

ภาคผนวก จ

เอกสารการสอบเทียบความถูกต้อง ของเครื่องมือตรวจวัดคุณภาพสิ่งแวดล้อม

เอกสาร

- ฉ-1 เอกสารสอบเทียบเครื่องมือตรวจวัดคุณภาพอากาศ
ฉ-2 เอกสารสอบเทียบเครื่องมือตรวจวัดระดับเสียง
ฉ-3 เอกสารสอบเทียบเครื่องมือตรวจวิเคราะห์คุณภาพน้ำ

**ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง
และเครื่องมือตรวจวิเคราะห์คุณภาพสิ่งแวดล้อม**

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
คุณภาพอากาศ		
- TSP	- High Volume Air Sampler No. B08, B11, B12, B15, B19, B20 B23, B25 ,B31, B33, B36, B37, B44	- Digital Balance
- PM-10	- High Volume Air PM-10 Sampler No. B06, B07, R11, B11, B15, B18, B20, B26, B32, B42	- Digital Balance
- PM-2.5	- High Volume Air PM-2.5 Sampler No. B01, B02, B03, B04, B05, B06, B07, B08, B10, B11, B13, B14, B15	- Digital Balance
- SO ₂	- Gas Sampler Box No. B01, B02, B03, B04, B05, B06, B07, B08, B09, B11, B12	- Spectrophotometer
- CO	- Rotameter NO. B01, B02 - Personal Pump SKC No. B02, B04, B07, B11, B18 B21, B24, B32, B41, B47, B50, B56, B62, B63, B73, B89	- CO Analyzer NO. B01, B02
- THC	- Rotameter NO. B01, B02 - Personal Pump SKC No. B02, B04, B10, B11, B13, B18, B21, B22, B23, B24, B26, B31, B40, B51, B65, B74	- THC Analyzer NO. B01, R01
- NO ₂	- NO ₂ Analyzer No. B01, B02, B03, B05, B06, B07, B08, B10, B11, B13, B14, B15, B18, B20, B21	- NO ₂ Analyzer No. B01, B02, B03, B05, B06, B08, B10, B11, B13, B14, B15, B16, B18, B20, B21
ระดับเสียง		
- Leq 1 hr, Leq 24 hr, L10, L50, L90, Lmax, Ldn	- Acoustic Calibrator - Sound Level Meter ACO-No. B02, B03, B04, B12, B15, B18, B19, B33, B28, B36, B38 B41, B42, B44, R41	-

ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง
และเครื่องมือตรวจวิเคราะห์คุณภาพสิ่งแวดล้อม (ต่อ)

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
คุณภาพน้ำ		
- Color	-	- Spectrophotometer
- Temperature	-	- Thermometer
- Turbidity	-	- Turbidity Meter
- pH	-	- pH Meter
- Salinity	-	- Conductivity Meter
- Conductivity	-	- Conductivity Meter
- SS	-	- Digital Balance
- TDS	-	- Digital Balance
- DO	-	- DO Meter
- BOD ₅	-	- DO Meter
- COD	-	- COD Reactor
- Total Nitrogen	-	- Spectrophotometer
- Total Potassium	-	- ICP
- NO ₃ -N	-	- Spectrophotometer
- NH ₃ -N	-	- Spectrophotometer
- Hg	-	- AAS
- Pb	-	- AAS
- Cd	-	- ICP
- Cr	-	- ICP
- Cr ⁺⁶	-	- AAS
- Cu	-	- ICP
- Sn	-	- ICP
- Mn	-	- ICP
- Zn	-	- ICP
- TKN	-	- Digital Balance
- Grease & Oil	-	- Digital Balance
- Fecal Coliform Bacteria	-	- Incubator
- Total Coliform Bacteria	-	- Incubator

เอกสาร ฉ-1

เอกสารสอบเทียบเครื่องมือตรวจวัดคุณภาพอากาศ



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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 ³ /min)	R ²
B01	B01	01/08/2024	y = 1.171x-2.911	0.998
B02	B02	02/08/2024	y = 1.163x+0.020	0.999
B03	B03	05/08/2024	y = 1.195x-3.992	0.998
B04	B04	02/08/2024	y = 1.212x-3.522	0.999
B05	B05	02/08/2024	y = 1.222x-5.699	0.997
B06	B06	05/08/2024	y = 1.192x-3.521	0.999
B07	B07	08/08/2024	y = 1.173x-2.945	0.998
B08	B08	02/08/2024	y = 1.181x-2.549	0.999
B09	B09	02/08/2024	y = 1.202x-4.007	0.999
B10	B10	05/08/2024	y = 1.187x-0.531	0.998
B11	B11	05/08/2024	y = 1.092x+1.351	1.000
B12	B12	07/08/2024	y = 1.186x-4.168	0.998
B13	B13	05/08/2024	y = 1.182x-3.641	0.996
B14	B14	05/08/2024	y = 1.226x-5.106	0.999
B15	B15	05/08/2024	y = 1.218x-3.602	1.000
B16	B16	02/08/2024	y = 1.174x-1.318	0.997
B17	B17	05/08/2024	y = 1.188x-1.593	1.000
B18	B18	02/08/2024	y = 1.218x-5.796	0.999
B19	B19	02/08/2024	y = 1.225x-6.976	0.998
B20	B20	02/08/2024	y = 1.197x-2.746	0.999
B21	B21	05/08/2024	y = 1.214x-5.212	0.997
B22	B22	05/08/2024	y = 1.205x-5.711	0.999
B23	B23	02/08/2024	y = 1.221x-4.197	0.998
B24	B24	02/08/2024	y = 1.164x-1.349	0.999
B25	B25	07/08/2024	y = 1.125x-0.794	1.000
B26	B26	07/08/2024	y = 1.181x-2.418	0.998
B27	B27	07/08/2024	y = 1.109x-1.204	0.998
B28	B28	07/08/2024	y = 1.183x-5.519	1.000
B29	B29	02/08/2024	y = 1.227x-3.979	0.996
B30	B30	05/08/2024	y = 1.174x-2.401	0.999
B31	B31	05/08/2024	y = 1.190x-4.450	1.000
B32	B32	05/08/2024	y = 1.203x-1.091	0.999
B33	B33	05/08/2024	y = 1.218x-3.935	1.000
B34	B34	05/08/2024	y = 1.224x-5.708	0.996

Calibrated by :

(Mr. Adul Dangklom)

Approved by :

(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 ³ /min)	R ²
B35	B35	05/08/2024	y = 1.186x-3.084	0.999
B36	B36	05/08/2024	y = 1.210x-3.778	0.997
B37	B37	06/08/2024	y = 1.196x-3.291	0.998
B38	B38	06/08/2024	y = 1.176x-3.769	1.000
B39	B39	05/08/2024	y = 1.200x-1.884	0.999
B40	B40	05/08/2024	y = 1.192x-3.238	0.999
B41	B41	05/08/2024	y = 1.170x-2.205	0.996
B42	B42	05/08/2024	y = 1.141x-0.385	1.000
B43	B43	02/08/2024	y = 1.175x-1.695	0.996
B44	B44	02/08/2024	y = 1.167x-1.577	0.998
R01	R01	02/08/2024	y = 1.177x-4.285	0.999
R02	R02	02/08/2024	y = 1.216x-5.757	0.997
R03	R03	02/08/2024	y = 1.198x-6.621	0.999
R04	R04	08/08/2024	y = 1.170x-2.838	0.997
R05	R05	08/08/2024	y = 1.184x-4.669	1.000
R06	R06	01/08/2024	y = 1.205x-5.684	0.998
R07	R07	01/08/2024	y = 1.114x+0.237	1.000
R08	R08	01/08/2024	y = 1.073x+1.881	0.997
R09	R09	01/08/2024	y = 1.186x-1.865	0.999
R10	R10	02/08/2024	y = 1.171x-3.610	0.996
R11	R11	02/08/2024	y = 1.201x-4.470	1.000
R12	R12	02/08/2024	y = 1.167x-3.984	0.998
R13	R13	06/08/2024	y = 1.171x-3.661	0.997
R14	R14	06/08/2024	y = 1.194x-2.635	0.998
R15	R15	02/08/2024	y = 1.207x-6.878	0.999
R16	R16	02/08/2024	y = 1.212x-6.360	1.000
R17	R17	05/08/2024	y = 1.194x-4.223	0.999
R18	R18	05/08/2024	y = 1.151x-2.849	0.999
R19	R19	05/08/2024	y = 1.172x-3.442	0.998
R20	R20	05/08/2024	y = 1.184x-3.473	0.999

Calibrated by :

(Mr. Adul 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 ³ /min)	R ²
B01	B01	02/08/2024	y = 1.192x-3.010	0.997
B02	B02	05/08/2024	y = 1.166x-1.422	0.998
B03	B03	07/08/2024	y = 1.198x-2.675	0.997
B04	B04	02/08/2024	y = 1.195x-4.855	0.999
B05	B05	05/08/2024	y = 1.215x-6.792	0.999
B06	B06	02/08/2024	y = 1.184x-3.554	0.997
B07	B07	01/05/2024	y = 1.132x-0.786	1.000
B08	B08	02/08/2024	y = 1.203x-1.746	0.997
B09	B09	05/08/2024	y = 1.198x-3.274	0.999
B10	B10	02/08/2024	y = 1.175x-1.634	0.996
B11	B11	02/08/2024	y = 1.188x-1.290	0.999
B12	B12	07/08/2024	y = 1.200x-4.619	0.997
B13	B13	05/08/2024	y = 1.140x-2.044	0.997
B14	B14	06/08/2024	y = 1.137x+0.196	0.996
B15	B15	05/08/2024	y = 1.156x-0.963	1.000
B16	B16	06/08/2024	y = 1.178x+0.511	0.999
B17	B17	02/08/2024	y = 1.167x-2.529	0.998
B18	B18	01/08/2024	y = 1.193x-2.801	0.997
B19	B19	05/08/2024	y = 1.174x-2.984	0.998
B20	B20	01/08/2024	y = 1.197x-4.582	0.999
B21	B21	05/08/2024	y = 1.195x-3.263	0.998
B22	B22	02/08/2024	y = 1.137x-0.996	0.998
B23	B23	05/08/2024	y = 1.191x-2.392	0.998
B24	B24	01/08/2024	y = 1.185x-3.393	0.997
B25	B25	02/08/2024	y = 1.202x-3.881	0.997
B26	B26	02/08/2024	y = 1.193x-3.733	0.997
B27	B27	02/08/2024	y = 1.165x-4.778	0.999
B28	B28	02/08/2024	y = 1.182x-4.730	0.999
B29	B29	05/08/2024	y = 1.177x-4.217	0.999
B30	B30	05/08/2024	y = 1.188x-3.046	0.998
B31	B31	01/08/2024	y = 1.173x-1.247	1.000
B32	B32	01/08/2024	y = 1.157x-3.072	1.000
B33	B33	05/08/2024	y = 1.153x-0.882	0.997
B34	B34	05/08/2024	y = 1.193x-1.943	0.996

Calibrated by :

(Mr. Adul 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 ³ /min)	R ²
R01	R01	05/08/2024	y = 1.192x-5.434	0.998
R02	R02	07/08/2024	y = 1.182x-2.772	0.998
R03	R03	07/08/2024	y = 1.199x-4.793	1.000
R04	R04	07/08/2024	y = 1.189x-6.456	0.996
R05	R05	07/08/2024	y = 1.162x-3.444	1.000
R06	R06	07/08/2024	y = 1.194x-3.230	0.999
R07	R07	01/08/2024	y = 1.127x-0.967	0.998
R08	R08	01/08/2024	y = 1.181x-3.206	0.998
R09	R09	01/08/2024	y = 1.197x-3.914	0.999
R10	R10	01/08/2024	y = 1.133x-1.368	0.999
R11	R11	01/08/2024	y = 1.129x+0.473	0.999
R12	R12	06/08/2024	y = 1.194x-5.439	0.998
R13	R13	06/08/2024	y = 1.166x-1.899	1.000
R14	R14	06/08/2024	y = 1.181x-3.793	0.999
R15	R15	02/08/2024	y = 1.186x-3.195	0.997
R16	R16	02/08/2024	y = 1.174x-3.244	1.000
R17	R17	01/08/2024	y = 1.120x+0.523	0.999
R18	R18	07/08/2024	y = 1.146x-2.616	1.000
R19	R19	07/08/2024	y = 1.180x-1.421	1.000
R20	R20	07/08/2024	y = 1.123x-3.226	0.996

Calibrated by :

(Mr. Adul Dangklom)

Approved by :

(Mr. Peera Detudom)



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CALIBRATION REPORT			
PM2.5 AIR SAMPLER (VERY SHARP CUT CYCLONE-VSCC)			
DATE :	16 October 2024	BRAND :	BGI
MODEL :	PQ200	SERIAL NO.	000927
NO.	PM2.5-01		
CALIBRATING CONDITION			
Pressure	1011	mmbar	Temp. 24.5 °C
		% RH	50
Calibration Method : Dry Cal Primary		Model : Defender 510 H	S/N : 136164
CALIBRATION SETTING			
detaCal	PM2.5 AIR SAMPLER		
Flowrate Reading, L/min	Initial Flowrate Reading (Before Adj.), L/min	%Dif.	Final Flowrate Reading (After Adj.), L/min
16.70	16.68	0.120	16.70

Calibrated by :

(Mr.Adul Dangklom)

Approved by :

(Mr.Peera Detudom)



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CALIBRATION REPORT			
PM2.5 AIR SAMPLER (VERY SHARP CUT CYCLONE-VSCC)			
DATE :	16 October 2024	BRAND :	BGI
MODEL :	PQ200	SERIAL NO.	160810-47 (VSCC)
NO.	PM2.5-02		
CALIBRATING CONDITION			
Pressure	1011	mmbar	Temp. 24.5 °C
% RH	50		
Calibration Method : Dry Cal Primary		Model : Defender 510 H	S/N : 136164
CALIBRATION SETTING			
detaCal	PM2.5 AIR SAMPLER		
Flowrate Reading, L/min	Initial Flowrate Reading (Before Adj.), L/min	% Dif.	Final Flowrate Reading (After Adj.), L/min
16.70	16.65	0.299	16.70

Calibrated by :

[Redacted Signature]

(Mr.Adul Dangklom)

Approved by :

[Redacted Signature]

(Mr.Peera Detudom)



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CALIBRATION REPORT			
PM2.5 AIR SAMPLER (VERY SHARP CUT CYCLONE-VSCC)			
DATE :	16 October 2024	BRAND :	BGI
MODEL :	PQ200	SERIAL NO.	160810-49 (VSCC)
NO.	PM2.5-03		
CALIBRATING CONDITION			
Pressure	1011	mmbar	Temp. 24.5 °C
% RH	50		
Calibration Method : Dry Cal Primary		Model : Defender 510 H	S/N : 136164
CALIBRATION SETTING			
detaCal	PM2.5 AIR SAMPLER		
Flowrate Reading, L/min	Initial Flowrate Reading (Before Adj.), L/min	% Dif.	Final Flowrate Reading (After Adj.), L/min
16.70	16.66	0.240	16.70

Calibrated by :

[Signature]

(Mr.Adul Dangklom)

Approved by :

[Signature]

(Mr.Peera Detudom)



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CALIBRATION REPORT			
PM2.5 AIR SAMPLER (VERY SHARP CUT CYCLONE-VSCC)			
DATE :	16 October 2024	BRAND :	BGI
MODEL :	PQ200	SERIAL NO.	160810-4 (VSCC)
NO.	PM2.5-04		
CALIBRATING CONDITION			
Pressure	1011	mmbar	Temp. 24.5 °C
% RH	50		
Calibration Method : Dry Cal Primary	Model : Defender 510 H	S/N : 136164	
CALIBRATION SETTING			
detaCal	PM2.5 AIR SAMPLER		
Flowrate Reading, L/min	Initial Flowrate Reading (Before Adj.), L/min	% Dif.	Final Flowrate Reading (After Adj.), L/min
16.70	16.64	0.359	16.70

