLY TEMP	314.9	°C	315 ± 5
RCCELL PRESS	8.5	IN-Hg-A	2 - 10 constant
SAMPLE PRESS	28.7	IN-Hg-A	25 - 30 constant
NO Span Conc	400	PPB	20 - 20,000
NO <sub>x</sub> Span Conc	400	PPB	20 - 20,000
NO Slope	1.007	-	1.0 ± 0.3
NO <sub>x</sub> Slope	1.010	-	1.0 ± 0.3
NO Offset	1.5	mV	-20 to +150
NO <sub>x</sub> Offset	1.0	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 :

Adul Dangklom  
(Mr.Adul Dangklom)

Approved by :

Peera Detudom  
(Mr.Peera Detudom)



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### CALIBRATION REPORT

#### CHEMILUMINESCENT NO / NO<sub>2</sub> / NO<sub>x</sub> ANALYZER

DATE : 07 August 2023

BRAND : API

MODEL : 200E

NO. NOX-B10

SERIAL NO. 4465

#### Calibrator (Dilution System)

Brand : API

Model : 700

Last Cal. Date : 06 September 2022

Serial No. : 421

#### Reference Standard Gas

Standard Gas : Nitric Oxide (NO)

Cylinder No. : D636192

Certified Date : 20 April 2022

Expired Date : 20 April 2024

Cylinder Conc. : 49.1 ppm

#### CALIBRATING CONDITION

Pressure 1011 mmbar

Temp. 24.5 °C

% RH 49

#### CALIBRATION SETTING

Span	Initial Reading (Before Adj.), PPB			Final Reading (After Adj.), PPB	
	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.10	-	0	-
NO Span	400	399.8	-0.050	400.0	1.006
NO <sub>x</sub> Span	400	400.1	0.025	400.0	1.008

#### API Model 200E NO<sub>x</sub> Analyzer Check List

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	500 standard
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air
SAMPLE FLOW	505	cc/min	500 ± 50
OZONE FLOW	78	cc/min	80 ± 15
PMT	103.2	mV	-20 - 150
AZERO	94.0	mV	-20 - 150
HVPS	672	V	420 - 900 constant
RCELL TEMP	50.1	°C	50 ± 1
BOX TEMP	29.4	°C	8 - 48
PMT TEMP	7.5	°C	7 ± 2
MOLY TEMP	314.7	°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 <sub>x</sub> Span Conc	400	PPB	20 - 20,000
NO Slope	1.006	-	1.0 ± 0.3
NO <sub>x</sub> Slope	1.008	-	1.0 ± 0.3
NO Offset	1.2	mV	-20 to +150
NO <sub>x</sub> Offset	0.8	mV	-20 to 150
Stability at Zero	0.1	PPB	< 0.2
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas

Calibrated by :

Adul Dangklom

(Mr. Adul Dangklom)

Approved by :

Peera Detudom

(Mr. Peera Detudom)



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## CALIBRATION REPORT

### CHEMILUMINESCENT NO / NO<sub>2</sub> / NO<sub>x</sub> ANALYZER

DATE : 10 September 2023

BRAND : API

MODEL : 200A

NO. NOX-B03

SERIAL NO. 2617

#### Calibrator (Dilution System)

Brand : API

Model : 700

Last Cal. Date : 08 August 2023

Serial No. : 911

#### Reference Standard Gas

Standard Gas : Nitric Oxide (NO)

Cylinder No. : D636192

Certified Date : 20 April 2022

Expired Date : 20 April 2024

Cylinder Conc. : 49.1 ppm

#### CALIBRATING CONDITION

Pressure 1011 mmbar

Temp. 24.6 °C

% RH 49

#### CALIBRATION SETTING

Span Set Point	Initial Reading (Before Adj.), PPB			Final Reading (After Adj.), PPB	
	Expected Concentration	Analyzer Response	% Dif	Analyzer Response	Slope
Zero	0	0.11	-	0	-
NO Span	400	400.1	0.025	400.0	1.008
NO <sub>x</sub> Span	400	400.3	0.075	400.0	1.012

#### API Model 200A NO<sub>x</sub> Analyzer Check List

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	500 standard
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air
SAMPLE FLOW	511	cc/min	500 ± 50
OZONE FLOW	79	cc/min	80 ± 15
PMT	103.0	mV	-20 - 150
AZERO	94.1	mV	-20 - 150
HVPS	674	V	420 - 900 constant
RCELL TEMP	50.2	°C	50 ± 1
BOX TEMP	29.1	°C	8 - 48
PMT TEMP	7.3	°C	7 ± 2
MOLY TEMP	314.8	°C	315 ± 5
RCELL PRESS	8.2	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 <sub>x</sub> Span Conc	400	PPB	20 - 20,000
NO Slope	1.008	-	1.0 ± 0.3
NO <sub>x</sub> Slope	1.012	-	1.0 ± 0.3
NO Offset	1.6	mV	-20 to +150
NO <sub>x</sub> Offset	1.0	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 :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)



