

ภาคผนวก จ

เอกสารสอบเทียบความถูกต้องของเครื่องมือ

- จ-1 เอกสารสอบเทียบความถูกต้องของเครื่องมือตรวจวัดคุณภาพอากาศ
จ-2 เอกสารสอบเทียบความถูกต้องของเครื่องมือตรวจวัดระดับเสียง
จ-3 เอกสารสอบเทียบความถูกต้องของเครื่องมือวิเคราะห์คุณภาพน้ำ

ตารางสรุปเอกสารการสอบเทียบความถูกต้องของเครื่องมือตรวจวิเคราะห์

รายการตรวจวิเคราะห์	เครื่องมือเก็บตัวอย่าง	ชื่อเครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
1. คุณภาพอากาศ		
- TSP	- High Volume Air Sampler NO. B08, B11, B12, B15, B19, B20, B23, B25, B33, B44, B36, B37	- Digital Balance
- PM-10	- High Volume Air PM-10 Sampler NO. B06, B07, B11, B15, B18, B20, B26, B32, R11,	- Digital Balance
- PM-2.5	- PM 2.5 Air Sampler NO. B01, B02, B03, B04, B05, B06, B07, B08, B10, B13, B14, B15,	- Digital Balance
- SO ₂	- Gas Sampler Box NO. B01, B02, B03, B04, B05, B06, B07, B08, B09, B11, B12,	- Spectrophotometer
- NO ₂	- NO ₂ Analyzer NO. B01, B02, B03, B05, B06, B08, B10, B11, B13, B14, B15, B16, B18, B21	- NO ₂ Analyzer NO. B01, B02, B03, B05, B06, B08, B10, B11, B13, B14, B15, B16, B18, B21
- CO	- Personal Pump SKC NO. B02, B04, B07, B11, B19, B21, B31, B32, B41, B47, B62, B63, B89	- CO Analyzer NO. B01, B02
- THC	- Personal Pump SKC NO. B02, B04, B07, B10, B13, B18, B23, B24, B26, B31, B40, B47, B51, B65	- THC Analyzer NO. B01, R01
	- Rotameter NO. B01, B02	
2. ระดับเสียง		
- Leq 1 hr, Leq 24 hr, L10, L50 และ L90	- Acoustic Calibration - Sound Level Meter ACO-NO. B02, B03, B04, B10, B12, B15, B18, B19, B28, B33, B36, B37, B38, B41, B42, B44, R41	-
3. คุณภาพน้ำ		
- Temperature	-	- Thermometer
- Turbidity	-	- Turbidity Meter
- pH	-	- pH Meter
- Salinity	-	- Digital Conductivity
- Conductivity	-	- Digital Conductivity
- Settleable Solids	-	- Digital Balance
- Total Dissolved Solids	-	- Digital Balance
- Dissolved Oxygen	-	- DO Mete
- BOD ₅	-	- DO Mete
- COD	-	- COD Reactor
- Phosphate	-	- Spectrophotometer

ตารางสรุปเอกสารการสอบเทียบความถูกต้องของเครื่องมือตรวจวิเคราะห์ (ต่อ)

รายการตรวจวิเคราะห์	เครื่องมือเก็บตัวอย่าง	ชื่อเครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
3. คุณภาพน้ำ (ต่อ)	-	- Block Digestion
	-	- Spectrophotometer
- Total N	-	- Inductively Coupled Plasma
- Total K	-	- Atomic Absorption Spectrophotometer
- Mercury (Hg)	-	- Atomic Absorption Spectrophotometer
- Lead (Pb)	-	- Atomic Absorption Spectrophotometer
- Cadmium (Cd)	-	- Atomic Absorption Spectrophotometer
- Total Chromium (Cr)	-	- Inductively Coupled Plasma
- TKN	-	- Block Digestion
- Grease & Oil	-	- Digital Balance
- Petroleum HC	-	- Spectrophotometer
- Phosphate-P	-	- Spectrophotometer
- Total Coliform Bacteria	-	- Incubator/Water Bath
- Fecal Coliform Bacteria	-	- Incubator/Water Bath
- PO ₄ -P	-	- Spectrophotometer
- NH ₃ -N	-	- Spectrophotometer
- NO ₃ -N	-	- Spectrophotometer
- Total Ammonia	-	- Spectrophotometer
- Cr ⁺⁶	-	- Atomic Absorption Spectrophotometer
- Cu	-	- Inductively Coupled Plasma
- Sn	-	- Inductively Coupled Plasma
- Mn	-	- Inductively Coupled Plasma
- Zn	-	- Inductively Coupled Plasma

ภาคผนวก ฉ-1

เอกสารสอบเทียบความถูกต้องของเครื่องมือตรวจวัดคุณภาพอากาศ



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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 :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Mr. Peera Detudom
(Mr. Peera Detudom)



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High Volume Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard Model : TE 5025A S/N : 3611