Calibrated by :

[Redacted Signature]

(Mr.Adul Dangklom)

Approved by :

[Redacted Signature]

(Mr.Peera Detudom)



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CALIBRATION REPORT			
PM2.5 AIR SAMPLER (VERY SHARP CUT CYCLONE-VSCC)			
DATE :	16 October 2024	BRAND :	BGI
MODEL :	PQ200	SERIAL NO.	160810-14(VSCC)
NO.	PM2.5-05		
CALIBRATING CONDITION			
Pressure	1011	mmbars	Temp. 24.5 °C
		% RH	50
Calibration Method : Dry Cal Primary		Model : Defender 510 H	S/N : 136164
CALIBRATION SETTING			
detaCal	PM2.5 AIR SAMPLER		
Flowrate Reading,L/min	Initial Flowrate Reading (Before Adj.),L/min	%Dif.	Final Flowrate Reading (After Adj.),L/min
16.70	16.64	0.359	16.70

Calibrated by :

(Mr.Adul Dangklom)

Approved by :

(Mr.Peera Detudom)



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CALIBRATION REPORT			
PM2.5 AIR SAMPLER (VERY SHARP CUT CYCLONE-VSCC)			
DATE :	16 October 2024	BRAND :	BGI
NO.	PM2.5-06	MODEL :	PQ200
		SERIAL NO.	164589 (VSCC)
CALIBRATING CONDITION			
Pressure	1011	mmbar	Temp. 24.5 °C
		% RH	50
Calibration Method : Dry Cal Primary		Model : Defender 510 H	S/N : 136164
CALIBRATION SETTING			
detaCal	PM2.5 AIR SAMPLER		
Flowrate Reading,L/min	Initial Flowrate Reading (Before Adj.),L/min	%Dif.	Final Flowrate Reading (After Adj.),L/min
16.70	16.68	0.120	16.70

Calibrated by :

(Mr.Adul Dangklom)

Approved by :

(Mr.Peera Detudom)



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CALIBRATION REPORT			
PM2.5 AIR SAMPLER (VERY SHARP CUT CYCLONE-VSCC)			
DATE :	16 October 2024	BRAND :	BGI
MODEL :	PQ200	SERIAL NO.	152099 (VSCC)
NO.	PM2.5-07		
CALIBRATING CONDITION			
Pressure	1011	mmbar	Temp. 24.5 °C
% RH		50	
Calibration Method : Dry Cal Primary		Model : Defender 510 H	
		S/N : 136164	
CALIBRATION SETTING			
detaCal	PM2.5 AIR SAMPLER		
Flowrate Reading,L/min	Initial Flowrate Reading (Before Adj.),L/min	%Dif.	Final Flowrate Reading (After Adj.),L/min
16.70	16.65	0.299	16.70

Calibrated by :

(Mr.Adul Dangklom)

Approved by :

(Mr.Peera Detudom)



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CALIBRATION REPORT			
PM2.5 AIR SAMPLER (VERY SHARP CUT CYCLONE-VSCC)			
DATE :	16 October 2024	BRAND :	BGI
NO.	PM2.5-08	MODEL :	PQ200
		SERIAL NO.	159904 (VSCC)
CALIBRATING CONDITION			
Pressure	1011	mmbar	Temp. 24.5 °C
		% RH	50
Calibration Method : Dry Cal Primary		Model : Defender 510 H	S/N : 136164
CALIBRATION SETTING			
detaCal	PM2.5 AIR SAMPLER		
Flowrate Reading,L/min	Initial Flowrate Reading (Before Adj.),L/min	%Dif.	Final Flowrate Reading (After Adj.),L/min
16.70	16.66	0.240	16.70

Calibrated by :

(Mr.Adul Dangklom)

Approved by :

(Mr.Peera Detudom)



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CALIBRATION REPORT			
PM2.5 AIR SAMPLER (VERY SHARP CUT CYCLONE-VSCC)			
DATE :	16 October 2024	BRAND :	BGI
NO.	PM2.5-09	MODEL :	PQ200
		SERIAL NO.	152125 (VSCC)
CALIBRATING CONDITION			
Pressure	1011	mmbar	Temp. 24.5 °C
		% RH	50
Calibration Method : Dry Cal Primary		Model : Defender 510 H	S/N : 136164
CALIBRATION SETTING			
detaCal	PM2.5 AIR SAMPLER		
Flowrate Reading,L/min	Initial Flowrate Reading (Before Adj.),L/min	%Dif.	Final Flowrate Reading (After Adj.),L/min
16.70	16.65	0.299	16.70

Calibrated by :

(Mr.Adul Dangklom)

Approved by :

(Mr.Peera Detudom)



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CALIBRATION REPORT			
PM2.5 AIR SAMPLER (VERY SHARP CUT CYCLONE-VSCC)			
DATE :	16 October 2024	BRAND :	BGI
MODEL :	PQ200	SERIAL NO.	164598 (VSCC)
NO.	PM2.5-10		
CALIBRATING CONDITION			
Pressure	1011	mmbar	Temp. 24.5 °C
		% RH	50
Calibration Method : Dry Cal Primary		Model : Defender 510 H	S/N : 136164
CALIBRATION SETTING			
detaCal	PM2.5 AIR SAMPLER		
Flowrate Reading,L/min	Initial Flowrate Reading (Before Adj.),L/min	%Dif.	Final Flowrate Reading (After Adj.),L/min
16.70	16.64	0.359	16.70

Calibrated by :

(Mr.Adul Dangklom)

Approved by :

(Mr.Peera Detudom)



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CALIBRATION REPORT			
PM2.5 AIR SAMPLER (VERY SHARP CUT CYCLONE-VSCC)			
DATE :	16 October 2024	MODEL :	CCZ-30
NO.	PM2.5-11	SERIAL NO.	2024EN0242005
CALIBRATING CONDITION			
Pressure	1011	mmbar	Temp. 24.5 °C % RH 50
Calibration Method : Dry Cal Primary		Model : Defender 510 H	S/N : 136164
CALIBRATION SETTING			
detaCal	PM2.5 AIR SAMPLER		
Flowrate Reading,L/min	Initial Flowrate Reading (Before Adj.),L/min	%Dif.	Final Flowrate Reading (After Adj.),L/min
16.70	16.68	0.120	16.70

Calibrated by :

(Mr.Adul Dangklom)

Approved by :

(Mr.Peera Detudom)



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CALIBRATION REPORT			
PM2.5 AIR SAMPLER (VERY SHARP CUT CYCLONE-VSCC)			
DATE :	16 October 2024	MODEL :	CCZ-30
NO.	PM2.5-13	SERIAL NO.	2024EN0242004
CALIBRATING CONDITION			
Pressure	1011	mmbar	Temp. 24.5 °C % RH 50
Calibration Method : Dry Cal Primary		Model : Defender 510 H	S/N : 136164
CALIBRATION SETTING			
detaCal	PM2.5 AIR SAMPLER		
Flowrate Reading,L/min	Initial Flowrate Reading (Before Adj.),L/min	%Dif.	Final Flowrate Reading (After Adj.),L/min
16.70	16.66	0.240	16.70

Calibrated by :

(Mr.Adul Dangklom)

Approved by :

(Mr.Peera Detudom)



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CALIBRATION REPORT			
PM2.5 AIR SAMPLER (VERY SHARP CUT CYCLONE-VSCC)			
DATE :	16 October 2024	MODEL :	CCZ--30
NO.	PM2.5-14	SERIAL NO.	2024EN0242001
CALIBRATING CONDITION			
Pressure	1011	mmbar	Temp. 24.5 °C % RH 50
Calibration Method : Dry Cal Primary		Model : Defender 510 H	S/N : 136164
CALIBRATION SETTING			
detaCal	PM2.5 AIR SAMPLER		
Flowrate Reading,L/min	Initial Flowrate Reading (Before Adj.),L/min	%Dif.	Final Flowrate Reading (After Adj.),L/min
16.70	16.68	0.120	16.70

Calibrated by :

[Signature]

(Mr.Adul Dangklom)

Approved by :

[Signature]

(Mr.Peera Detudom)



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CALIBRATION REPORT			
PM2.5 AIR SAMPLER (VERY SHARP CUT CYCLONE-VSCC)			
DATE :	16 October 2024	MODEL :	CCZ-30
NO.	PM2.5-15	SERIAL NO.	2024EN0242002
CALIBRATING CONDITION			
Pressure	1011	mmbar	Temp. 24.5 °C % RH 50
Calibration Method : Dry Cal Primary		Model : Defender 510 H	S/N : 136164
CALIBRATION SETTING			
detaCal	PM2.5 AIR SAMPLER		
Flowrate Reading,L/min	Initial Flowrate Reading (Before Adj.),L/min	%Dif.	Final Flowrate Reading (After Adj.),L/min
16.70	16.66	0.240	16.70

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)	02/09/2024	200	200.3	199.8	200.5	200.0
B02	2 (A&B)	03/09/2024	200	200.4	199.9	200.7	200.2
B03	2 (A&B)	02/09/2024	200	200.6	200.1	200.4	199.9
B04	2 (A&B)	03/09/2024	200	200.8	200.3	200.2	199.7
B05	2 (A&B)	02/09/2024	200	200.6	200.0	200.3	199.8
B06	2 (A&B)	02/09/2024	200	200.4	199.9	200.5	200.0
B07	2 (A&B)	04/09/2024	200	200.5	200.0	200.8	200.3
B08	2 (A&B)	04/09/2024	200	200.3	199.8	200.4	199.9
B09	2 (A&B)	04/09/2024	200	200.7	200.2	200.6	200.1
B10	2 (A&B)	04/09/2024	200	200.6	200.1	200.3	199.8
B11	2 (A&B)	04/09/2024	200	200.5	199.9	200.4	199.9
B12	2 (A&B)	02/09/2024	200	200.3	199.8	200.6	200.1
B13	2 (A&B)	03/09/2024	200	200.6	200.1	200.3	199.8
B14	2 (A&B)	02/09/2024	200	200.5	200.0	200.7	200.1
B15	2 (A&B)	03/09/2024	200	200.3	199.8	200.5	199.9
B16	2 (A&B)	04/09/2024	200	200.7	200.2	200.6	200.1
B17	2 (A&B)	02/09/2024	200	200.4	199.9	200.3	199.8

Calibrated by :

(Mr. Adul Dangklom)

Approved by :

(Mr. Peera Detudom)



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Rotameter Calibration Report (For Personal Pump High Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Calibration Data

Rotameter Data			Calibration Data								
No.	Brand	Model	Date	Flow Rate (mL/min)						Value From Calibration Curve	
				Flow Rate (Reading)			Actual (Q std.)				
				1	2	3	1	2	3	y	R ²
H-B01	Dwyer	VFB-65	02/10/2024	500	1,000	2,000	502.4	998.3	1992.4	0.996x + 5.889	1.000
H-B02	Dwyer	VFB-65	04/10/2024	500	1,000	2,000	498.5	1001.9	2009.0	0.997x + 5.707	1.000
H-B03	Dwyer	VFB-65	04/10/2024	500	1,000	2,000	499.2	996.1	2011.4	1.004x - 11.451	0.999
H-B04	Dwyer	VFB-65	04/10/2024	500	1,000	2,000	504.0	999.2	1995.1	0.995x + 7.219	1.000
H-B05	Dwyer	VFB-65	03/10/2024	500	1,000	2,000	498.7	1001.8	2007.6	0.997x + 4.568	1.000
H-B06	Dwyer	VFB-65	03/10/2024	500	1,000	2,000	497.3	999.1	2012.1	1.005x - 11.101	0.999
H-B07	Dwyer	VFB-65	01/10/2024	500	1,000	2,000	503.0	1004.1	1992.6	0.998x + 6.074	1.000
H-B08	Dwyer	VFB-65	02/10/2024	500	1,000	2,000	503.7	1000.4	1994.6	0.992x + 12.996	1.000
H-B09	Dwyer	VFB-65	01/10/2024	500	1,000	2,000	501.3	1001.6	1990.3	0.999x + 4.046	0.999
H-B10	Dwyer	VFB-65	01/10/2024	500	1,000	2,000	500.3	1002.0	1992.6	0.995x + 8.990	1.000

Calibrated by :

(Mr.Adul Dangklom)

Approved by :

(Mr. Peera Detudorn)



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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 ²
L-B01	Dwyer	VFA-21	02/10/2024	50	100	200	50.8	99.7	201.2	0.990x + 1.455	1.000
L-B02	Dwyer	VFA-21	04/10/2024	50	100	200	50.3	98.8	199.5	1.003x - 0.022	0.999
L-B03	Dwyer	VFA-21	04/10/2024	50	100	200	50.6	100.7	200.1	1.002x + 0.030	1.000
L-B04	Dwyer	VFA-21	04/10/2024	50	100	200	50.9	101.3	201.6	0.993x + 2.147	1.000
L-B05	Dwyer	VFA-21	03/10/2024	50	100	200	49.9	102.0	200.2	1.001x + 0.423	1.000
L-B06	Dwyer	VFA-21	03/10/2024	50	100	200	50.2	100.7	200.9	0.999x + 0.931	1.000
L-B07	Dwyer	VFA-21	01/10/2024	50	100	200	50.1	100.5	200.9	0.999x + 1.192	0.999
L-B08	Dwyer	VFA-21	02/10/2024	50	100	200	50.1	101.2	199.0	1.001x - 0.298	1.000
L-B09	Dwyer	VFA-21	01/10/2024	50	100	200	50.2	99.0	202.1	1.001x + 0.711	0.999
L-B10	Dwyer	VFA-21	01/10/2024	50	100	200	50.3	100.2	201.7	1.003x + 0.455	1.000

Calibrated by :