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## CALIBRATION REPORT

### CHEMILUMINESCENT NO / NO<sub>2</sub> / NO<sub>x</sub> ANALYZER

DATE : 8 October 2023

BRAND : API

MODEL : 200A

NO. NOX-B03

SERIAL NO. 2617

#### Calibrator (Dilution System)

Brand : API Model : 700  
Last Cal. Date : 08 August 2023 Serial No. : 911

#### Reference Standard Gas

Standard Gas : Nitric Oxide (NO) Cylinder No. : D636192  
Certified Date : 20 April 2022 Expired Date : 20 April 2024 Cylinder Conc. : 49.1 ppm

#### CALIBRATING CONDITION

Pressure 1011 mmbar Temp. 24.6 °C % RH 48

#### CALIBRATION SETTING

Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	-0.11	-	0	-
NO Span	400	399.9	-0.025	400.0	1.006
NO <sub>x</sub> Span	400	400.1	0.025	400.0	1.009

#### API Model 200A NO<sub>x</sub> Analyzer Check List

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	500 standard
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air
SAMPLE FLOW	506	cc/min	500 ± 50
OZONE FLOW	78	cc/min	80 ± 15
PMT	103.3	mV	-20 - 150
AZERO	94.1	mV	-20 - 150
HVPS	674	V	420 - 900 constant
RCELL TEMP	50.2	°C	50 ± 1
BOX TEMP	29.0	°C	8 - 48
PMT TEMP	7.3	°C	7 ± 2
MOLY TEMP	314.8	°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 <sub>x</sub> Span Conc	400	PPB	20 - 20,000
NO Slope	1.006	-	1.0 ± 0.3
NO <sub>x</sub> Slope	1.009	-	1.0 ± 0.3
NO Offset	1.3	mV	-20 to +150
NO <sub>x</sub> Offset	0.9	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 :

Adul Dangklom  
(Mr.Adul Dangklom)

Approved by :

Peera Detudom  
(Mr.Peera Detudom)



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## CALIBRATION REPORT

### CHEMILUMINESCENT NO / NO<sub>2</sub> / NO<sub>x</sub> ANALYZER

DATE : 05 November 2023

BRAND : API

MODEL : 200A

NO. NOX-B17

SERIAL NO. 1977

#### Calibrator (Dilution System)

Brand : API

Model : 700

Last Cal. Date : 08 August 2023

Serial No. : 911

#### Reference Standard Gas

Standard Gas : Nitric Oxide (NO)

Cylinder No. : A00726SV

Certified Date : 05 January 2023

Expired Date : 05 January 2026

Cylinder Conc. : 48.8 ppm

#### CALIBRATING CONDITION

Pressure 1011 mmbar

Temp. 24.5 °C

% RH 49

#### CALIBRATION SETTING

Span Set Point	Initial Reading (Before Adj.), PPB			Final Reading (After Adj.), PPB	
	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
NO Span	400	400.1	0.025	400.0	1.009
NO <sub>x</sub> Span	400	400.4	0.100	400.0	1.012

#### API Model 200A NO<sub>x</sub> Analyzer Check List

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	500 standard
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air
SAMPLE FLOW	511	cc/min	500 ± 50
OZONE FLOW	79	cc/min	80 ± 15
PMT	103.1	mV	-20 - 150
AZERO	93.9	mV	-20 - 150
HVPS	674	V	420 - 900 constant
RCELL TEMP	50.2	°C	50 ± 1
BOX TEMP	29.1	°C	8 - 48
PMT TEMP	7.3	°C	7 ± 2
MOLY TEMP	314.7	°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 <sub>x</sub> Span Conc	400	PPB	20 - 20,000
NO Slope	1.009	-	1.0 ± 0.3
NO <sub>x</sub> Slope	1.012	-	1.0 ± 0.3
NO Offset	1.6	mV	-20 to +150
NO <sub>x</sub> Offset	1.0	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 :

Adul Dangklom

(Mr. Adul Dangklom)

Approved by :

Peera Detudom

(Mr. Peera Detudom)