Calibration Data

High Volume Air Sampler Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (ft 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 :

Adul Dangklom
(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 :

Adul Dangklom
(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 :

Adul Dangklom
(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 : Adul Dangklom
(Mr.Adul Dangklom)

Approved by : Peera Detudom
(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 : Adul Dangklom
(Mr.Adul Dangklom)

Approved by : Peera Detudom
(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 : Adul Dangklom
(Mr.Adul Dangklom)

Approved by : Peera Detudom
(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 : Adul Dangklom
(Mr.Adul Dangklom)

Approved by : Peera Detudom
(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	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 : Adul Dangklom
(Mr.Adul Dangklom)

Approved by : Mr. Peera Detudom
(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.	164589 (VSCC)
NO.	PM2.5-06		
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 : Adul Dangklom
(Mr.Adul Dangklom)

Approved by : Mr. Peera Detudom
(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 : Adul Dangklorn
(Mr.Adul Dangklorn)

Approved by : Peera Detudom
(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. :	159904 (VSCC)
NO. :	PM2.5-08		
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 : Adul Dangklorn
(Mr.Adul Dangklorn)

Approved by : Peera Detudom
(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. :	152125 (VSCC)
NO. :	PM2.5-09		
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 : Adul Dangklom
(Mr.Adul Dangklom)

Approved by : Mr.Peera Detudom
(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 : Adul Dangklom
(Mr.Adul Dangklom)

Approved by : Mr.Peera Detudom
(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 : Adul Dangklom
(Mr.Adul Dangklom)

Approved by : Mr. Peera Detudom
(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 : Adul Dangklom
(Mr.Adul Dangklom)

Approved by : Mr. Peera Detudom
(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 : Adul Dangklom
(Mr.Adul Dangklom)

Approved by : Peera Detudom
(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 : Adul Dangklom
(Mr.Adul Dangklom)

Approved by : Peera Detudom
(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 : Adul Dangklom
(Mr.Adul Dangklom)

Approved by : Peera Detudom
(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 : Adul Dangklom
(Mr.Adul Dangklom)

Approved by : Peera Detudom
(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 : Adul Dangklom
(Mr.Adul Dangklom)

Approved by : Mr. Peera Detudom
(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 : Adul Dangklom
(Mr.Adul Dangklom)

Approved by : Mr. Peera Detudom
(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	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 : Adul Dangklom
(Mr.Adul Dangklom)

Approved by : Peera Detudom
(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. :	164589 (VSCC)
NO. :	PM2.5-06		
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 : Adul Dangklom
(Mr.Adul Dangklom)

Approved by : Peera Detudom
(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 : Adul Dangklorn
(Mr.Adul Dangklorn)

Approved by : Peera Detudom
(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. :	159904 (VSCC)
NO. :	PM2.5-08		
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 : Adul Dangklorn
(Mr.Adul Dangklorn)

Approved by : Peera Detudom
(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.	152125 (VSCC)
NO.	PM2.5-09		
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 : Adul Dangklom
(Mr.Adul Dangklom)

Approved by : Mr.Peera Detudom
(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 : Adul Dangklom
(Mr.Adul Dangklom)

Approved by : Mr.Peera Detudom
(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 : Adul Dangklom
(Mr.Adul Dangklom)

Approved by : Mr. Peera Detudom
(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 : Adul Dangklom
(Mr.Adul Dangklom)

Approved by : Mr. Peera Detudom
(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 : Adul Dangklom
(Mr.Adul Dangklom)

Approved by : Peera Detudom
(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 : Adul Dangklom
(Mr.Adul Dangklom)

Approved by : Peera Detudom
(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 :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(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-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	
	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 :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(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-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		
RCCELL 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		
RCCELL 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 : Adul Dangklom
(Mr.Adul Dangklom)

Approved by : Peera Detudom
(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-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	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
NO Span	400	399.7	-0.075	400.0	1.004
NO _x Span	400	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		
RCCELL 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		
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	1.004	-	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 : Adul Dangklom
(Mr.Adul Dangklom)

Approved by : Peera Detudom
(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-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	399.8	-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 : Adul Dangklom
(Mr.Adul Dangklom)

Approved by : Mr. Peera Detudom
(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-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				
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 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 : Adul Dangklom
(Mr.Adul Dangklom)

Approved by : Mr. Peera Detudom
(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 : Adul Dangklom
(Mr.Adul Dangklom)

Approved by : Mr. Peera Detudom
(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 : Adul Dangklom
(Mr.Adul Dangklom)

Approved by : Mr. Peera Detudom
(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-802	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.	: A007265V	
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 ₂ Span Conc	400	PPB	20 - 20,000		
NO Slope	1.008	-	1.0 ± 0.3		
NO ₂ Slope	1.012	-	1.0 ± 0.3		
NO Offset	1.7	mV	-20 to +150		
NO ₂ 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 : Adul Dangklom
(Mr.Adul Dangklom)