(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 ± 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	03/10/2024	1,000	1,500	2,000	1,006	1,505	2,012	1.013x - 17.267	0.999
B02	SKC	224-PCXR4	626166	03/10/2024	1,000	1,500	2,000	998	1,500	1,995	1.000x - 2.067	1.000
B03	SKC	224-PCXR4	612968	02/10/2024	1,000	1,500	2,000	1,005	1,494	2,006	0.998x + 4.721	0.999
B04	SKC	224-PCXR4	602804	03/10/2024	1,000	1,500	2,000	996	1,511	2,007	1.012x - 19.485	0.999
B05	SKC	224-PCXR4	612693	02/10/2024	1,000	1,500	2,000	1,005	1,504	2,008	1.004x - 4.306	1.000
B06	SKC	224-PCXR4	262188	02/10/2024	1,000	1,500	2,000	1,013	1,505	2,008	0.996x + 6.748	0.999
B07	SKC	224-PCXR4	626262	02/10/2024	1,000	1,500	2,000	1,005	1,506	2,010	1.011x - 12.753	1.000
B08	SKC	224-PCXR4	626100	03/10/2024	1,000	1,500	2,000	1,000	1,498	1,993	0.995x + 5.105	1.000
B09	SKC	224-PCXR4	626479	02/10/2024	1,000	1,500	2,000	1,005	1,494	2,002	0.996x + 5.969	1.000
B10	SKC	224-PCXR4	091950	02/10/2024	1,000	1,500	2,000	1,004	1,504	2,008	1.011x - 15.436	1.000
B11	SKC	224-PCXR8	564315	03/10/2024	1,000	1,500	2,000	1,010	1,497	2,001	0.993x + 10.007	1.000
B12	SKC	224-PCXR4	034656	04/10/2024	1,000	1,500	2,000	998	1,507	2,005	1.013x - 22.552	0.999
B13	SKC	224-PCXR4	602073	03/10/2024	1,000	1,500	2,000	1,001	1,494	2,000	0.998x + 1.307	1.000
B14	SKC	224-PCXR4	626313	03/10/2024	1,000	1,500	2,000	1,014	1,504	2,013	0.999x + 8.699	1.000
B15	SKC	224-PCXR4	626474	03/10/2024	1,000	1,500	2,000	1,006	1,513	2,008	1.002x - 0.788	0.999
B16	SKC	224-PCXR4	626477	03/10/2024	1,000	1,500	2,000	1,001	1,514	2,009	1.009x - 11.678	1.000
B17	SKC	224-PCXR4	626860	02/10/2024	1,000	1,500	2,000	1,018	1,513	2,013	0.997x + 11.094	0.999
B18	SKC	224-PCXR4	691484	02/10/2024	1,000	1,500	2,000	999	1,498	1,999	1.000x + 0.668	1.000
B19	SKC	224-PCXR4	691599	03/10/2024	1,000	1,500	2,000	1,000	1,508	2,007	1.004x - 5.189	1.000
B20	SKC	224-PCXR4	691587	03/10/2024	1,000	1,500	2,000	997	1,514	2,005	1.010x - 12.129	1.000
B21	SKC	224-PCXR4	691531	04/10/2024	1,000	1,500	2,000	996	1,499	2,000	1.001x - 1.875	1.000
B22	SKC	224-PCXR4	691654	03/10/2024	1,000	1,500	2,000	999	1,508	2,006	1.008x - 13.641	1.000
B23	SKC	224-PCXR4	798393	03/10/2024	1,000	1,500	2,000	1,001	1,494	1,995	0.996x + 3.954	1.000
B24	SKC	224-PCXR4	626363	02/10/2024	1,000	1,500	2,000	999	1,492	2,003	1.001x - 3.994	1.000
B25	SKC	224-PCXR4	798489	03/10/2024	1,000	1,500	2,000	1,001	1,501	1,995	0.993x + 10.846	1.000
B26	SKC	224-PCXR4	798479	03/10/2024	1,000	1,500	2,000	996	1,507	2,004	1.007x - 13.888	1.000
B27	SKC	224-PCXR4	691673	03/10/2024	1,000	1,500	2,000	1,006	1,505	2,009	1.010x - 14.064	0.999
B28	SKC	224-PCXR4	691570	03/10/2024	1,000	1,500	2,000	996	1,510	2,008	1.012x - 19.941	0.999
B29	SKC	224-PCXR4	626472	03/10/2024	1,000	1,500	2,000	1,005	1,502	2,005	1.006x - 9.763	1.000
B30	SKC	224-PCXR4	691489	03/10/2024	1,000	1,500	2,000	1,004	1,501	2,008	1.009x - 13.737	1.000
B31	SKC	224-PCXR4	691509	03/10/2024	1,000	1,500	2,000	1,012	1,497	1,997	0.990x + 14.932	1.000
B32	SKC	224-PCXR4	091567	03/10/2024	1,000	1,500	2,000	1,010	1,510	2,008	1.003x - 3.978	0.999
B33	SKC	224-PCXR4	091756	02/10/2024	1,000	1,500	2,000	998	1,512	2,005	1.007x - 10.478	1.000
B34	SKC	224-PCXR4	612962	02/10/2024	1,000	1,500	2,000	999	1,504	2,000	1.001x - 0.963	1.000
B35	SKC	224-PCXR4	602682	02/10/2024	1,000	1,500	2,000	1,004	1,498	2,002	0.996x + 5.501	1.000
B36	SKC	224-PCXR4	626164	02/10/2024	1,000	1,500	2,000	1,008	1,507	2,004	1.000x + 2.331	1.000
B37	SKC	224-PCXR4	626256	04/10/2024	1,000	1,500	2,000	1,008	1,505	2,008	1.002x - 2.423	1.000
B38	SKC	224-PCXR4	626167	04/10/2024	1,000	1,500	2,000	997	1,499	1,998	1.001x - 2.994	1.000
B39	SKC	224-PCXR4	034637	04/10/2024	1,000	1,500	2,000	998	1,504	1,999	1.004x - 8.599	1.000
B40	SKC	224-PCXR4	798349	04/10/2024	1,000	1,500	2,000	1,001	1,500	1,994	0.999x - 2.619	1.000

Calibrated by :

(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.)				
					1	2	3	1	2	3	y	R ²
B41	SKC	224-PCXR4	612669	02/10/2024	1,000	1,500	2,000	1,010	1,497	2,001	0.994x + 9.527	1.000
B42	SKC	224-PCXR4	626041	04/10/2024	1,000	1,500	2,000	998	1,507	2,005	1.009x - 14.416	0.999
B43	SKC	224-PCXR4	034636	03/10/2024	1,000	1,500	2,000	1,005	1,494	2,001	0.995x + 6.369	1.000
B44	SKC	224-PCXR8	529341	03/10/2024	1,000	1,500	2,000	1,010	1,494	2,000	0.990x + 14.704	1.000
B45	SKC	224-PCXR8	529594	02/10/2024	1,000	1,500	2,000	1,014	1,504	2,010	0.997x + 11.890	1.000
B46	SKC	224-PCXR8	566743	04/10/2024	1,000	1,500	2,000	1,006	1,514	2,009	1.002x - 1.391	0.999
B47	SKC	224-PCXR8	566747	02/10/2024	1,000	1,500	2,000	1,000	1,513	2,009	1.009x - 11.714	1.000
B48	SKC	224-PCXR8	566753	04/10/2024	1,000	1,500	2,000	1,020	1,513	2,012	0.995x + 15.140	0.999
B49	SKC	224-PCXR8	566780	04/10/2024	1,000	1,500	2,000	999	1,498	2,000	1.000x + 0.144	1.000
B50	SKC	224-PCXR8	500400	04/10/2024	1,000	1,500	2,000	1,000	1,508	2,006	1.004x - 5.541	1.000
B51	SKC	224-PCXR8	500363	04/10/2024	1,000	1,500	2,000	996	1,506	2,005	1.007x - 10.582	1.000
B52	SKC	224-PCXR8	093186	03/10/2024	1,000	1,500	2,000	998	1,509	2,003	1.006x - 10.386	1.000
B53	SKC	224-PCXR8	707670	03/10/2024	1,000	1,500	2,000	1,000	1,493	1,996	0.994x + 4.977	0.999
B54	SKC	224-PCXR3	509821	02/10/2024	1,000	1,500	2,000	1,001	1,493	2,008	1.006x - 9.295	1.000
B55	SKC	224-PCXR3	510710	04/10/2024	1,000	1,500	2,000	999	1,508	2,004	1.005x - 8.519	1.000
B56	SKC	224-PCXR3	511450	03/10/2024	1,000	1,500	2,000	1,003	1,502	2,012	1.008x - 10.418	1.000
B57	SKC	224-PCXR3	510798	02/10/2024	1,000	1,500	2,000	997	1,503	2,005	1.009x - 15.639	1.000
B58	SKC	224-PCXR3	509852	02/10/2024	1,000	1,500	2,000	1,016	1,517	2,008	0.994x + 13.453	0.999
B59	SKC	224-PCXR3	509862	04/10/2024	1,000	1,500	2,000	999	1,511	2,010	1.010x - 14.912	0.999
B60	SKC	224-PCXR3	512655	02/10/2024	1,000	1,500	2,000	1,009	1,514	1,996	0.992x + 12.737	0.999
B61	SKC	224-PCXR3	503915	04/10/2024	1,000	1,500	2,000	1,005	1,503	2,006	1.011x - 15.735	0.999
B62	SKC	224-PCXR3	505975	03/10/2024	1,000	1,500	2,000	1,006	1,513	2,008	1.002x - 0.788	0.999
B63	SKC	224-PCXR3	511432	02/10/2024	1,000	1,500	2,000	1,020	1,513	2,013	0.995x + 14.152	0.999
B64	SKC	224-PCXR3	508302	04/10/2024	1,000	1,500	2,000	1,000	1,508	2,007	1.004x - 5.189	1.000
B65	SKC	224-PCXR3	508310	02/10/2024	1,000	1,500	2,000	997	1,514	2,005	1.006x - 7.652	1.000
B66	SKC	224-PCXR3	509861	04/10/2024	1,000	1,500	2,000	996	1,499	2,003	1.009x - 13.421	1.000
B67	SKC	224-PCXR3	506295	03/10/2024	1,000	1,500	2,000	998	1,510	2,004	1.010x - 17.666	0.999
B68	SKC	224-PCXR3	505872	03/10/2024	1,000	1,500	2,000	998	1,494	1,997	0.996x + 2.043	1.000
B69	SKC	224-PCXR3	508375	04/10/2024	1,000	1,500	2,000	996	1,499	2,003	1.004x - 4.961	1.000
B70	SKC	224-PCXR3	510623	03/10/2024	1,000	1,500	2,000	1,002	1,504	2,000	1.002x - 1.959	1.000
B71	SKC	224-PCXR3	508367	03/10/2024	1,000	1,500	2,000	996	1,503	1,999	1.003x - 5.913	1.000
B72	SKC	224-PCXR3	505977	04/10/2024	1,000	1,500	2,000	997	1,499	1,996	0.998x - 0.140	1.000
B73	SKC	224-PCXR3	512606	02/10/2024	1,000	1,500	2,000	1,005	1,504	2,007	1.008x - 11.262	1.000
B74	SKC	224-PCXR3	505993	03/10/2024	1,000	1,500	2,000	998	1,504	2,002	1.005x - 10.110	1.000
B75	SKC	224-PCXR3	509820	02/10/2024	1,000	1,500	2,000	1,004	1,503	2,007	1.009x - 12.679	1.000
B76	SKC	224-PCXR3	509811	04/10/2024	1,000	1,500	2,000	1,005	1,493	2,003	0.997x + 5.309	1.000
B77	SKC	224-PCXR3	508301	02/10/2024	1,000	1,500	2,000	998	1,495	2,002	1.002x - 3.498	1.000
B78	SKC	224-PCXR3	510677	03/10/2024	1,000	1,500	2,000	1,015	1,505	2,010	1.003x - 0.420	0.999
B79	SKC	224-PCXR3	510920	04/10/2024	1,000	1,500	2,000	999	1,493	2,004	1.008x - 14.332	1.000

Calibrated by :

(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.)				
					1	2	3	1	2	3	y	R ²
B80	SKC	224-PCXR3	504569	03/10/2024	1,000	1,500	2,000	998	1,507	2,003	1.007x – 12.517	1.000
B81	SKC	224-PCXR3	503480	03/10/2024	1,000	1,500	2,000	997	1,496	1,997	1.001x - 3.994	1.000
B82	SKC	224-PCXR3	505673	03/10/2024	1,000	1,500	2,000	1,005	1,503	2,006	1.001x – 1.851	0.999
B83	SKC	224-PCXR3	510785	02/10/2024	1,000	1,500	2,000	1,001	1,505	2,000	0.999x + 0.108	1.000
B84	SKC	224-PCXR3	508333	02/10/2024	1,000	1,500	2,000	1,003	1,504	1,999	1.001x - 1.315	1.000
B85	SKC	224-PCXR3	505757	02/10/2024	1,000	1,500	2,000	1,003	1,506	2,001	1.003x - 1.855	1.000
B86	SKC	224-PCXR3	512625	04/10/2024	1,000	1,500	2,000	1,000	1,501	1,998	1.000x - 1.111	1.000
B87	SKC	224-PCXR3	504324	04/10/2024	1,000	1,500	2,000	999	1,509	2,007	1.009x – 15.683	0.999
B88	SKC	224-PCXR3	508307	04/10/2024	1,000	1,500	2,000	999	1,500	1,996	0.996x + 4.825	1.000
B89	SKC	224-PCXR3	509860	04/10/2024	1,000	1,500	2,000	1,002	1,503	2,006	1.008x – 10.170	1.000
B90	SKC	224-PCXR3	508366	02/10/2024	1,000	1,500	2,000	999	1,506	2,003	1.000x - 0.612	1.000
B91	SKC	224-PCXR3	510919	02/10/2024	1,000	1,500	2,000	1,011	1,504	2,001	0.991x + 17.894	1.000
B92	SKC	224-PCXR3	510987	03/10/2024	1,000	1,500	2,000	1,004	1,505	2,008	1.008x - 10.210	1.000
B93	SKC	224-PCXR3	509845	03/10/2024	1,000	1,500	2,000	1,005	1,505	2,005	1.005x – 5.793	1.000
B94	SKC	224-PCXR8	A127871	03/10/2024	1,000	1,500	2,000	1,003	1,503	2,001	1.003x – 3.458	1.000
B95	SKC	224-PCXR8	A127921	01/10/2024	1,000	1,500	2,000	998	1,506	2,006	1.008x – 11.706	1.000
B96	SKC	224-PCXR8	A127942	01/10/2024	1,000	1,500	2,000	1,003	1,502	2,000	0.999x + 2.679	1.000
B97	SKC	224-PCXR8	A127955	01/10/2024	1,000	1,500	2,000	1,004	1,505	2,008	1.010x – 12.557	1.000
B98	SKC	224-PCXR8	A127956	01/10/2024	1,000	1,500	2,000	998	1,497	2,001	1.004x – 8.311	1.000

Calibrated by :