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CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO <sub>2</sub> / NO <sub>x</sub> ANALYZER					
DATE :	20 December 2023	BRAND :	API	MODEL :	200E
NO.	NOX-B11	SERIAL NO.	4467		
Calibrator (Dilution System)					
Brand	: Teledyne			Model	: 700E
Last Cal. Date	: 30 October 2023			Serial No.	: 201-S
Reference Standard Gas					
Standard Gas	: Nitric Oxide (NO)			Cylinder No.	: D636192
Certified Date	: 20 April 2022	Expired Date	: 20 April 2024	Cylinder Conc.	: 49.1 ppm
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.6	°C
			% RH	49	
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
NO Span	400	399.8	-0.050	400.0	1.007
NO <sub>x</sub> Span	400	400.1	0.025	400.0	1.011
API Model 200E NO <sub>x</sub> Analyzer Check List					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	500 standard		
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air		
SAMPLE FLOW	510	cc/min	500 ± 50		
OZONE FLOW	79	cc/min	80 ± 15		
PMT	103.3	mV	-20 - 150		
AZERO	93.9	mV	-20 - 150		
HVPS	672	V	420 - 900 constant		
RCELL TEMP	50.1	°C	50 ± 1		
BOX TEMP	29.2	°C	8 - 48		
PMT TEMP	7.3	°C	7 ± 2		
MOLY TEMP	314.8	°C	315 ± 5		
RCELL PRESS	8.3	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.4	IN-Hg-A	25 - 30 constant		
NO Span Conc	400	PPB	20 - 20,000		
NO <sub>x</sub> Span Conc	400	PPB	20 - 20,000		
NO Slope	1.007	-	1.0 ± 0.3		
NO <sub>x</sub> Slope	1.011	-	1.0 ± 0.3		
NO Offset	1.4	mV	-20 to +150		
NO <sub>x</sub> Offset	0.9	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 :

Abul Dangklom

(Mr.Abul Dangklom)

Approved by :

Peera Detudom

(Mr.Peera Detudom)

**QUALITY CALIBRATION CO.,LTD.**

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

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

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

CERTIFICATE No : 23M2441

REFERENCE No : 68471-1

PAGE : 1 OF 2

**Certificate of Calibration**

**EQUIPMENT** : DIGITAL BALANCE

**MANUFACTURER** : METTLER TOLEDO

**MODEL** : XS105DU

**SERIAL No** : 1126422905

**ID No** : BA 05/50

**CONDITION AS RECEIVED** : USED ITEM

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

**CALIBRATED BY** : ATSAWIN Y.

**CALIBRATION DATE** : 10-Mar-23

**APPROVED BY** :   
PONGSAK J.

**ISSUED DATE** : 16-Mar-23

**RECEIVED DATE** : 10-Mar-23

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



CERTIFICATE No : 23M2441

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : XS105DU  
MANUFACTURER : METTLER TOLEDO S/N : 1126422905  
ID No : BA 05/50 RECEIVED DATE : 10-Mar-23  
AIR PRESSURE : 1010mbar  $\pm$  1mbar CALIBRATION DATE : 10-Mar-23  
AMBIENT TEMPERATURE : 23°C  $\pm$  1°C RELATIVE HUMIDITY : 49 %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	M2302013S	02-Feb-25
2) STANDARD WEIGHT	E2	15843	M2302014S	02-Feb-25

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON 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 CENTRAL BUREAU OF WEIGHTS&MEASURES

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

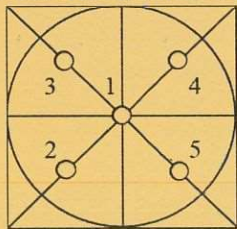
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY ( $\pm$ g)
0.00	0.00000	0.00000	0.000039
0.02	0.02000	0.00000	0.000039
0.10	0.10000	0.00000	0.000039
0.20	0.20001	-0.00001	0.000040
0.50	0.50001	-0.00001	0.000040
1.00	1.00000	0.00000	0.000041
2.00	2.00003	-0.00003	0.000042
5.00	5.00001	-0.00001	0.000046
10.00	10.00003	-0.00003	0.000053
20.00	20.00005	-0.00005	0.000067
50.00	50.00001	-0.00001	0.00011
100.00	100.00001	-0.00001	0.00019
200.00	200.00001	-0.00001	0.00032

5. OFF CENTER LOADING ERROR



POINT	READING (g)
1	50.0000
2	50.0001
3	50.0000
4	50.0000
5	49.9999
OFF-CENTER LOADING	0.0001

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

# SITHIPHORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY



451-451/1 Sirinthorn Rd.,Bangbumru, Bangplud Bangkok 10700 THAILAND.  
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NSC-TISI-TIS 17025  
CALIBRATION 0394

Cert. No. : SP22018

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 :** ORGANIC LABORATORY IV  
  
**Ambient Temperature :** ( 24.4  $\pm$  5 ) °C  
**Relative Humidity :** ( 60.1  $\pm$  25 ) %  
  
**Received Date :** 30 AUGUST 2022  
**Calibration Date :** 30 AUGUST 2022  
**Date of Issue :** 31 AUGUST 2022

**Calibrated by :**

Nathakorn Pisutpaisan

**Approved by :**

  
( Thanakul Petchurai )

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.

## Continuation of Calibration Certificate

Cert. No. : SP22018

Job No. : VC65SP0008

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	87569	13/10/2022
Didymium liquid	RM-DL	28912	87588	15/10/2022
Neutral density filter	RM-1N2N3N	13877	87600	15/10/2022
Potassium dichromate solutions	RM-0204060810	14204	87614	16/10/2022
Potassium Iodide solution	-	KI-0701-001	CI-0090-22	08/04/2024

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	467.8	-0.02	0.16	2.00
	536.56	536.5	-0.06	0.16	2.00
	640.50	640.5	0.00	0.16	2.00
RM-DL	740.09	740.0	-0.09	0.16	2.00
	864.94	865.2	0.26	0.16	2.00

UUC\* = Unit Under Calibration

Continuation of Calibration Certificate

Cert. No. : SP22018

Job No. : VC65SP0008

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	1.0524	1.0539	0.0015	0.0028	2.00
		29914	0.7	0.7454	0.7459	0.0005	0.0029	2.00
		29381	0.5	0.5426	0.5426	0.0000	0.0028	2.00
	546.1	29360	1.0	0.9822	0.9810	-0.0012	0.0028	2.00
		29914	0.7	0.6962	0.6960	-0.0002	0.0028	2.00
		29381	0.5	0.5076	0.5070	-0.0006	0.0029	2.00
	590.0	29360	1.0	1.0221	1.0202	-0.0019	0.0028	2.00
		29914	0.7	0.7238	0.7230	-0.0008	0.0029	2.00
		29381	0.5	0.5364	0.5360	-0.0004	0.0031	2.00
	635.0	29360	1.0	0.9751	0.9732	-0.0019	0.0028	2.00
		29914	0.7	0.6912	0.6902	-0.0010	0.0029	2.00
		29381	0.5	0.5214	0.5210	-0.0004	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	0.2436	0.2419	-0.0017	0.0101	2.00	
		40	0.4905	0.4855	-0.0050	0.0115	2.00	
		60	0.7453	0.7388	-0.0065	0.0067	2.00	
		80	0.9920	0.9839	-0.0081	0.0071	2.00	
		100	1.2487	1.2414	-0.0073	0.0073	2.00	

UUC\* = Unit Under Calibration

**Condition of this result of calibration : Spectrophotometer PERKINELMER Model Lambda 25 S/N 501S141230**

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

Transimission T(%)	Absorbance(A)
0.0107	3.9886

\*\*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



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

Calibration Report Total Hydrocarbon Analyzer			
Date : 05 July 2023		Brand : HORIBA	Model : APHA-360CE
No. B01		Serial No. 4211954001	
Calibrator (Dilution System)			
Brand : API		Model : 700	
Last Cal. Date : 04 August 2022		Serial No. : 911	
Reference Standard Gas			
Standard Gas : Methane (CH <sub>4</sub> )		Cylinder No. : D612165	
Certified Date : 25 February 2023	Expired Date : 25 February 2031	Cylinder Conc. : 453 ppm	
Calibrating Condition			
Pressure : 1011 mmbar	Temp. : 24.6 °C	% RH : 49	Start Time : 2:00 PM
Pre-Calibration Checks			
Change Particulate Filter : Yes	Station Temp : 25.0 °C		
Leak Test : Yes			
Calibration Setting			
Span Set Point	Initial Reading (Before Adj)		Final Reading (After Adj)
	Expected Concentration (PPM)	Analyzer Response (PPM)	Analyzer Response (PPM)
Zero	0	-0.10	0
Span	10	10.03	10
Calibration Setting (Final)			
Span Instrument Gain: 0.998			Finish Time: 3:00 PM
APHA-360 Total Hydrocarbon Analyzer			
Test Values	Observed Value	Units	Nominal Range
Signal (CH <sub>4</sub> )	911.7	mV	800-1,350
Signal (THC)	917.1	mV	800-1,350
Detector	77.9	kPa	((Pressure Air/1013)x100)-20 ± 4 kPa
Purifier	19.2	kPa	8 - 25
NMC	259.5	°C	260 ± 10
Bypass	0.9	L / min	0.9 ± 0.3
Over Flow	0.8	L / Min	0.8

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)

## เอกสาร 5-2

เอกสารสอบเทียบเครื่องมือตรวจวิเคราะห์ระดับเสียง

Request No. 21-66/0413

MTC No. EEL. BP. 109/0366

## CALIBRATION CERTIFICATE

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

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

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

### Instrument Calibrated :

Description : Sound Calibrator

Manufacturer : ACO

Model : 2127

Serial No. : 130006

### Ambient Environment

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

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

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

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

**Calibration Procedure:** CP-102-04 based on IEC 60942-2003. The sound pressure level of instrument was 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 : 27 Mar. 2023

Date of Calibration : 29 Mar. 2023

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

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

FM.BL.MTC.002 Rev.4

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0413

MTC No. EEL. BP. 109/0366

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

Nominal Output of Unit Under Test = 94 dB re 20 $\mu$ Pa at 1000 Hz

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

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Brüel&Kjaer 4180	93.94	-0.06	$\pm 0.10$	$\pm 0.40$ dB

2. Frequency

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

3. Total distortion

Standard Microphone Type	Measured Total distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Brüel&Kjaer 4180	1.80	$\pm 0.50$	$\pm 3.0\%$

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :

  
(Mr. Weerachai Deechaiyae)

Approved by :

  
(Mr. Prawate Kluaypa)  
Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 29 Mar. 2023