(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.)				
					1	2	3	1	2	3	y	R ²
R01	SKC	224-PCXR4	602467	03/10/2024	1,000	1,500	2,000	1,005	1,505	2,008	1.006x - 6.472	1.000
R02	SKC	224-PCXR4	626450	04/10/2024	1,000	2,000	3,000	1,003	1,503	2,006	1.009x - 16.691	0.999
R03	SKC	224-PCXR4	691592	03/10/2024	1,000	1,500	2,000	996	1,506	2,006	1.008x - 13.145	1.000
R04	SKC	224-PCXR4	691672	02/10/2024	1,000	1,500	2,000	1,003	1,502	2,000	0.995x + 7.476	1.000
R05	SKC	224-PCXR4	798470	02/10/2024	1,000	1,500	2,000	1,004	1,505	2,008	1.005x - 7.440	1.000
R06	SKC	224-PCXR4	798456	04/10/2024	1,000	1,500	2,000	1,003	1,506	2,001	1.003x - 1.855	1.000
R07	SKC	224-PCXR4	798480	03/10/2024	1,000	1,500	2,000	995	1,501	1,997	1.002x - 6.149	1.000
R08	SKC	224-PCXR4	883215	04/10/2024	1,000	1,500	2,000	995	1,509	2,004	1.011x - 20.001	0.999
R09	SKC	224-PCXR4	034650	02/10/2024	1,000	1,500	2,000	996	1,500	1,997	1.000x - 1.051	1.000
R10	SKC	224-PCXR4	091765	03/10/2024	1,000	1,500	2,000	1,002	1,503	2,006	1.007x - 9.531	1.000
R11	SKC	224-PCXR4	091763	03/10/2024	1,000	1,500	2,000	999	1,506	2,001	1.010x - 20.761	0.999
R12	SKC	224-PCXR4	091568	03/10/2024	1,000	1,500	2,000	1,012	1,504	2,001	0.990x + 19.294	1.000
R13	SKC	224-PCXR4	091638	04/10/2024	1,000	1,500	2,000	1,004	1,505	2,008	1.008x - 10.210	1.000
R14	SKC	224-PCXR4	091764	03/10/2024	1,000	1,500	2,000	998	1,498	1,997	0.999x + 0.148	1.000
R15	SKC	224-PCXR8	529457	03/10/2024	1,000	1,500	2,000	1,003	1,497	2,000	0.996x + 5.377	1.000
R16	SKC	224-PCXR8	529643	04/10/2024	1,000	1,500	2,000	996	1,505	2,006	1.012x - 19.118	1.000
R17	SKC	224-PCXR8	529645	04/10/2024	1,000	1,500	2,000	1,004	1,503	2,006	1.002x - 3.334	1.000
R18	SKC	224-PCXR8	566756	04/10/2024	1,000	1,500	2,000	997	1,504	1,998	1.001x - 3.462	1.000
R19	SKC	224-PCXR8	566802	03/10/2024	1,000	1,500	2,000	1,005	1,504	2,007	1.004x - 4.118	1.000
R20	SKC	224-PCXR8	529089	01/10/2024	1,000	1,500	2,000	999	1,493	2,006	1.005x - 8.571	1.000
R21	SKC	224-PCXR8	665728	03/10/2024	1,000	1,500	2,000	1,004	1,503	1,996	0.993x + 9.763	1.000
R22	SKC	224-PCXR8	707444	04/10/2024	1,000	1,500	2,000	999	1,504	2,000	1.001x - 0.963	1.000
R23	SKC	224-PCXR8	761067	04/10/2024	1,000	1,500	2,000	1,004	1,498	2,002	0.996x + 5.501	1.000
R24	SKC	224-PCXR8	707893	04/10/2024	1,000	1,500	2,000	997	1,495	2,003	1.006x - 11.110	1.000
R25	SKC	224-PCXR8	761052	04/10/2024	1,000	1,500	2,000	1,016	1,507	2,003	0.992x + 15.204	1.000
R26	SKC	224-PCXR8	707956	04/10/2024	1,000	1,500	2,000	1,002	1,499	2,002	1.001x - 0.028	1.000
R27	SKC	224-PCXR8	707398	01/10/2024	1,000	1,500	2,000	1,008	1,505	2,008	1.006x - 6.261	1.000
R28	SKC	224-PCXR8	707481	03/10/2024	1,000	1,500	2,000	1,005	1,505	2,004	0.999x + 1.175	1.000
R29	SKC	224-PCXR8	707402	01/10/2024	1,000	1,500	2,000	1,001	1,500	1,996	1.001x - 4.617	1.000
R30	SKC	224-PCXR8	093811	03/10/2024	1,000	1,500	2,000	1,000	1,506	1,998	0.998x + 6.228	1.000
R31	SKC	224-PCXR8	093183	04/10/2024	1,000	1,500	2,000	1,005	1,502	1,999	1.006x - 13.357	0.999
R32	SKC	224-PCXR8	671950	03/10/2024	1,000	1,500	2,000	996	1,504	2,004	1.008x - 14.572	1.000
R33	SKC	224-PCXR4	626254	03/10/2024	1,000	1,500	2,000	1,005	1,503	2,008	1.007x - 9.639	1.000
R34	SKC	224-PCXR4	626131	04/10/2024	1,000	1,500	2,000	996	1,495	2,001	1.002x - 5.649	1.000
R35	SKC	224-PCXR8	707460	03/10/2024	1,000	1,500	2,000	999	1,498	1,999	0.997x + 2.375	1.000
R36	SKC	224-PCXR8	707446	04/10/2024	1,000	1,500	2,000	1,000	1,495	1,997	0.995x + 4.558	1.000
R37	SKC	224-PCXR8	707432	04/10/2024	1,000	1,500	2,000	994	1,502	1,996	1.000x - 2.818	1.000
R38	SKC	224-PCXR8	707349	04/10/2024	1,000	1,500	2,000	997	1,507	2,004	1.005x - 6.648	1.000
R39	SKC	224-PCXR8	761095	04/10/2024	1,000	1,500	2,000	1,000	1,496	1,997	0.999x + 0.856	1.000

Calibrated by :

(Mr. Adul Dangklom)

Approved by :

(Mr. Peera Detudom)



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

Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Environmental Conditions

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

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (ml/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R ²
R40	SKC	224-PCXR4	612753	04/10/2024	1,000	1,500	2,000	1,005	1,503	2,011	1.007x - 10.270	0.999
R41	SKC	224-PCXR4	626140	02/10/2024	1,000	1,500	2,000	1,000	1,506	2,013	1.012x - 16.627	1.000
R42	SKC	224-PCXR4	626463	04/10/2024	1,000	1,500	2,000	1,000	1,506	1,998	0.998x + 6.229	1.000
R43	SKC	224-PCXR4	626129	01/10/2024	1,000	1,500	2,000	999	1,504	2,004	1.008x - 14.732	1.000
R44	SKC	224-PCXR4	602753	01/10/2024	1,000	1,500	2,000	1,000	1,497	2,001	1.000x - 0.172	1.000
R45	SKC	224-PCXR4	626137	02/10/2024	1,000	1,500	2,000	997	1,496	1,998	1.001x - 3.542	1.000
R47	SKC	224-PCXR4	A129234	03/10/2024	1,000	1,500	2,000	1,005	1,506	2,002	1.001x - 1.275	1.000
R48	SKC	224-PCXR4	A129253	03/10/2024	1,000	1,500	2,000	1,005	1,503	2,007	1.002x + 0.236	1.000
R49	SKC	224-PCXR4	A129168	03/10/2024	1,000	1,500	2,000	1,000	1,495	2,001	0.999x + 0.228	1.000
R50	SKC	224-PCXR4	A129282	03/10/2024	1,000	1,500	2,000	997	1,490	1,999	1.004x - 13.816	1.000
R51	SKC	224-PCXR4	A129284	03/10/2024	1,000	1,500	2,000	994	1,502	1,996	1.000x - 2.818	1.000

Calibrated by :

(Mr. Adul Dangklom)

Approved by :



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CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER					
DATE :	16 October 2024	BRAND :	API	MODEL :	200A
NO.	NOX-B01	SERIAL NO.	2368		
Calibrator (Dilution System)					
Brand	: API			Model	: 700
Last Cal. Date	: 05 August 2024			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	50				
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
NO Span	400	399.7	-0.075	400.0	1.006
NO _x Span	400	400.1	0.025	400.0	1.009
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	506	cc/min	500 ± 50		
OZONE FLOW	78	cc/min	80 ± 15		
PMT	103.2	mV	-20 - 150		
AZERO	94.0	mV	-20 - 150		
HVPS	671	V	420 - 900 constant		
RCELL TEMP	50.1	°C	50 ± 1		
BOX TEMP	28.9	°C	8 - 48		
PMT TEMP	7.0	°C	7 ± 2		
MOLY TEMP	315.3	°C	315 ± 5		
RCELL PRESS	8.3	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.6	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	1.006	-	1.0 ± 0.3		
NO _x Slope	1.009	-	1.0 ± 0.3		
NO Offset	1.2	mV	-20 to +150		
NO _x Offset	0.8	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by :

(Mr.Adul Dangklom)

Approved by :

(Mr.Peera Detudom)



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CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER					
DATE :	16 October 2024	BRAND :	API	MODEL :	200A
NO.	NOX-B02	SERIAL NO.	2409		
Calibrator (Dilution System)					
Brand	: API			Model	: 700
Last Cal. Date	: 05 August 2024			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	50				
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.10	-	0	-
NO Span	400	399.9	-0.025	400.0	1.007
NO _x Span	400	400.1	0.025	400.0	1.011
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	103.4	mV	-20 - 150		
AZERO	94.2	mV	-20 - 150		
HVPS	670	V	420 - 900 constant		
RCELL TEMP	50.2	°C	50 ± 1		
BOX TEMP	29.4	°C	8 - 48		
PMT TEMP	7.5	°C	7 ± 2		
MOLY TEMP	315.2	°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 _x Span Conc	400	PPB	20 - 20,000		
NO Slope	1.007	-	1.0 ± 0.3		
NO _x Slope	1.011	-	1.0 ± 0.3		
NO Offset	1.6	mV	-20 to +150		
NO _x 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 :

(Mr.Adul Dangklom)

Approved by :

(Mr.Peera Detudom)



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CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER					
DATE :	16 October 2024	BRAND :	API	MODEL :	200A
NO.	NOX-B03	SERIAL NO.	2617		
Calibrator (Dilution System)					
Brand : API			Model : 700		
Last Cal. Date : 05 August 2024			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	50	
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
NO Span	400	399.6	-0.100	400.0	1.003
NO _x Span	400	399.8	-0.050	400.0	1.007
API Model 200A NO _x Analyzer Check List					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	500 standard		
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air		
SAMPLE FLOW	512	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	50.5	°C	50 ± 1		
BOX TEMP	29.2	°C	8 - 48		
PMT TEMP	7.4	°C	7 ± 2		
MOLY TEMP	314.7	°C	315 ± 5		
RCELL PRESS	8.2	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.4	IN-Hg-A	25 - 30 constant		
NO Span Conc	400	PPB	20 - 20,000		
NO _x Span Conc	400	PPB	20 - 20,000		
NO Slope	1.003	-	1.0 ± 0.3		
NO _x Slope	1.007	-	1.0 ± 0.3		
NO Offset	1.1	mV	-20 to +150		
NO _x Offset	0.7	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.Adul Dangklom)

Approved by :

(Mr.Peera Detudorn)



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CALIBRATION REPORT						
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER						
DATE :	16 October 2024	BRAND :	API	MODEL :	200E	
NO.	NOX-B05	SERIAL NO.	2284			
Calibrator (Dilution System)						
Brand	: API			Model	: 700	
Last Cal. Date	: 05 August 2024			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						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	1.010	
NO _x Span	400	400.3	0.075	400.0	1.014	
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	511	cc/min	500 ± 50			
OZONE FLOW	79	cc/min	80 ± 15			
PMT	103.2	mV	-20 - 150			
AZERO	93.8	mV	-20 - 150			
HVPS	675	V	420 - 900 constant			
RCELL TEMP	50.4	°C	50 ± 1			
BOX TEMP	29.1	°C	8 - 48			
PMT TEMP	7.3	°C	7 ± 2			
MOLY TEMP	314.9	°C	315 ± 5			
RCELL PRESS	8.4	IN-Hg-A	2 - 10 constant			
SAMPLE PRESS	28.6	IN-Hg-A	25 - 30 constant			
NO Span Conc	400	PPB	20 - 20,000			
NO _x Span Conc	400	PPB	20 - 20,000			
NO Slope	1.010	-	1.0 ± 0.3			
NO _x Slope	1.014	-	1.0 ± 0.3			
NO Offset	1.8	mV	-20 to +150			
NO _x Offset	1.1	mV	-20 to 150			
Stability at Zero	0.1	PPB	< 0.2			
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas			

Calibrated by :

(Mr.Adul Dangklom)

Approved by :

(Mr.Peera Detudom)



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CALIBRATION REPORT

CHEMILUMINESCENT NO / NO₂ / NO_x ANALYZER

DATE : 16 October 2024

BRAND : API

MODEL : 200E

NO. NOX-B10

SERIAL NO. 4465

Calibrator (Dilution System)

Brand : API

Model : 700

Last Cal. Date : 05 August 2024

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 50

CALIBRATION SETTING

Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
NO Span	400	399.7	-0.075	400.0	1.004
NO _x Span	400	399.9	-0.025	400.0	1.008

API Model 200E NO_x Analyzer Check List

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	500 standard
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air
SAMPLE FLOW	505	cc/min	500 ± 50
OZONE FLOW	78	cc/min	80 ± 15
PMT	103.0	mV	-20 - 150
AZERO	93.7	mV	-20 - 150
HVPS	673	V	420 - 900 constant
RCELL TEMP	50.1	°C	50 ± 1
BOX TEMP	29.5	°C	8 - 48
PMT TEMP	7.0	°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 _x Span Conc	400	PPB	20 - 20,000
NO Slope	1.004	-	1.0 ± 0.3
NO _x Slope	1.008	-	1.0 ± 0.3
NO Offset	1.3	mV	-20 to +150
NO _x Offset	0.8	mV	-20 to 150
Stability at Zero	0.1	PPB	< 0.2
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas

Calibrated by :

(Mr.Adul Dangklom)

Approved by :

(Mr.Peera Detudom)



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CALIBRATION REPORT

CHEMILUMINESCENT NO / NO₂ / NO_x ANALYZER

DATE : 16 October 2024

BRAND : API

MODEL : 200A

NO. NOX-B15

SERIAL NO. 213

Calibrator (Dilution System)

Brand : API

Model : 700

Last Cal. Date : 05 August 2024

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 50

CALIBRATION SETTING

Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
NO Span	400	399.8	-0.050	400.0	1.008
NO _x Span	400	400.2	0.050	400.0	1.010

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	509	cc/min	500 ± 50
OZONE FLOW	79	cc/min	80 ± 15
PMT	103.1	mV	-20 - 150
AZERO	93.9	mV	-20 - 150
HVPS	671	V	420 - 900 constant
RCELL TEMP	50.0	°C	50 ± 1
BOX TEMP	28.8	°C	8 - 48
PMT TEMP	7.1	°C	7 ± 2
MOLY TEMP	315.4	°C	315 ± 5
RCELL PRESS	8.5	IN-Hg-A	2 - 10 constant
SAMPLE PRESS	28.7	IN-Hg-A	25 - 30 constant
NO Span Conc	400	PPB	20 - 20,000
NO _x Span Conc	400	PPB	20 - 20,000
NO Slope	1.008	-	1.0 ± 0.3
NO _x Slope	1.010	-	1.0 ± 0.3
NO Offset	1.4	mV	-20 to +150
NO _x 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 :

(Mr.Adul Dangklom)

Approved by :

(Mr.Peera Detudom)



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CALIBRATION REPORT

CHEMILUMINESCENT NO / NO₂ / NO_x ANALYZER

DATE :	16 October 2024	BRAND :	API	MODEL :	200E
NO.	NOX-B16	SERIAL NO.	249		

Calibrator (Dilution System)

Brand	: API	Model	: 700
Last Cal. Date	: 05 August 2024	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	50
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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	400.1	0.025	400.0	1.009
NO _x Span	400	400.2	0.050	400.0	1.012

API Model 200E NO_x Analyzer Check List

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	500 standard
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air
SAMPLE FLOW	507	cc/min	500 ± 50
OZONE FLOW	78	cc/min	80 ± 15
PMT	103.3	mV	-20 - 150
AZERO	94.1	mV	-20 - 150
HVPS	674	V	420 - 900 constant
RCELL TEMP	50.3	°C	50 ± 1
BOX TEMP	29.0	°C	8 - 48
PMT TEMP	7.2	°C	7 ± 2
MOLY TEMP	315.1	°C	315 ± 5
RCELL PRESS	8.4	IN-Hg-A	2 - 10 constant
SAMPLE PRESS	28.7	IN-Hg-A	25 - 30 constant
NO Span Conc	400	PPB	20 - 20,000
NO _x Span Conc	400	PPB	20 - 20,000
NO Slope	1.009	-	1.0 ± 0.3
NO _x Slope	1.012	-	1.0 ± 0.3
NO Offset	1.7	mV	-20 to +150
NO _x 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 :

(Mr.Adul Dangklom)

Approved by :

(Mr.Peera Detudom)