Date of Issue : 30 Mar. 2023

Ref : 2011266032701228001

End of Certificate

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Noise B\_292/23

### 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	29 March 2023
		Due Date	29 March 2024

#### Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-B24	ACO	6236	00182005	16 July 2023	93.9	94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.94 ± 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@spscon.com, www.spscon.com

Calibration Report Total Hydrocarbon Analyzer			
Date : 03 August 2023		Brand : HORIBA	Model : APHA-360CE
No. B01		Serial No. 4211954001	
Calibrator (Dilution System)			
Brand : API		Model : 700	
Last Cal. Date : 04 August 2022		Serial No. : 911	
Reference Standard Gas			
Standard Gas : Methane (CH <sub>4</sub> )		Cylinder No. : D612165	
Certified Date : 25 February 2023	Expired Date : 25 February 2031		Cylinder Conc. : 453 ppm
Calibrating Condition			
Pressure : 1011 mmbar	Temp. : 24.5 °C	% RH : 49	Start Time : 10:00 AM
Pre-Calibration Checks			
Change Particulate Filter : Yes	Station Temp : 25.0 °C		
Leak Test : Yes			
Calibration Setting			
Span Set Point	Initial Reading (Before Adj)		Final Reading (After Adj)
	Expected Concentration (PPM)	Analyzer Response (PPM)	Analyzer Response (PPM)
Zero	0	-0.10	0
Span	10	10.02	10
Calibration Setting (Final)			
Span Instrument Gain: 0.999		Finish Time: 11:00 AM	
APHA-360 Total Hydrocarbon Analyzer			
Test Values	Observed Value	Units	Nominal Range
Signal (CH <sub>4</sub> )	911.3	mV	800-1,350
Signal (THC)	916.2	mV	800-1,350
Detector	78.1	kPa	((Pressure Air/1013)x100)-20 ± 4 kPa
Purifier	19.0	kPa	8 - 25
NMC	258.8	°C	260 ± 10
Bypass	0.9	L / min	0.9 ± 0.3
Over Flow	0.8	L / Min	0.8

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)



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

Calibration Report Total Hydrocarbon Analyzer			
Date : 05 September 2023		Brand : HORIBA	Model : APHA-360CE
No. B01		Serial No. 4211954001	
Calibrator (Dilution System)			
Brand : API		Model : 700	
Last Cal. Date : 08 August 2023		Serial No. : 911	
Reference Standard Gas			
Standard Gas : Methane (CH <sub>4</sub> )		Cylinder No. : D612165	
Certified Date : 25 February 2023	Expired Date : 25 February 2031		Cylinder Conc. : 453 ppm
Calibrating Condition			
Pressure : 1011 mmbar	Temp. : 24.6 °C	% RH : 49	
		Start Time : 1:00 PM	
Pre-Calibration Checks			
Change Particulate Filter : Yes	Station Temp : 25.0 °C		
Leak Test : Yes			
Calibration Setting			
Span Set Point	Initial Reading (Before Adj)		Final Reading (After Adj)
	Expected Concentration (PPM)	Analyzer Response (PPM)	Analyzer Response (PPM)
Zero	0	-0.10	0
Span	10	10.04	10
Calibration Setting (Final)			
Span Instrument Gain: 0.997	Finish Time: 2:00 PM		
APHA-360 Total Hydrocarbon Analyzer			
Test Values	Observed Value	Units	Nominal Range
Signal (CH <sub>4</sub> )	910.9	mV	800-1,350
Signal (THC)	915.7	mV	800-1,350
Detector	78.0	kPa	((Pressure Air/1013)x100)-20 ± 4 kPa
Purifier	19.3	kPa	8 - 25
NMC	259.1	°C	260 ± 10
Bypass	0.9	L / min	0.9 ± 0.3
Over Flow	0.8	L / Min	0.8

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)



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Calibration Report Total Hydrocarbon Analyzer			
Date : 04 October 2023		Brand : HORIBA	Model : APHA-360CE
No. B01		Serial No. 4211954001	
Calibrator (Dilution System)			
Brand : API		Model : 700	
Last Cal. Date : 08 August 2023		Serial No. : 911	
Reference Standard Gas			
Standard Gas : Methane (CH <sub>4</sub> )		Cylinder No. : D612165	
Certified Date : 25 February 2023	Expired Date : 25 February 2031	Cylinder Conc. : 453 ppm	
Calibrating Condition			
Pressure : 1011 mmbar	Temp. : 24.5 °C	% RH : 49	Start Time : 9:00 AM
Pre-Calibration Checks			
Change Particulate Filter : Yes	Station Temp : 25.0 °C		
Leak Test : Yes			
Calibration Setting			
Span Set Point	Initial Reading (Before Adj)		Final Reading (After Adj)
	Expected Concentration (PPM)	Analyzer Response (PPM)	Analyzer Response (PPM)
Zero	0	-0.10	0
Span	10	10.02	10
Calibration Setting (Final)			
Span Instrument Gain : 0.998	Finish Time : 10:00 AM		
APHA-360 Total Hydrocarbon Analyzer			
Test Values	Observed Value	Units	Nominal Range
Signal (CH <sub>4</sub> )	911.4	mV	800-1,350
Signal (THC)	916.7	mV	800-1,350
Detector	77.9	kPa	((Pressure Air/1013)x100)-20 ± 4 kPa
Purifier	19.1	kPa	8 - 25
NMC	259.7	°C	260 ± 10
Bypass	0.9	L / min	0.9 ± 0.3
Over Flow	0.8	L / Min	0.8

Calibrated by :

Adul Dangklom

(Mr. Adul Dangklom)

Approved by :

Peera Detudom

(Mr. Peera Detudom)



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Calibrator (Dilution System)			
Brand : API		Model : 700	
Last Cal. Date : 08 August 2023		Serial No. : 911	
Reference Standard Gas			
Standard Gas : Methane (CH <sub>4</sub> )		Cylinder No. : D612165	
Certified Date : 25 February 2023	Expired Date : 25 February 2031	Cylinder Conc. : 453 ppm	
Calibrating Condition			
Pressure : 1011 mmbar	Temp. : 24.5 °C	% RH : 49	Start Time : 9:00 AM
Pre-Calibration Checks			
Change Particulate Filter : Yes	Station Temp : 25.0 °C		
Leak Test : Yes			
Calibration Setting			
Span Set Point	Initial Reading (Before Adj)		Final Reading (After Adj)
	Expected Concentration (PPM)	Analyzer Response (PPM)	Analyzer Response (PPM)
Zero	0	-0.10	0
Span	10	10.02	10
Calibration Setting (Final)			
Span Instrument Gain : 0.998	Finish Time : 10:00 AM		
APHA-360 Total Hydrocarbon Analyzer			
Test Values	Observed Value	Units	Nominal Range
Signal (CH <sub>4</sub> )	911.4	mV	800-1,350
Signal (THC)	916.7	mV	800-1,350
Detector	77.9	kPa	((Pressure Air/1013)x100)-20 ± 4 kPa
Purifier	19.1	kPa	8 - 25
NMC	259.7	°C	260 ± 10
Bypass	0.9	L / min	0.9 ± 0.3
Over Flow	0.8	L / Min	0.8

Calibrated by :

Adul Dangklom

(Mr. Adul Dangklom)

Approved by :

Peera Detudom

(Mr. Peera Detudom)



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 Total Hydrocarbon Analyzer			
Date :	04 October 2023	Brand :	HORIBA
		Model :	APHA-360CE
No.	B01	Serial No.	4211954001
Calibrator (Dilution System)			
Brand :	API	Model :	700
Last Cal. Date :	08 August 2023	Serial No. :	911
Reference Standard Gas			
Standard Gas :	Methane (CH <sub>4</sub> )	Cylinder No. :	D612165
Certified Date :	25 February 2023	Expired Date :	25 February 2031
		Cylinder Conc. :	453 ppm
Calibrating Condition			
Pressure	1011	mmbar	Temp. 24.5 °C
		% RH	49
		Start Time :	9:00 AM
Pre-Calibration Checks			
Change Particulate Filter	Yes	Station Temp :	25.0 °C
Leak Test	Yes		
Calibration Setting			
Span Set Point	Initial Reading (Before Adj)		Final Reading (After Adj)
	Expected Concentration (PPM)	Analyzer Response (PPM)	Analyzer Response (PPM)
Zero	0	-0.10	0
Span	10	10.02	10
Calibration Setting (Final)			
Span Instrument Gain:	0.998	Finish Time:	10:00 AM
APHA-360 Total Hydrocarbon Analyzer			
Test Values	Observed Value	Units	Nominal Range
Signal (CH <sub>4</sub> )	911.4	mV	800-1,350
Signal (THC)	916.7	mV	800-1,350
Detector	77.9	kPa	((Pressure Air/1013)x100)-20 ± 4 kPa
Purifier	19.1	kPa	8 - 25
NMC	259.7	°C	260 ± 10
Bypass	0.9	L / min	0.9 ± 0.3
Over Flow	0.8	L / Min	0.8

Calibrated by :

Adul Dangklom

(Mr. Adul Dangklom)

Approved by :

Peera Detudom

(Mr. Peera Detudom)

### เอกสาร 5-3

เอกสารสอบเทียบเครื่องมือตรวจวิเคราะห์คุณภาพน้ำ

## CERTIFICATE OF CALIBRATION

### FOR

NOMENCLATURE : pH METER  
MANUFACTURER : ECOSENSE/YSI  
MODEL / TYPE : PH100A  
SERIAL NO. : JC03148/YSI60537718A[PH 05/61]  
CLID. NO. : 272101139  
JOB CONTROL NO. : 230314028617

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

DATE OF RECEIVED : 14 March 2023

DATE OF ISSUED : 17 March 2023

Report of calibration screening must not be taken in part. Except complete. Without the approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Sukgasem Seehanart  
Monthira Treechum  
Calibration Engineer