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CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER					
DATE :	16 October 2024	BRAND :	API	MODEL :	TML-41M
NO.	NOX-B20	SERIAL NO.	N02782		
Calibrator (Dilution System)					
Brand : API			Model : 700		
Last Cal. Date : 05 August 2024			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	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	400.2	0.050	400.0	1.010
NO _x Span	400	400.3	0.075	400.0	1.013
API Model TML-41M 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	78	cc/min	80 ± 15		
PMT	103.0	mV	-20 - 150		
AZERO	93.8	mV	-20 - 150		
HVPS	670	V	420 - 900 constant		
RCELL TEMP	50.1	°C	50 ± 1		
BOX TEMP	29.3	°C	8 - 48		
PMT TEMP	7.2	°C	7 ± 2		
MOLY TEMP	314.8	°C	315 ± 5		
RCELL PRESS	8.4	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.7	IN-Hg-A	25 - 30 constant		
NO Span Conc	400	PPB	20 - 20,000		
NO _x Span Conc	400	PPB	20 - 20,000		
NO Slope	1.010	-	1.0 ± 0.3		
NO _x Slope	1.013	-	1.0 ± 0.3		
NO Offset	1.8	mV	-20 to +150		
NO _x 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 :

(Mr.Adul Dangklom)

Approved by :

(Mr.Peera Detudom)



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CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER					
DATE :	16 October 2024	BRAND :	API	MODEL :	200E
NO.	NOX-B07	SERIAL NO.	4338		
Calibrator (Dilution System)					
Brand	: API			Model	: 700
Last Cal. Date	: 05 August 2024			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	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	399.9	-0.025	400.0	1.008
NO _x Span	400	400.2	0.050	400.0	1.012
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	510	cc/min	500 ± 50		
OZONE FLOW	79	cc/min	80 ± 15		
PMT	103.4	mV	-20 - 150		
AZERO	94.0	mV	-20 - 150		
HVPS	672	V	420 - 900 constant		
RCELL TEMP	50.0	°C	50 ± 1		
BOX TEMP	28.9	°C	8 - 48		
PMT TEMP	7.1	°C	7 ± 2		
MOLY TEMP	314.7	°C	315 ± 5		
RCELL PRESS	8.3	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.4	IN-Hg-A	25 - 30 constant		
NO Span Conc	400	PPB	20 - 20,000		
NO _x Span Conc	400	PPB	20 - 20,000		
NO Slope	1.008	-	1.0 ± 0.3		
NO _x Slope	1.012	-	1.0 ± 0.3		
NO Offset	1.7	mV	-20 to +150		
NO _x 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 :

(Mr.Adul Dangklom)

Approved by :

(Mr.Peera Detudom)



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CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER					
DATE :	23 October 2024	BRAND :	API	MODEL :	200E
NO.	NOX-B11	SERIAL NO.	4467		
Calibrator (Dilution System)					
Brand : API			Model : 700		
Last Cal. Date : 05 August 2024			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	50
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
NO Span	400	399.6	-0.100	400.0	1.004
NO _x Span	400	399.9	-0.025	400.0	1.007
API Model 200E NO _x Analyzer Check List					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	500 standard		
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air		
SAMPLE FLOW	513	cc/min	500 ± 50		
OZONE FLOW	79	cc/min	80 ± 15		
PMT	103.4	mV	-20 - 150		
AZERO	94.1	mV	-20 - 150		
HVPS	675	V	420 - 900 constant		
RCELL TEMP	50.2	°C	50 ± 1		
BOX TEMP	29.3	°C	8 - 48		
PMT TEMP	7.5	°C	7 ± 2		
MOLY TEMP	314.9	°C	315 ± 5		
RCELL PRESS	8.2	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.4	IN-Hg-A	25 - 30 constant		
NO Span Conc	400	PPB	20 - 20,000		
NO _x Span Conc	400	PPB	20 - 20,000		
NO Slope	1.004	-	1.0 ± 0.3		
NO _x Slope	1.007	-	1.0 ± 0.3		
NO Offset	1.1	mV	-20 to +150		
NO _x Offset	0.6	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by :

(Mr.Adul Dangklom)

Approved by :

(Mr.Peera Detudom)



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CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER					
DATE :	23 October 2024	BRAND :	API	MODEL :	200A
NO.	NOX-B01	SERIAL NO.	2368		
Calibrator (Dilution System)					
Brand	: API			Model	: 700
Last Cal. Date	: 05 August 2024			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	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	399.9	-0.025	400.0	1.007
NO _x Span	400	400.1	0.025	400.0	1.011
API Model 200A NO _x Analyzer Check List					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	500 standard		
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air		
SAMPLE FLOW	507	cc/min	500 ± 50		
OZONE FLOW	78	cc/min	80 ± 15		
PMT	103.0	mV	-20 - 150		
AZERO	93.9	mV	-20 - 150		
HVPS	670	V	420 - 900 constant		
RCELL 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		
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 _x Span Conc	400	PPB	20 - 20,000		
NO Slope	1.007	-	1.0 ± 0.3		
NO _x Slope	1.011	-	1.0 ± 0.3		
NO Offset	1.3	mV	-20 to +150		
NO _x Offset	0.8	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by :

(Mr.Adul Dangklom)

Approved by :

(Mr.Peera Detudom)



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CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER					
DATE :	23 October 2024	BRAND :	API	MODEL :	200A
NO.	NOX-B02	SERIAL NO.	2409		
Calibrator (Dilution System)					
Brand : API			Model : 700		
Last Cal. Date : 05 August 2024			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 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	1.008
NO _x Span	400	400.3	0.075	400.0	1.012
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	509	cc/min	500 ± 50		
OZONE FLOW	78	cc/min	80 ± 15		
PMT	103.2	mV	-20 - 150		
AZERO	94.1	mV	-20 - 150		
HVPS	672	V	420 - 900 constant		
RCELL TEMP	50.1	°C	50 ± 1		
BOX TEMP	28.9	°C	8 - 48		
PMT TEMP	7.2	°C	7 ± 2		
MOLY TEMP	315.3	°C	315 ± 5		
RCELL PRESS	8.2	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.4	IN-Hg-A	25 - 30 constant		
NO Span Conc	400	PPB	20 - 20,000		
NO _x Span Conc	400	PPB	20 - 20,000		
NO Slope	1.008	-	1.0 ± 0.3		
NO _x Slope	1.012	-	1.0 ± 0.3		
NO Offset	1.7	mV	-20 to +150		
NO _x Offset	1.1	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by :

(Mr.Adul Dangklom)

Approved by :

(Mr.Peera Detudom)



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CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER					
DATE :	23 October 2024	BRAND :	API	MODEL :	200A
NO.	NOX-B03	SERIAL NO.	2617		
Calibrator (Dilution System)					
Brand : API			Model : 700		
Last Cal. Date : 05 August 2024			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 50					
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.10	-	0	-
NO Span	400	399.7	-0.075	400.0	1.005
NO _x Span	400	399.9	-0.025	400.0	1.008
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	511	cc/min	500 ± 50		
OZONE FLOW	79	cc/min	80 ± 15		
PMT	103.1	mV	-20 - 150		
AZERO	94.0	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	315.1	°C	315 ± 5		
RCELL PRESS	8.2	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.3	IN-Hg-A	25 - 30 constant		
NO Span Conc	400	PPB	20 - 20,000		
NO _x Span Conc	400	PPB	20 - 20,000		
NO Slope	1.005	-	1.0 ± 0.3		
NO _x Slope	1.008	-	1.0 ± 0.3		
NO Offset	1.2	mV	-20 to +150		
NO _x Offset	0.8	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by :

(Mr.Adul Dangklom)

Approved by :

(Mr.Peera Detudom)



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CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER					
DATE :	23 October 2024	BRAND :	API	MODEL :	200E
NO.	NOX-B06	SERIAL NO.	2286		
Calibrator (Dilution System)					
Brand	: API			Model	: 700
Last Cal. Date	: 05 August 2024			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	50	
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
NO Span	400	399.6	-0.100	400.0	1.004
NO _x Span	400	399.8	-0.050	400.0	1.008
API Model 200E NO _x Analyzer Check List					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	500 standard		
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air		
SAMPLE FLOW	505	cc/min	500 ± 50		
OZONE FLOW	78	cc/min	80 ± 15		
PMT	103.3	mV	-20 - 150		
AZERO	93.9	mV	-20 - 150		
HVPS	669	V	420 - 900 constant		
RCELL TEMP	50.0	°C	50 ± 1		
BOX TEMP	28.9	°C	8 - 48		
PMT TEMP	7.1	°C	7 ± 2		
MOLY TEMP	315.4	°C	315 ± 5		
RCELL PRESS	8.4	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.6	IN-Hg-A	25 - 30 constant		
NO Span Conc	400	PPB	20 - 20,000		
NO _x Span Conc	400	PPB	20 - 20,000		
NO Slope	1.004	-	1.0 ± 0.3		
NO _x Slope	1.008	-	1.0 ± 0.3		
NO Offset	1.0	mV	-20 to +150		
NO _x Offset	0.6	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by :

(Mr.Adul Dangklom)

Approved by :

(Mr.Peera Detudom)



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CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER					
DATE :	23 October 2024	BRAND :	API	MODEL :	200E
NO.	NOX-B08	SERIAL NO.	4336		
Calibrator (Dilution System)					
Brand : API			Model : 700		
Last Cal. Date : 05 August 2024			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	50	
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.), PPB			Final Reading (After Adj.), PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
NO Span	400	399.8	-0.050	400.0	1.007
NO _x Span	400	400.1	0.025	400.0	1.010
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	503	cc/min	500 ± 50		
OZONE FLOW	78	cc/min	80 ± 15		
PMT	103.3	mV	-20 - 150		
AZERO	94.0	mV	-20 - 150		
HVPS	669	V	420 - 900 constant		
RCCELL TEMP	50.0	°C	50 ± 1		
BOX TEMP	28.8	°C	8 - 48		
PMT TEMP	7.1	°C	7 ± 2		
MOLY TEMP	314.7	°C	315 ± 5		
RCCELL PRESS	8.3	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.4	IN-Hg-A	25 - 30 constant		
NO Span Conc	400	PPB	20 - 20,000		
NO _x Span Conc	400	PPB	20 - 20,000		
NO Slope	1.007	-	1.0 ± 0.3		
NO _x Slope	1.010	-	1.0 ± 0.3		
NO Offset	1.3	mV	-20 to +150		
NO _x 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 :

(Mr.Adut Dangklom)

Approved by :

(Mr.Peera Detudom)



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CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER					
DATE :	23 October 2024	BRAND :	API	MODEL :	200A
NO.	NOX-B13	SERIAL NO.	1983		
Calibrator (Dilution System)					
Brand	: API			Model	: 700
Last Cal. Date	: 05 August 2024			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	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	400.1	0.025	400.0	1.010
NO _x Span	400	400.4	0.100	400.0	1.015
API Model 200E NO _x Analyzer Check List					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	500 standard		
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air		
SAMPLE FLOW	509	cc/min	500 ± 50		
OZONE FLOW	78	cc/min	80 ± 15		
PMT	103.0	mV	-20 - 150		
AZERO	93.7	mV	-20 - 150		
HVPS	673	V	420 - 900 constant		
RCELL TEMP	50.1	°C	50 ± 1		
BOX TEMP	29.5	°C	8 - 48		
PMT TEMP	7.2	°C	7 ± 2		
MOLY TEMP	314.8	°C	315 ± 5		
RCELL PRESS	8.3	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.6	IN-Hg-A	25 - 30 constant		
NO Span Conc	400	PPB	20 - 20,000		
NO _x Span Conc	400	PPB	20 - 20,000		
NO Slope	1.010	-	1.0 ± 0.3		
NO _x Slope	1.015	-	1.0 ± 0.3		
NO Offset	1.8	mV	-20 to +150		
NO _x 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 :

(Mr.Adul Dangklorn)

Approved by :

(Mr.Peera Detudom)



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CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER					
DATE :	23 October 2024	BRAND :	API	MODEL :	200A
NO.	NOX-B15	SERIAL NO.	213		
Calibrator (Dilution System)					
Brand : API			Model : 700		
Last Cal. Date : 05 August 2024			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	50	
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
NO Span	400	399.7	-0.075	400.0	1.006
NO _x Span	400	400.1	0.025	400.0	1.009
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	93.8	mV	-20 - 150		
HVPS	673	V	420 - 900 constant		
RCCELL TEMP	50.5	°C	50 ± 1		
BOX TEMP	29.4	°C	8 - 48		
PMT TEMP	7.3	°C	7 ± 2		
MOLY TEMP	315.2	°C	315 ± 5		
RCCELL PRESS	8.4	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.7	IN-Hg-A	25 - 30 constant		
NO Span Conc	400	PPB	20 - 20,000		
NO _x Span Conc	400	PPB	20 - 20,000		
NO Slope	1.006	-	1.0 ± 0.3		
NO _x Slope	1.009	-	1.0 ± 0.3		
NO Offset	1.1	mV	-20 to +150		
NO _x Offset	0.8	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by :

(Mr.Adul Dangklom)

Approved by :



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CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER					
DATE :	23 October 2024	BRAND :	API	MODEL :	TML-41M
NO.	NOX-B21	SERIAL NO.	N02374		
Calibrator (Dilution System)					
Brand	: API			Model	: 700
Last Cal. Date	: 05 August 2024			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	50				
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
NO Span	400	399.5	-0.125	400.0	1.003
NO _x Span	400	399.8	-0.050	400.0	1.007
API Model TML-41M NO _x Analyzer Check List					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	500 standard		
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air		
SAMPLE FLOW	507	cc/min	500 ± 50		
OZONE FLOW	78	cc/min	80 ± 15		
PMT	103.2	mV	-20 - 150		
AZERO	93.9	mV	-20 - 150		
HVPS	671	V	420 - 900 constant		
RCCELL TEMP	50.3	°C	50 ± 1		
BOX TEMP	29.1	°C	8 - 48		
PMT TEMP	7.0	°C	7 ± 2		
MOLY TEMP	315.1	°C	315 ± 5		
RCCELL 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	1.003	-	1.0 ± 0.3		
NO _x Slope	1.007	-	1.0 ± 0.3		
NO Offset	1.0	mV	-20 to +150		
NO _x Offset	0.7	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.Adul Dangklom)

Approved by :

(Mr.Peera Detudom)



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CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER					
DATE :	23 October 2024	BRAND :	API	MODEL :	200A
NO.	NOX-B14	SERIAL NO.	212		
Calibrator (Dilution System)					
Brand	: API			Model	: 700
Last Cal. Date	: 05 August 2024			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	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	400.2	0.050	400.0	1.010
NO _x Span	400	400.4	0.100	400.0	1.013
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	506	cc/min	500 ± 50		
OZONE FLOW	78	cc/min	80 ± 15		
PMT	103.1	mV	-20 - 150		
AZERO	93.8	mV	-20 - 150		
HVPS	67.2	V	420 - 900 constant		
RCCELL TEMP	50.4	°C	50 ± 1		
BOX TEMP	29.0	°C	8 - 48		
PMT TEMP	7.3	°C	7 ± 2		
MOLY TEMP	315.4	°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 _x Span Conc	400	PPB	20 - 20,000		
NO Slope	1.010	-	1.0 ± 0.3		
NO _x Slope	1.013	-	1.0 ± 0.3		
NO Offset	1.7	mV	-20 to +150		
NO _x Offset	1.1	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by :

(Mr.Adul Dangklom)

Approved by :

(Mr.Peera Detudom)



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CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER					
DATE :	23 October 2024	BRAND :	API	MODEL :	TML-41M
NO.	NOX-B18	SERIAL NO.	N07543		
Calibrator (Dilution System)					
Brand	: API			Model	: 700
Last Cal. Date	: 05 August 2024			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	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	1.008
NO _x Span	400	400.2	0.050	400.0	1.011
API Model TML-41M 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	510	cc/min	500 ± 50		
OZONE FLOW	79	cc/min	80 ± 15		
PMT	102.9	mV	-20 - 150		
AZERO	93.6	mV	-20 - 150		
HVPS	671	V	420 - 900 constant		
RCELL TEMP	50.3	°C	50 ± 1		
BOX TEMP	29.2	°C	8 - 48		
PMT TEMP	7.4	°C	7 ± 2		
MOLY TEMP	315.2	°C	315 ± 5		
RCELL PRESS	8.4	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.6	IN-Hg-A	25 - 30 constant		
NO Span Conc	400	PPB	20 - 20,000		
NO _x Span Conc	400	PPB	20 - 20,000		
NO Slope	1.008	-	1.0 ± 0.3		
NO _x Slope	1.011	-	1.0 ± 0.3		
NO Offset	1.6	mV	-20 to +150		
NO _x 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 :