Approved By : Mongkol Yotsoontorn  
Authorized Signatory  
17 March 2023



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. Q23028617

F3-011-04/01-12

page 1 of 4



@clccalibration

## REPORT OF CALIBRATION FOR

**NOMENCLATURE** : pH METER  
**MANUFACTURER** : ECOSENSE/YSI  
**MODEL / TYPE** : PH100A  
**SERIAL NO.** : JC03148/YSI60537718A[PH 05/61]  
**DATE OF CALIBRATION** : 15 March 2023

### 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** [ pH 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 06-664-260,11754256, Lot Number CC728484.
3. Calibration Bath, Kambic Model OB-22/2 ULT S/N. 17115653.
4. Precision Thermometer, ASL Model F200-A-8 S/N. 014433/03.
5. IPRT, ASL Model T100-250-1D S/N. L0193A-1-1.



## TRACEABILITY :

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

Lot Number. 160221 , 180121. Due Date 05 May 2023.

2. The measurements are traceable to International System of Units (SI) , through Control Company.

Certificate No. 4281-12405788 , Due Date 30 June 2023.

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

Certificate No. Q22130792, Due Date 05 January 2024.

4. The measurements are traceable to International System of Units (SI) , through Thailand Institute of Scientific and Technological Research (TISTR). Certificate No. PSL-T 0010/66, Due Date 06 November 2023.

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

Certificate No. TT-0166-22, Due Date 01 December 2023.

## 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)"





**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 : GOOD

## 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
4.000	4.00	140	0.000	0.012	2,20
6.996	6.99	-34	+0.006	0.015	2,06
10.007	9.98	-205	+0.027	0.015	2,05

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 008 Page 2,3 of 54

#### 2. TEMPERATURE RESULT [ pH PROBE ]

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

Note. Probe  $\varnothing$  12 mm

The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 008 Page 47 of 54

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

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

### End of Certificate ###

Certificate No. Q23028617

F3-011-04/01-12

page 4 of 4



@clccalibration

CERT.No.: HS-U017D

Harikul Science Co.,Ltd.

694 Soi Ratchadanivet 24, Pracharatbamphen,

Samsaennok, Huaikhwang, Bangkok 10310

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

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

Certificate of Calibration

Calibration Date : 3 Apr 23

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

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

Avg Room Temp : 20 °C

Avg Water Temp : 20 °C

Air Pressure : 760.00 mmHg

Salinity : 0 ppt

Model : YSI 5000

S/N : 15B100751

Probe : YSI 5010

S/N : 22D100097

ID NO. : -

Air Temp ref : S/N. E00522

Barometric ref : S/N. E00522

Water Temp ref : S/N. 11431

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)	9.08	(PASS)	-
Measurement 5 (mg/l)	9.08	(PASS)	-
Measurement 6 (mg/l)	9.08	(PASS)	-
Measurement 7 (mg/l)	9.08	(PASS)	-
Measurement 8 (mg/l)	9.08	(PASS)	-
Measurement 9 (mg/l)	9.08	(PASS)	-
Measurement 10 (mg/l)	9.08	(PASS)	-

Mean Measurement	9.08	mg/l	-	-
Inaccuracy	0.01	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)



CERTIFICATE No : 23M2443

REFERENCE No : 68471-3

PAGE : 1 OF 2

## Certificate of Calibration

**EQUIPMENT** : DIGITAL BALANCE

**MANUFACTURER** : SARTORIUS

**MODEL** : BSA224S-CW

**SERIAL No** : 36591842

**ID No** : BA 08/61

**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** : 10-Mar-23

**APPROVED BY** : PONGSAK J.

**ISSUED DATE** : 16-Mar-23

**RECEIVED DATE** : 10-Mar-23



CERTIFICATE No : 23M2443

PAGE : 2 OF 2

## Calibration Report

**EQUIPMENT** : DIGITAL BALANCE **MODEL** : BSA224S-CW  
**MANUFACTURER** : SARTORIUS **S/N** : 36591842  
**ID No** : BA 08/61 **RECEIVED DATE** : 10-Mar-23  
**AIR PRESSURE** : 1010mbar  $\pm$  1mbar **CALIBRATION DATE** : 10-Mar-23  
**AMBIENT TEMPERATURE** : 23°C  $\pm$  1°C **RELATIVE HUMIDITY** : 49 %RH  $\pm$  10 % RH

### CONDITION OF THIS RESULTS OF CALIBRATION

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

2. REFERENCE STANDARD INSTRUMENTS :-

<u>INSTRUMENT</u>	<u>MODEL</u>	<u>SERIAL No</u>	<u>CERTIFICATE No</u>	<u>DUE DATE</u>
1) STANDARD WEIGHT SET	E2	QK-I-151	M2302013S	02-Feb-25
2) STANDARD WEIGHT	E2	15843	M2302014S	02-Feb-25