(Mr.Adul Dangklom)

Approved by :

(Mr.Peera Detudom)



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CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER					
DATE :	27 October 2024	BRAND :	API	MODEL :	200A
NO.	NOX-B14	SERIAL NO.	212		
Calibrator (Dilution System)					
Brand	: API			Model	: 700
Last Cal. Date	: 05 August 2024			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	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	400.1	0.025	400.0	1.009
NO _x Span	400	400.2	0.050	400.0	1.012
API Model 200A NO _x Analyzer Check List					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	500 standard		
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air		
SAMPLE FLOW	507	cc/min	500 ± 50		
OZONE FLOW	79	cc/min	80 ± 15		
PMT	103.0	mV	-20 - 150		
AZERO	93.9	mV	-20 - 150		
HVPS	673	V	420 - 900 constant		
RCCELL TEMP	50.1	°C	50 ± 1		
BOX TEMP	29.3	°C	8 - 48		
PMT TEMP	7.2	°C	7 ± 2		
MOLY TEMP	315.2	°C	315 ± 5		
RCCELL PRESS	8.4	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.7	IN-Hg-A	25 - 30 constant		
NO Span Conc	400	PPB	20 - 20,000		
NO _x Span Conc	400	PPB	20 - 20,000		
NO Slope	1.009	-	1.0 ± 0.3		
NO _x Slope	1.012	-	1.0 ± 0.3		
NO Offset	1.7	mV	-20 to +150		
NO _x 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 :

(Mr.Adul Dangklom)

Approved by :

(Mr.Peera Detudom)



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CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER					
DATE :	27 October 2024	BRAND :	API	MODEL :	TML-41M
NO.	NOX-B18	SERIAL NO.	N07543		
Calibrator (Dilution System)					
Brand	: API		Model	: 700	
Last Cal. Date	: 05 August 2024		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	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	1.010
NO _x Span	400	400.4	0.100	400.0	1.013
API Model TML-41M 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	512	cc/min	500 ± 50		
OZONE FLOW	79	cc/min	80 ± 15		
PMT	103.2	mV	-20 - 150		
AZERO	94.0	mV	-20 - 150		
HVPS	669	V	420 - 900 constant		
RCELL TEMP	50.2	°C	50 ± 1		
BOX TEMP	29.4	°C	8 - 48		
PMT TEMP	7.0	°C	7 ± 2		
MOLY TEMP	314.8	°C	315 ± 5		
RCELL PRESS	8.3	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.6	IN-Hg-A	25 - 30 constant		
NO Span Conc	400	PPB	20 - 20,000		
NO _x Span Conc	400	PPB	20 - 20,000		
NO Slope	1.010	-	1.0 ± 0.3		
NO _x Slope	1.013	-	1.0 ± 0.3		
NO Offset	1.8	mV	-20 to +150		
NO _x Offset	1.1	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by :

(Mr.Adul Dangklom)

Approved by :

(Mr.Peera Detudom)



CERTIFICATE No : 24M2227

REFERENCE No : 72448-1

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE

MANUFACTURER : METTLER TOLEDO

MODEL : XS105DU

SERIAL No : 1126422905

ID No : BA05/50

CONDITION AS RECEIVED : USED ITEM

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

CALIBRATED BY : ATSAWIN Y.

CALIBRATION DATE : 08-Mar-24

APPROVED BY : 
PONGSAK J.

ISSUED DATE : 14-Mar-24

RECEIVED DATE : 08-Mar-24



CERTIFICATE No : 24M2227

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : XS105DU
MANUFACTURER : METTLER TOLEDO S/N : 1126422905
ID No : BA05/50 RECEIVED DATE : 08-Mar-24
AIR PRESSURE : 1010mbar \pm 1mbar CALIBRATION DATE : 08-Mar-24
AMBIENT TEMPERATURE : 25° C \pm 1° C RELATIVE HUMIDITY : 53 %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. 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 CENTRAL BUREAU OF WEIGHTS&MEASURES

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

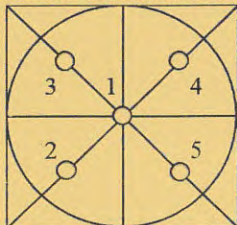
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0.000055 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (\pm g)
0.00	0.00000	0.00000	0.000065
0.02	0.02001	-0.00001	0.000065
0.10	0.10002	-0.00002	0.000066
0.20	0.20001	-0.00001	0.000066
0.50	0.50001	-0.00001	0.000065
1.00	1.00003	-0.00003	0.000066
2.00	2.00001	-0.00001	0.000067
5.00	5.00001	-0.00001	0.000068
10.00	9.99994	0.00006	0.000070
20.00	20.00008	-0.00008	0.000078
50.00	50.0000	0.0000	0.00013
100.00	100.0001	-0.0001	0.00019
120.00	120.0001	-0.0001	0.00022

5. OFF CENTER LOADING ERROR



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

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

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

END OF CALIBRATION REPORT

Cert. No. : SP24020

Pages 1 of 3

Calibration Certificate

Equipment : UV-VIS SPECTROPHOTOMETER

Manufacturer : PERKINELMER

Model : LAMBDA 25

Serial No.: 501S14123010

ID No.: SP03/58

Calibration Mode : WAVELENGTH ACCURACY
PHOTOMETRIC ACCURACY

Condition As Found : GOOD

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

Location : WET CHEMISTRY LABORATORY IV

Ambient Temperature : (28.1 \pm 5) °C

Relative Humidity : (47.2 \pm 25) %

Received Date : 27 AUGUST 2024

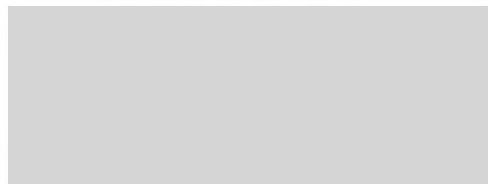
Calibration Date : 27 AUGUST 2024

Date of Issue : 27 AUGUST 2024

Calibrated by :

Nathakorn Pisutpaisan

Approved by :



SITHIPORN ASSOCIATES CO., LTD.

CALIBRATION LABORATORY

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

SITHIPORN
associates



Cert. No. : SP24020

Job No. : VC67SP0013

Pages : 2 of 3

Calibration Method :

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

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

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

Condition of this result of calibration :

1. Certified reference materials

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

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

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

3.1 The UK National Physical Laboratory (NPL)

3.2 The National Institute of Standards and Technology, NIST.

Result of calibration : Wavelength Accuracy

(Without adjustment)

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

UUC* = Unit Under Calibration

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



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					
Non-Dispersive Infrared CO Analyzer					
Date :	02 October 2024	Brand :	API	Model :	300E
No.	CO-B01			Serial No.	782
Calibrator (Dilution System)					
Brand : Teledyne			Model : 700		
Last Cal. Date : 30 October 2023			Serial No. : 421		
Reference Standard Gas					
Standard Gas : Carbon Monoxide (CO)			Cylinder No. : D711839		
Certified Date : 14 March 2024		Expired Date : 14 March 2032		Cylinder Conc. : 4,580 ppm	
Calibrating Condition					
Pressure : 1011 mmbar		Temp. : 24.6 °C		% RH : 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	40.04	0.100	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	4015.1	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	811	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	3033.4	mV	250 mV to 4750 mV		
Slope	1.017	-	1.0 ± 0.3		
Offset	0.2	-	0 ± 0.3		

Calibrated by :

(Mr.Adul Dangklom)

Approved by :

(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					
Non-Dispersive Infrared CO Analyzer					
Date :	02 October 2024	Brand :	API	Model :	300E
No.	CO-B02			Serial No.	965
Calibrator (Dilution System)					
Brand : Teledyne			Model : 700		
Last Cal. Date : 30 October 2023			Serial No. : 421		
Reference Standard Gas					
Standard Gas : Carbon Monoxide (CO)			Cylinder No. : D711839		
Certified Date : 14 March 2024		Expired Date : 14 March 2032		Cylinder Conc. : 4,580 ppm	
Calibrating Condition					
Pressure : 1011 mmbar		Temp. : 24.6 °C		% RH : 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	39.97	-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	4014.7	mV	2500-4800 mV		
CO Reference	3948.1	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	48.3	°C	48 ± 4		
Bench Temperature	48.1	°C	48 ± 2		
Wheel Temperature	68.2	°C	68 ± 2		
Box Temperature	30.6	°C	Ambient Temp + 7 ± 10		
Photo-Drive	3037.8	mV	250 mV to 4750 mV		
Slope	1.017	-	1.0 ± 0.3		
Offset	0.2	-	0 ± 0.3		

Calibrated by :

(Mr.Adul Dangklom)

Approved by :

(Mr. Peera Detudom)



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

Calibration Report Total Hydrocarbon Analyzer			
Date :	04 October 2024	Brand :	HORIBA
No.	B01	Model :	APHA-360CE
		Serial No.	4211954001
Calibrator (Dilution System)			
Brand :	Teledyne	Model :	700E
Last Cal. Date :	30 October 2023	Serial No.	201-S
Reference Standard Gas			
Standard Gas :	Methane (CH ₄)	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 :	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	10.04	10
Calibration Setting (Final)			
Span Instrument Gain:	0.996	Finish Time:	10:00 AM
APHA-360 Total Hydrocarbon Analyzer			
Test Values	Observed Value	Units	Nominal Range
Signal (CH ₄)	911.2	mV	800-1,350
Signal (THC)	916.5	mV	800-1,350
Detector	78.1	kPa	((Pressure Air/1013)x100)-20 ± 4 kPa
Purifier	19.3	kPa	8 - 25
NMC	258.7	°C	260 ± 10
Bypass	0.9	L / min	0.9 ± 0.3
Over Flow	0.8	L / Min	0.8

Calibrated by :

(Mr.Adul Dangklom)

Approved by :

(Mr. Peera Detudom)



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

Calibration Report Total Hydrocarbon Analyzer			
Date :	02 October 2024	Brand :	HORIBA
No. :	R01	Model :	APHA-370
		Serial No. :	WDDDN38N
Calibrator (Dilution System)			
Brand :	Teledyne	Model :	700E
Last Cal. Date :	30 October 2023	Serial No. :	201-S
Reference Standard Gas			
Standard Gas :	Methane (CH ₄)	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 :	3:00 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:	0.997	Finish Time:	4:00 PM
APHA-360 Total Hydrocarbon Analyzer			
Test Values	Observed Value	Units	Nominal Range
Signal (CH ₄)	910.5	mV	800-1,350
Signal (THC)	915.7	mV	800-1,350
Detector	78.0	kPa	((Pressure Air/1013)x100)-20 ± 4 kPa
Purifier	19.2	kPa	8 - 25
NMC	259.4	°C	260 ± 10
Bypass	0.9	L / min	0.9 ± 0.3
Over Flow	0.8	L / Min	0.8

Calibrated by : 
(Mr. Adul Dangklorn)

Approved by : 
(Mr. Peera Detudom)

เอกสาร ฉ-2

เอกสารสอบเทียบเครื่องมือตรวจวัดระดับเสียง



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0304

MTC No. EEL. BP. 109/0267

CALIBRATION CERTIFICATE

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

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

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

Instrument Calibrated :

Description : Sound Calibrator

Manufacturer : ACO

Model : 2127

Serial No. : 130006

Ambient Environment

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

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

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

Standards used :

1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.
3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.
4. Digital Multimeter Agilent 34401A S/N MY44005560.
5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.
6. Audio Analyzer Keithley 2015-P S/N4106495.
7. Condenser Microphone B&K 4180 S/N 2889871.

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

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

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

Date of Receipt : 22 Feb. 2024

Date of Calibration : 4 Mar. 2024

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

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

FM.BL.MTC.002 Rev.4

Head Office

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Changwat Pathumthani 12120, Thailand

Tel. (66) 0 2577 9000

Fax. (66) 0 2577 9009

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

Office/Laboratory

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,
Amphoe Muang, Changwat Samutprakan 10280, Thailand

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

Fax. (66) 0 2323 9165

E-mail : mtc@tistr.or.th

Office

196 Phahonyothin Road, Chatuchak, Bangkok 10900,
Thailand

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

Fax. (66) 0 2579 8592

E-mail : sumalee@tistr.or.th

Request No. 21-67/0304

MTC No. EEL. BP. 109/0267

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

Nominal Output of Unit Under Test = 94 dB re 20 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 2
1/2 inch Bruel&Kjaer 4180	93.85	-0.15	± 0.10	± 0.75 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	999.9	-0.1	± 1.5	$\pm 2.0\%$

3. Total Distortion

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

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

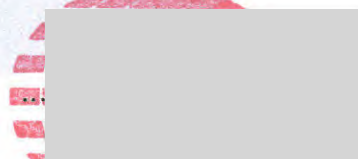
3. The microphone volume correction was not included.

Calibrated by :



(Mr. Weerachai Deechaiyae)

Approved by :



Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 4 Mar. 2024

Date of Issue : 5 Mar. 2024

Ref : 2011267022200795001

End of Certificate

2 / 2

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

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

Head Office

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

Tel. (66) 0 2577 9000

Fax. (66) 0 2577 9009

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

Office/Laboratory

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,
Amphoe Muang, Changwat Samutprakan 10280, Thailand

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

Fax. (66) 0 2323 9165

E-mail : mtc@tistr.or.th

Office

196 Phahonyothin Road, Chatuchak, Bangkok 10900,
Thailand

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

Fax. (66) 0 2579 8592

E-mail : sumalee@tistr.or.th



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

Noise B_408/24

Sound Level Meter Calibration Report

Acoustic Calibrator Data

Brand	ACO	Number	AC 03/56
Model	2127	Serial No.	130006
Calibration Range	94 dB, 1000 Hz	Last Calibration	04 March 2024
		Due Date	04 March 2025

Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-B03	ACO	6236	00222297	16 October 2024	93.9	93.9
ACO-B12	ACO	6236	00152081	16 October 2024	94.1	93.9
ACO-B18	ACO	6236	00172048	16 October 2024	93.9	93.9
ACO-B28	ACO	6236	00182009	16 October 2024	94.0	93.9
ACO-B33	ACO	6236	00182015	16 October 2024	93.9	93.9
ACO-B36	ACO	6236	00192027	16 October 2024	94.1	93.9
ACO-B38	ACO	6236	00192029	16 October 2024	93.9	93.9
ACO-B41	ACO	6236	00192032	16 October 2024	94.0	93.9
ACO-B42	ACO	6236	00192033	16 October 2024	93.9	93.9
ACO-B44	ACO	6236	00222302	16 October 2024	93.9	93.9
ACO-R41	ACO	6236	00192053	16 October 2024	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.85 ± 0.10 dB	

Calibrated by :

(Mr. Adul Dangklom)

Approved by :

(Mr. Peera Detudom)



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

Noise B_399/24

Sound Level Meter Calibration Report

Acoustic Calibrator Data

Brand	ACO	Number	AC 03/56
Model	2127	Serial No.	130006
Calibration Range	94 dB, 1000 Hz	Last Calibration	04 March 2024
		Due Date	04 March 2025

Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-B02	ACO	6236	00090370	16 October 2024	94.1	93.9
ACO-B04	ACO	6236	00222298	16 October 2024	94.1	93.9
ACO-B10	ACO	6236	00222299	16 October 2024	93.9	93.9
ACO-B15	ACO	6236	00222300	16 October 2024	94.0	93.9
ACO-B19	ACO	6236	00172057	16 October 2024	93.9	93.9
ACO-B37	ACO	6236	00192028	16 October 2024	94.0	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.85 ± 0.10 dB	

Calibrated by :

(Mr. Adul Dangklom)

Approved by :

(Mr. Peera Detudom)



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

Noise B_400/24

Sound Level Meter Calibration Report

Acoustic Calibrator Data

Brand	ACO	Number	AC 03/56
Model	2127	Serial No.	130006
Calibration Range	94 dB, 1000 Hz	Last Calibration	04 March 2024
		Due Date	04 March 2025

Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-B22	ACO	6236	00172060	16 October 2024	94.1	93.9
ACO-B38	ACO	6236	00192029	16 October 2024	93.9	93.9
ACO-B44	ACO	6236	00222302	16 October 2024	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.85 ± 0.10 dB	

Calibrated by :

(Mr. Adul Dangklom)

Approved by :

(Mr. Peera Detudom)



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

Noise B_401/24

Sound Level Meter Calibration Report

Acoustic Calibrator Data

Brand	ACO	Number	AC 03/56
Model	2127	Serial No.	130006
Calibration Range	94 dB, 1000 Hz	Last Calibration	04 March 2024
		Due Date	04 March 2025

Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-B33	ACO	6236	00182015	16 October 2024	94.1	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.85 ± 0.10 dB	

Calibrated by :

(Mr. Adul Dangklom)

Approved by :

(Mr. Peera Detudom)

เอกสาร ฉ-3

เอกสารสอบเทียบเครื่องมือตรวจวิเคราะห์คุณภาพน้ำ

Cert. No. : SP24020

Pages 1 of 3

Calibration Certificate

Equipment : UV-VIS SPECTROPHOTOMETER

Manufacturer : PERKINELMER

Model : LAMBDA 25

Serial No.: 501S14123010

ID No.: SP03/58

Calibration Mode : WAVELENGTH ACCURACY
PHOTOMETRIC ACCURACY

Condition As Found : GOOD

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

Location : WET CHEMISTRY LABORATORY IV

Ambient Temperature : (28.1 \pm 5) °C

Relative Humidity : (47.2 \pm 25) %

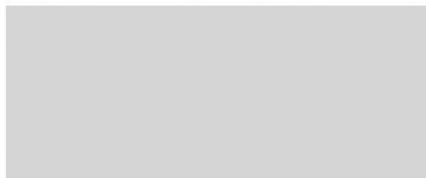
Received Date : 27 AUGUST 2024

Calibration Date : 27 AUGUST 2024

Date of Issue : 27 AUGUST 2024

Calibrated by : Nathakorn Pisutpaisan

Approved by :



SITHIPORN ASSOCIATES CO., LTD.

CALIBRATION LABORATORY

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

SITHIPORN
associates



Cert. No. : SP24020

Job No. : VC67SP0013

Pages : 2 of 3

Calibration Method :

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

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

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

Condition of this result of calibration :

1. Certified reference materials

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

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

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

3.1 The UK National Physical Laboratory (NPL)

3.2 The National Institute of Standards and Technology, NIST.

Result of calibration : Wavelength Accuracy

(Without adjustment)

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

UUC* = Unit Under Calibration

SITHIPORN ASSOCIATES CO., LTD.

CALIBRATION LABORATORY

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

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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

Certificate of Calibration

Certificate No. : 67-400037-2

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 : 23 January 2024

Date of Calibration : 03 February 2024

Date of Issue : 03 February 2024

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-0016-22	07 Feb 2024	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

(Surachai Promthong)

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full except with the prior written approval of the Calibratech Co.,Ltd.



Certificate of Calibration

Certificate No. : 67-400037-2

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 0.4336 °C

Standard Reading (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (± °C)
20.5609	20	0.6	0.31

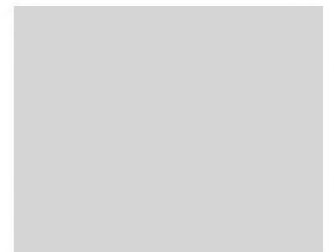
Remark

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%

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES

534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250

TEL. 0-2717-3000-29 FAX. 0-2719-9484

Certificate of Calibration

Cert.No.: 24CH285

Page.: 1 of 2

Equipment : Turbidity Meter
Manufacturer : Eutech
Model : CyberScan WLTB1000
Serial No. : 201802206
ID. No. : TB 03/61
Condition As-Received: Used Item
Received Date : 05 March 2024
Calibration Date : 06 March 2024
Reference : 2403-0144WN-1
Submitted by : S.P.S. Consulting Service Co.,Ltd.
7 Phaholyothin 24, Phaholyothin Road.,
Jompol, Chatuchak, Bangkok 10900

Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 20) %
Calibration Procedure : In - house method : CP-CH11
based on direct measurement by
using Formazin standard solution

Calibrated by : Walalak Sirithean

Approved by :

- () Pornthippa Tameyakul
() Unnopphol Harachai
(✓) Saithip Meangmai

Issue Date : 06 March 2024

The Uncertainties are for a confidence probability of approximately 95%.

This certificate may not be reproduced other than in full, except with the prior written
approval of the head of Calibration and Testing Equipment Services.

A 0013024



Cert.No. : 24CH285

Page. : 2 of 2

Condition of this calibration result

1. Reference Standard Instruments :

This certification is traceable to the International System of unit (SI unit) through:-
- Technology Promotion Association (Thailand-Japan).

<u>Instruments</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Certificate No.</u>	<u>Due date</u>
1) Thermo-Hygograph	1103328	130EC010	23H1361	13 June 2024
2) Electronic Balance	14233821	110RC001	23MM405	16 July 2024

2. Standard Material : The Formazin suspension has been prepared gravimetric from

<u>Material</u>	<u>Manufacturer</u>	<u>Lot No.</u>	<u>Assay</u>
1) Hexamethylenetetramine	HIMEDIA	0000493947	99.65%
2) Hydrazinium Sulfate	HIMEDIA	0000522014	99.40%

3. This certificate is valid only to the item calibrated on date and place of calibration.

Calibration result

Performing three - Formazin suspension standard curve by using 0,10,1000 NTU

Turbidity Meter Serial Number : 201802206

Standard Formazine suspension (NTU)	UUC* Reading (NTU)	Uncertainty of Measurement (\pm NTU)	Coverage Factor <i>k</i>
20	19.2	0.38	2.00
40	39.4	0.40	2.00
100	99.0	0.70	2.00
400	389	1.5	2.00

Remark - UUC* = Unit Under Calibration
- NTU = Nephelometric Turbidity Units

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

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CERTIFICATE No : 24E6416
REFERENCE No : 73694-1

PAGE : 1 OF 3

Certificate of Calibration

EQUIPMENT : pH METER
MANUFACTURER : HANNA
MODEL : HI 3512
SERIAL No : TH118035
ID No : pH 04/56
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : S.P.S. CONSULTING SERVICE CO., LTD.
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD.,
JOMPOL, CHATUCHAK, BANGKOK 10900

CALIBRATED BY : ATSAWIN Y.

CALIBRATION DATE : 27-Jun-24

APPROVED BY : 

ISSUED DATE : 27-Jun-24

RECEIVED DATE : 24-Jun-24



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 : 24E6416

PAGE : 2 OF 3

Calibration Report

EQUIPMENT : pH METER
MANUFACTURER : HANNA
ID No : pH 04/56
RECEIVED DATE : 24-Jun-24
AMBIENT TEMPERATURE : 23 ° C ± 3 ° C
MODEL : HI 3512
SERIAL NUMBER : TH118035
CALIBRATION DATE : 27-Jun-24
RELATIVE HUMIDITY : 50 % RH ± 10% RH

CONDITION OF THIS RESULTS OF CALIBRATION

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

INSTRUMENT	MODEL	SERIAL No/ LOT No	CERTIFICATE No	DUE DATE
1) pH STANDARD SOLUTION	00651-06	CC784945	4880-14413915	24-Aug-25
2) pH STANDARD SOLUTION	00651-08	CC785578	4881-14430633	31-Aug-25
3) pH STANDARD SOLUTION	00651-10	CC787086	4882-14483317	21-Sep-25
4) PROCESS CALIBRATOR	CA150	91S6079	24E1251	09-Apr-25
5) BATH	260014	1247 48074	23T9014	13-Sep-24
6) THERMOMETER WITH PROBE	421504	55000379	23T9623	13-Sep-24

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

RESULT OF CALIBRATION : ADJUSTMENT

1. DISPLAY UNIT ONLY

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

mV APPLIED	UUC READING (mV)	CORRECTION (mV)	UUC READING (pH)	UNCERTAINTY OF MEASUREMENT (± mV)	COVERAGE FACTOR k
414.11	414.8	-0.69	-0.115	0.15	2.00
354.95	355.5	-0.55	0.884	0.15	2.00
295.80	296.4	-0.60	1.885	0.15	2.00
236.64	237.1	-0.46	2.886	0.15	2.00
177.48	178.0	-0.52	3.887	0.15	2.00
118.32	118.8	-0.48	4.887	0.15	2.00
59.16	59.6	-0.44	5.887	0.15	2.00
0.00	0.4	-0.40	6.888	0.15	2.00
-59.16	-58.7	-0.46	8.101	0.15	2.00
-118.32	-117.9	-0.42	9.345	0.15	2.00
-177.48	-177.4	-0.08	10.589	0.15	2.00
-236.64	-236.4	-0.24	11.834	0.15	2.00
-295.80	-294.5	-1.30	13.077	0.15	2.00
-354.95	-354.7	-0.25	14.322	0.15	2.00
-414.11	-413.9	-0.21	15.565	0.15	2.00

END OF CALIBRATION REPORT PAGE 2 OF 3



QUALITY CALIBRATION CO., LTD.

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

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

CERTIFICATE No : 24E6416

PAGE : 3 OF 3

Calibration Report

RESULT OF CALIBRATION (CONTINUE):

2. DISPLAY UNIT WITH pH ELECTRODE S/N: 09081C6M

STANDARD pH BUFFER SOLUTION (pH)	UUC READING (pH)	CORRECTION (pH)	VALUE BEFORE ADJUSTMENT	UNCERTAINTY OF MEASUREMENT (\pm pH)	COVERAGE FACTOR k
4.015	4.011	0.004	3.905	0.012	2.00
7.003	7.003	0.000	6.972	0.012	2.00
10.009	10.014	-0.005	9.570	0.014	2.00

3. DISPLAY UNIT WITH TEMPERATURE

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

4. PERCENT SLOPE 100%

UUC : UNIT UNDER CALIBRATION

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

END OF CALIBRATION REPORT



CALIBRATION LABORATORY Co., LTD.

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



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : CONDUCTIVITY METER
MANUFACTURER : METTLER TOLEDO
MODEL / TYPE : SEVEN COMPACT S230
SERIAL NO. : C141708983/5821320179
CLID. NO. : 272300452
JOB CONTROL NO. : 240213016389
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 : 13 February 2024

DATE OF ISSUED : 16 February 2024

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

Calibrated By : Sukgasem Seehanart
Calibration Engineer



Approved By :

Authorized Signatory
16 February 2024

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

Certificate No. Q24016389

F3-011-05/12-23

page 1 of 4



@clccalibration

REPORT OF CALIBRATION FOR

NOMENCLATURE : CONDUCTIVITY METER
MANUFACTURER : METTLER TOLEDO
MODEL / TYPE : SEVEN COMPACT S230
SERIAL NO. : C141708983/5821320179
DATE OF CALIBRATION : 13 February 2024

ENVIRONMENT CONDITIONS :

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

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

PROCEDURE USED :

This instrument [Conductivity Meter] was calibrated under procedure No. **WI-305-130**. The calibration was performed by direct measurement with Certified Reference Material (CRM) and Reference Material (RM) .

This instrument [Temperature] was calibrated under procedure No. **WI-305-244**. The calibration was performed by Comparison with Calibration Bath, Precision Thermometer and IPRT which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Conductivity Solution , Hanna Product Code HI 7033L Lot Number 7830.
2. Potassium Chloride Solution (nominal 1.41 mS/cm)
3. Potassium Chloride Solution (nominal 12.8 mS/cm)
4. Calibration Bath, Kambic Model OB-22/2 ULT S/N. 17115653.
5. Precision Thermometer, ASL Model F200-A-8 S/N. 014433/03.
6. IPRT, ASL Model T100-250-1D S/N. L0193A-1-1.



TRACEABILITY :

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

Certificate No. 20F21 , Due Date June 2025 .

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

Certificate No. HC30595403 , Due Date 31 January 2026 .

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

Certificate No. HC20111554 , Due Date 30 September 2025.

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

Certificate No. Q23136342, Due Date 20 December 2024.

5. The measurements are traceable to International System of Units (SI) , through Thailand Institute of Scientific and Technological Research (TISTR). Certificate No. PSL-T 0203/67, Due Date 07 December 2024.

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

Certificate No. TT-0136-23, Due Date 12 December 2024.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2,00$ which for a normal distribution corresponds to a coverage probability of approximately 95 %.

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



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

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

CALIBRATION DATA

1. Conductivity Solution Test @ 25°C

Standard Conductivity Solution	DUC Reading	Uncertainty of Measurement
*84.00 $\mu\text{S/cm}$	84.05 $\mu\text{S/cm}$ [Cell Constant 0.548589]	$\pm 1.00 \mu\text{S/cm}$
1414.0 $\mu\text{S/cm}$	1415 $\mu\text{S/cm}$ [Cell Constant 0.548589]	$\pm 21.0 \mu\text{S/cm}$
12.83 mS/cm	12.75 mS/cm [Cell Constant 0.548589]	$\pm 0.19 \text{mS/cm}$

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

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

*2. Temperature Result [Probe Conductivity]

Immersion depth (mm)	Actual Temperature (°C)	DUC Reading (°C)	Correction (°C)	Uncertainty \pm (°C)
100	25.00	24.9	+0.10	0.07

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

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

End of Certificate

Certificate No. Q24016389

F3-011-05/12-23

page 4 of 4





CERTIFICATE No : 24M2229
REFERENCE No : 72448-3

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE

MANUFACTURER : SARTORIUS

MODEL : BSA224S-CW

SERIAL No : 36591843

ID No : BA 09/61

CONDITION AS RECEIVED : USED ITEM

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

CALIBRATED BY : ATSAWIN Y.