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON 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 CENTRAL BUREAU OF WEIGHTS&MEASURES

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

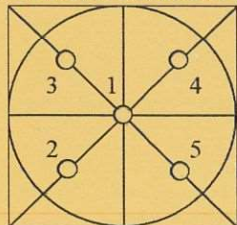
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY ( $\pm$ g)
0.0	0.0000	0.0000	0.000058
0.1	0.1000	0.0000	0.000059
0.2	0.2000	0.0000	0.000059
0.5	0.5000	0.0000	0.000060
1.0	1.0000	0.0000	0.000060
2.0	2.0000	0.0000	0.000061
5.0	5.0000	0.0000	0.000063
10.0	10.0000	0.0000	0.000067
20.0	20.0001	-0.0001	0.000073
50.0	50.0000	0.0000	0.00011
100.0	100.0001	-0.0001	0.00019
200.0	200.0000	0.0000	0.00032

5. OFF CENTER LOADING ERROR



POINT	READING (g)
1	100.0000
2	100.0000
3	99.9999
4	99.9998
5	100.0000
OFF-CENTER LOADING	0.0002

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



MIRACLE INTERNATIONAL TECHNOLOGY CO.,LTD

214 Bangwaek Rd. Bangpai Bangkae Bangkok 10160

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



## CALIBRATION CERTIFICATE

Certificate No. : S2022090647-0003

Date Issued : 03-Oct-22

**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** : 30-Sep-22

**Date Calibrated** : 30-Sep-22

**Calibrated by** : Mr. Surat Aumarb

### 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:   
( Mr. Sarayuth Tochua)



Page 1 of 2

**Certificate No. :** S2022090647-0003

**Environment :** Ambient Temperature : Start record 26.5 °C, Stop record 26.6 °C  
Relative Humidity : Start record 54.8 %RH, Stop record 54.6 %RH

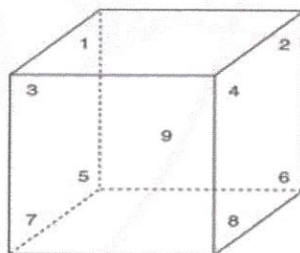
Calibration Temperature (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Stability <sup>1</sup> (°C)	Measured Uniformity <sup>2</sup> (°C)	Overall Variation <sup>3</sup> (°C)
35	35.0	35.0	0.03	0.07	0.14
41.5	41.5	41.5	0.03	0.08	0.15

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 <sup>4</sup> ±°C
35	34.88	34.86	34.89	34.90	34.93	34.92	34.95	34.89	34.93	0.18
41.5	41.40	41.33	41.32	41.41	41.43	41.43	41.38	41.33	41.37	0.18

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. AD2207-125-0001 for Digital Thermometer with Probe (Agilent) Module 1 (73) NTC, Pt1000 Serial No. MY44024042, Due 01-Feb-23

- 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**

**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 : 23T2448

REFERENCE No : 68471-8

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** : CHAICHARN CH.

**CALIBRATION DATE** : 10-Mar-23

**APPROVED BY** :   
PONGSAK J.

**ISSUED DATE** : 17-Mar-23

**RECEIVED DATE** : 10-Mar-23

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



CERTIFICATE No : 23T2448

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : WATER BATH  
MANUFACTURER : MEMMERT  
ID NUMBER : WB 05/58  
RECEIVED DATE : 10-Mar-23  
AMBIENT TEMPERATURE : 26 °C ± 1 °C

MODEL : WNB29  
SERIAL NUMBER : L614.0123  
CALIBRATION DATE : 10-Mar-23  
RELATIVE HUMIDITY : 51 %RH ± 10 % RH

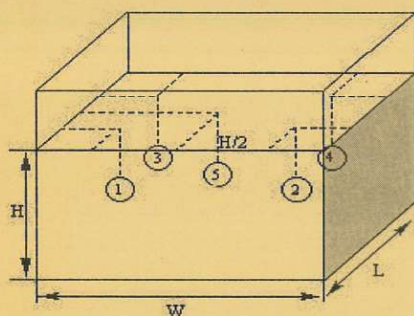
### CONDITION OF THIS RESULTS OF CALIBRATION

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	22T7514	05-Jul-23

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON 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) : 0.9
Overall Variation of Line Voltage (V) : 0
Instrument Condition : Normal

### BATH PERFORMANCE

Controller Temperature (°C)	Temperature Stability (±°C)	Radius Uniformity (°C)	Axial Uniformity (°C)	Overall Variation (°C)
50.4	0.12	0.14	0.15	0.34
60.4	0.18	0.23	0.19	0.50

### TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Indicating Temp (°C)	Measured Temperature (°C) at Spread Locations					Uncertainty (± °C)
		#1	#2	#3	#4	Ref. 5	
50.4	50.4	49.45	49.42	49.36	49.32	49.42	0.19
60.4	60.4	60.17	60.20	60.06	59.97	60.18	0.25

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