CALIBRATION DATE : 08-Mar-24

APPROVED BY : 

ISSUED DATE : 14-Mar-24

RECEIVED DATE : 08-Mar-24



CERTIFICATE No : 24M2229

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE **MODEL** : BSA224S-CW
MANUFACTURER : SARTORIUS **S/N** : 36591843
ID No : BA 09/61 **RECEIVED DATE** : 08-Mar-24
AIR PRESSURE : 1010mbar \pm 1mbar **CALIBRATION DATE** : 08-Mar-24
AMBIENT TEMPERATURE : 25° C \pm 1° C **RELATIVE HUMIDITY** : 55 %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. 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 CENTRAL BUREAU OF WEIGHTS&MEASURES

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

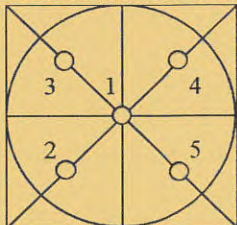
2. TARE FUNCTION : NORMAL

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	0.000082
0.1	0.1000	0.0000	0.000083
0.2	0.2000	0.0000	0.000083
0.5	0.5000	0.0000	0.000083
1.0	1.0000	0.0000	0.000084
2.0	2.0000	0.0000	0.000084
5.0	5.0000	0.0000	0.000086
10.0	10.0000	0.0000	0.000089
20.0	20.0001	-0.0001	0.000094
50.0	50.0000	0.0000	0.00012
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	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-V015C

Calibration Date : 20 Mar 24
 Submitted by : ASIA LAB @ CONSULTANT CO.,LTD
 184 Soi Phutthamonthon Sai 2 Soi 12,
 Bangphai, Bangkae, Bangkok 10160

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

Model : YSI 5000
 S/N : 15B100751
 Probe : YSI 5010
 S/N : 22D100097
 ID NO. : -
 Air Temp ref : S/N. F8065C26
 Barometric ref : S/N. F8065C26
 Water Temp ref : S/N. 11430
 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

(Supreecha Sumaritam)



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 : 24T0774

REFERENCE No : 71986-2

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : COD REACTOR

MANUFACTURER : HACH

MODEL : DRB 200

SERIAL No : 15110C0235

ID No : CRB 05/59

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 : 5-Feb-24

APPROVED BY :

ISSUED DATE : 5-Feb-24

RECEIVED DATE : 5-Feb-24

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

F-G010 REV : 02



CERTIFICATE No : 24T0774

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : COD REACTOR
MANUFACTURER : HACH
ID NUMBER : CRB 05/59
RECEIVED DATE : 5-Feb-24
AMBIENT TEMPERATURE : 23° C ± 1° C

MODEL : DRB 200
SERIAL NUMBER : 15110C0235
CALIBRATION DATE : 5-Feb-24
RELATIVE HUMIDITY : 52 %RH ± 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

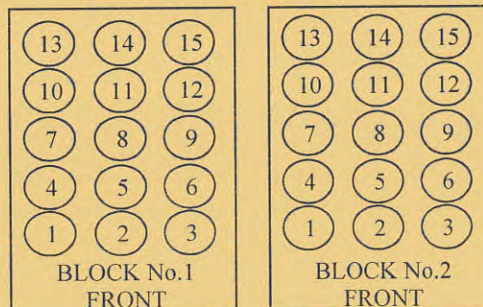
1. THIS INSTRUMENT WAS CALIBRATED BY DIRECT MEASUREMENT TEMPERATURE RECORDER WITH THERMOCOUPLE TYPE K UNDER NO LOAD CONDITION. THE THERMOCOUPLES WERE PLACED ON 15 POINTS AND LOCATED ONE THERMOCOUPLE IN EACH OF THE FOUR CORNERS OF THE REACTOR AND PLACED THE EIGHTH THERMOCOUPLE AT THE CENTER OF THE REACTOR.

2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) DATA LOGGER WITH TC TYPE K	HYDRA 2635A	8009008	23T6640	14-Jul-24

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



TEMPERATURE MEASUREMENT ACCURACY TEST

Block No.	1	2
Controller temperature (°C)	145	145
Indicating Temperature	145	145
Measured Temperature (°C) at Spread Locations	1	150.2
	2	150.2
	3	150.2
	4	149.9
	5	150.1
	6	150.7
	7	149.9
	8	149.9
	9	150.8
	10	149.5
	11	150.2
	12	150.0
	13	149.5
	14	149.5
	15	149.6
Uncertainty of Measurement(± °C)	0.86	0.86

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

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

F-G



MAINTENANCE AND TEST CERTIFICATE MODEL

OPTIMA 5300DV

Customer : <u>S.P.S.Consulting Service Co.,Ltd</u>	Date Tested: <u>July 4, 2024</u>	
	Recommendation Recertification	
Address : <u>7 Soi Phaholyothin 24</u>	Period <u>6</u> Months	
<u>Paholyothin Road</u>	Recertification Due: <u>January 4, 2025</u>	
<u>Jompol Chatuchak, Bangkok 1090</u>	Date Last Certified: <u>January 4, 2024</u>	
User Name: <u>K.Phenpha Vipasthawatt</u>	Visit Number: <u>1 of 2</u>	
Phone: <u>083-9269252</u>	PerkinElmer Phone: <u>02-719-6420 ext 206</u>	
Fax: <u>02-513-4221</u>	PerkinElmer Fax: <u>02-318-5597</u>	

CONFIGURATION TESTED		ACCESSORIES/COMPONENT NOT INCLUDED
MODEL	SERIAL NUMBER	
<u>OPTIMA 5300DV</u>	<u>077C7042401</u>	
TESTED EQUIPMENT	CALIBRATION NUMBER	EXPIRATION
<u>IPV Methods</u>		
TEST STANDARD USED	PART NUMBER	EXPIRATION DATE
<u>Multielement Standard</u>	<u>N069-1579</u>	<u>December 30, 2024</u>
<u>Wavecal Solution</u>	<u>N058-2152</u>	<u>September 30, 2024</u>
<u>VIS Wavecal solution</u>	<u>N930-2946</u>	<u>January 30, 2025</u>
<u>Instrument Cal. STD4</u>	<u>N930-0221</u>	<u>November 30, 2024</u>
CUSTOMER SUPPLIED	COMMENTS	CUSTOMER INITIALS
<u>2 % HNO3</u>		
<u>10 % HNO3</u>		



MAINTENANCE AND TEST CERTIFICATE MODEL

OPTIMA 5300DV

SERIAL NUMBER 077C7042401**DATE TESTED** July 4, 2024**1. MECHANICAL CHECKS**

A. Inspect and clean all fans and filters.

☐ OK

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

☐ OK

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

☐ OK

D. Adjust water and gas pressure regulator settings.

☐ OK

E. Inspect and leak check pneumatics drawers.

☐ OK

F. Clean the exterior of the instrument.

☐ OK**2. OPTICAL CHECKS**

A. Inspect and clean all optical components.

☐ OK

B. As required, check and replace all purgefilters.

☐ OK

C. Recheck optical alignment.

☐ OK**3. COOLING SYSTEM CHECKS**

A. Perform preventive maintenance on chiller.

☐ OK

B. Flush out the chiller every year.

☐ N/A**4. PERFORMANCE CHECKS**

A. Torch View Alignment.

☐ OK

B. Wavelength Calibration.

☐ OK



MAINTENANCE AND TEST CERTIFICATE MODEL

OPTIMA 5300DV

SERIAL NUMBER : 077C7042401DATE TESTED : July 4, 2024

PARAMETER		SPECIFICATION		FINAL VALUE	
Spectral Resolution : UV	As 193.696 nm	≤ 0.007		0.00550	
	Ni 231.604 nm	≤ 0.008		0.00714	
	Ni 341.476 nm	≤ 0.012		0.00790	
Spectral Resolution : VIS	La 408.672 nm	≤ 0.020		0.01655	
	Ba 455.403 nm	≤ 0.025		0.02391	
Precision					
	As 193.656 nm	% RSD	< 1.0	0.72	%
	Zn 213.856 nm	% RSD	< 1.0	0.66	%
	Mn 257.610 nm	% RSD	< 1.0	0.30	%
	La 379.478 nm	% RSD	< 1.0	0.98	%
	Ba 455.403 nm	% RSD	< 1.0	0.95	%
	Ba 493.408 nm	% RSD	< 1.0	0.78	%
Detection Limits : Axial	Tl 190.080 nm	3(sd)		6.22	ppb
	As 193.696 nm	3(sd)		6.44	ppb
	Pb 220.353 nm	3(sd)		2.06	ppb
Detection Limits : Radial	As 193.696 nm	3(sd)		78.26	ppb
	Zn 213.856 nm	3(sd)		2.07	ppb
	Mn 257.610 nm	3(sd)		0.52	ppb
	La 379.478 nm	3(sd)		2.63	ppb
	Ba 455.403 nm	3(sd)		0.08	ppb
	Ba 493.408 nm	3(sd)		0.75	ppb
BEC : Axial (IB X 500)/(IS-IB)	Cd 226.502 nm	≤ 150 ppb		64.72	
BEC : Radial (IB X 1000)/(IS-IB)	Mn 257.610 nm	≤ 45 ppb		15.04	



MAINTENANCE AND TEST CERTIFICATE MODEL

OPTIMA 5300DV

SERIAL NUMBER 077C7042401**DATE TESTED** July 4, 2024**Remarks :**

Commissioning follow as commissioning performance sheets.

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



meets



does not meet

the PerkinElmer Specifications listed on this certificate.

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

Service Department PerkinElmer Ltd.

Authorized Representative: _____

(

Service Engineer

MAINTENANCE REPORT AND CALIBRATION CERTIFICATE

ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL

PinAAcle 900T

Customer :	S.P.S.Consulting Service Co.,Ltd	Date Tested:	July 4, 2024
Address :	7 Soi Phaholyothin 24 Paholyothin Road Jompol Chatuchak, Bangkok 10900	Recommendation Recertification	
User Name:	K.Phenpha Vipasthawatt	Period	6 Months
Phone:	083-9269252	Recertification Due:	January 4, 2025
Email:		Date Last Certified:	January 4, 2024
		Visit Number:	2 OF 2
		PerkinElmer Phone:	02-719-6420 ext 204
		PerkinElmer Fax:	02-318-5597

CONFIGURATION TESTED		
MODEL	SERIAL NUMBER	SOFTWARE
PinAAcle 900T	PTCS14111103	Wiblab V5.1
AS 900		
TEST STANDARD USED	PART NUMBER	EXPIRATION DATE
Copper	N9300183	APR 30 2025
GFAAS Mixed standard	N9300244	FEB 28 2025
MG0-042	N101-3000	
MG2-045	N101-3002	

MAINTENANCE REPORT AND CALIBRATION CERTIFICATE

ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL

PinAAcle 900T

SERIAL NUMBER PTCS14111103

DATE TESTED July 4, 2024

1. INSTRUMENT CHECKS

A. The Mirror and Lenses Condition

OK

B. Grating Condition

OK

C. Replace or Clean Dust Filter

OK

D. Cleaning the Contact Cylinders

OK

E. Cleaning the Furnace Windows

OK

F. Cleaning the Burner Head

OK

G. Cleaning the Nebulizer

OK

H. Cleaning the Drain System

OK

2. AUTOSAMPLE CHECK

A. Sampling and Arm

OK

B. Sampling & Rinse Pump

OK

C. Sample Position & Clean

OK

3. COOLING SYSTEM CHECKS

A. Clean and Change Distill water

OK

B. Themensor

OK

4. FIAS CHECKS

A. Pump and 5 Port Valve

N/A

B. Chemifold and Tubing

N/A

C. Power Supply

N/A

D. Flow meter and Gas system

N/A

MAINTENANCE REPORT AND CALIBRATION CERTIFICATE

ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL

PinAAcle 900T

SERIAL NUMBER	PTCS14111103	DATE TESTED	July 4, 2024
PARAMETER		SPECIFICATION	ACTUAL VAULE
A. Flame Mode Tests			
1. Detector-Linearity with Barium (553.55 nm)			
Neutral Density Filter 0.2 :		<u>0.2042</u> Abs. <u>+ 5%</u>	<u>0.1815</u> Abs.
Neutral Density Filter 1.0 :		<u>0.9798</u> Abs. <u>+ 5%</u>	<u>1.0220</u> Abs.
2. Baseline Noise at 1 Abs with Barium (553.55 nm)			
(at an integration time of 0.5 seconds			
and 99 replicates)			
		SD <u>≤ 0.010 Abs.</u>	<u>0.0016</u> Abs.
3. AA Baseline with Copper (Cu 324.75 nm)			
(at an integration time of 0.5 seconds			
and 99 replicates)			
		SD <u>≤ 0.001 Abs.</u>	<u>0.0001</u> Abs.
4. D ₂ Background Compensation (Copper 324.75 nm)			
with Neutral Density Filter 1.0		Absorbance <u>≤ 0.010 Abs</u>	<u>0.0079</u> Abs.
5. AA-BG Baseline Noise with Copper (324.75 nm)			
(at an integration time of 2.0 seconds			
and 99 replicates)			
		SD <u>≤ 0.005 Abs.</u>	<u>0.0007</u> Abs.
6. AA-BG Baseline Noise with Arsenic (193.70 nm)			
(at an integration time of 2.0 seconds			
and 99 replicates)			
		SD <u>≤ 0.005 Abs.</u>	<u>0.0024</u> Abs.

MAINTENANCE REPORT AND CALIBRATION CERTIFICATE

ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL

PinAAcle 900T

SERIAL NUMBER	<u>PTCS14111103</u>	DATE TESTED	<u>July 4, 2024</u>
PARAMETER	SPECIFICATION	ACTUAL VAULE	
7. Flame Interlock Shutdown	Shutdown correct?	<div>OK</div>	
8. Flame Sensitivity with Copper (324.75 nm)			
(5 mg/L Cu Standard a read time of 10 seconds			
10 replicates, standard burner and Stainless stell nebulizer)			
	Sensitivity ≥ 0.250 Abs.	<u>0.3118</u>	Abs.
(2 mg/L Cu Standard a read time of 10 seconds			
10 replicates, standard burner and High sensitivity nebulizer)			
	Sensitivity ≥ 0.250 Abs.	<u>N/A</u>	Abs.

MAINTENANCE REPORT AND CALIBRATION CERTIFICATE

ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL

PinAAcle 900T

SERIAL NUMBER	PTCS14111103	DATE TESTED	July 4, 2024
PARAMETER	SPECIFICATION	ACTUAL VAULE	
B. THGA Tests			
1. Furnace Gas Flows			
Internal Flow	250 ± 25 mL/min	250	mL/min
External Flow	100 ± 10 mL/min	100	mL/min
2. Chromium Baseline Noise (357.87 nm)			
(mesure 5 furnace dry firings without any sample)			
	Baseline ≤ 0.005 Int.Abs	0.0021	
	SD ≤ 0.005 Int.Abs	0.0004	Int.Abs.
3. Chromium Characteristic Mass(m ₀) and Precition (357.87 nm)			
(measure 5 furnace firing using 20 ul			
sample injections of 10 ug/L Cr standard)			
	m0 Results ≤ 7.0 pg/0.0044A-s	7	pg/0.0044A-s
	Precision ≤ 2.0%	1.32	%
4. Copper Characteristic Mass(m ₀) and Zeeman Ratio (324.75 nm)			
(measure 5 furnace firing using 20 ul			
sample injections of 25 ug/L Cu standard)			
	m0 Results ≤ 16.5 pg/0.0044A-s	14.4	pg/0.0044A-s
	Zeeman Ratio 0.52 + 0.04	0.559	

MAINTENANCE REPORT AND CALIBRATION CERTIFICATE

ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL

PinAAcle 900T

SERIAL NUMBER PTCS14111103 **DATE TESTED** July 4, 2024

Remarks :

- Neutral Density Filter refer to data sheet

- Zeeman Ratio = Atomic Signal(peak area)

Atomic Signal(peak area)+Background Signal(peak area)

= 0.1491/0.1491+0.1176

0.559

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



meets



does not meet

the PerkinElmer Specifications listed on this certificate.

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

Service Department PerkinElmer Ltd.

Customer Service Engineer:

(

Service Engineer



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

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.

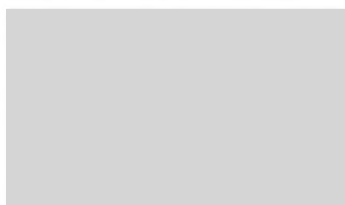
This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

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:



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

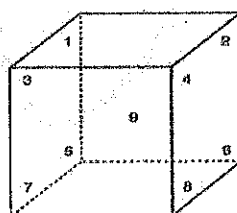
Calibration Temperature (°C)	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	MPE (±°C)
35	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	0.5
41.5	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	0.5

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