Approved by : Peera Detudom
(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-803	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.	: A007265V	
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 ₂ Span Conc	400	PPB	20 - 20,000		
NO Slope	1.005	-	1.0 ± 0.3		
NO ₂ Slope	1.008	-	1.0 ± 0.3		
NO Offset	1.2	mV	-20 to +150		
NO ₂ Offset	0.8	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by : Adul Dangklom
(Mr.Adul Dangklom)

Approved by : Peera Detudom
(Mr.Peera Detudom)



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CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO 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.	: A007265V	
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 ₂ Span Conc	400	PPB	20 - 20,000		
NO Slope	1.004	-	1.0 ± 0.3		
NO ₂ Slope	1.008	-	1.0 ± 0.3		
NO Offset	1.0	mV	-20 to +150		
NO ₂ 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 : Adul Dangklom
(Mr.Adul Dangklom)

Approved by : Peera Detudom
(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.	: A007265V	
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		
RCELL 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		
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 ₂ Span Conc	400	PPB	20 - 20,000		
NO Slope	1.007	-	1.0 ± 0.3		
NO ₂ Slope	1.010	-	1.0 ± 0.3		
NO Offset	1.3	mV	-20 to +150		
NO ₂ Offset	0.9	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by : Adul Dangklom
(Mr.Adul Dangklom)

Approved by : Peera Detudom
(Mr.Peera Detudom)



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

CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER					
DATE :	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.	: A007265V	
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 : Adul Dangklom
(Mr.Adul Dangklom)

Approved by : Peera Detudom
(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.	: A007265V	
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		
RCELL 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		
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	1.006	-	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 : Adul Dangklom
(Mr.Adul Dangklom)

Approved by : Peera Detudom
(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-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 : Adul Dangklom
(Mr.Adul Dangklom)

Approved by : Mr. Peera Detudom
(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 : Adul Dangklom
(Mr.Adul Dangklom)

Approved by : Mr. Peera Detudom
(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-818	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	%Diff	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		
RCCELL 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		
RCCELL 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 ₂ Span Conc	400	PPB	20 - 20,000		
NO Slope	1.008	-	1.0 ± 0.3		
NO ₂ Slope	1.011	-	1.0 ± 0.3		
NO Offset	1.6	mV	-20 to +150		
NO ₂ Offset	1.0	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by : Adul Dangklom
(Mr.Adul Dangklom)

Approved by : Peera Detudom
(Mr.Peera Detudom)



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CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER					
DATE :	27 October 2024	BRAND :	API	MODEL :	200A
NO.	NOX-814	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	%Diff	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 ₂ Span Conc	400	PPB	20 - 20,000		
NO Slope	1.009	-	1.0 ± 0.3		
NO ₂ Slope	1.012	-	1.0 ± 0.3		
NO Offset	1.7	mV	-20 to +150		
NO ₂ Offset	1.0	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by : Adul Dangklom
(Mr.Adul Dangklom)

Approved by : Peera Detudom
(Mr.Peera Detudom)



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CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER					
DATE :	27 October 2024	BRAND :	API	MODEL :	TML-41M
NO.	NOX-818	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.	: A007265V	
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 : Adul Dangklom
(Mr.Adul Dangklom)

Approved by : Peera Detudom
(Mr.Peera Detudom)



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Personal Pump Calibration Report															
Calibration Method : Dry Cal Primary Flowmeter						Model : Defender 510-H			S/N : 136164						
Environmental Conditions															
Temperature						25 ± 3 °C			Pressure				1010 ± 15 mmbar		
Personal Pump Data															
No.	Brand	Model	Serial No.	Date	Flow Rate (ml/min)						Value From Calibration Curve				
					Setting			Actual (Q std.)			y	R ²			
					1	2	3	1	2	3					
801	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			
802	SKC	224-PCXR4	626166	03/10/2024	1,000	1,500	2,000	998	1,500	1,995	1.000x - 2.067	1.000			
803	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			
804	SKC	224-PCXR4	602804	03/10/2024	1,000	1,500	2,000	996	1,511	2,007	1.012x - 19.485	0.999			
805	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			
806	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			
807	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			
808	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			
809	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			
810	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			
811	SKC	224-PCXR4	564315	03/10/2024	1,000	1,500	2,000	1,010	1,497	2,001	0.993x + 10.007	1.000			
812	SKC	224-PCXR4	034656	04/10/2024	1,000	1,500	2,000	998	1,507	2,005	1.013x - 22.552	0.999			
813	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			
814	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			
815	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			
816	SKC	224-PCXR4	626477	03/10/2024	1,000	1,500	2,000	1,001	1,514	2,009	1.009x - 11.478	1.000			
817	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			
818	SKC	224-PCXR4	691484	02/10/2024	1,000	1,500	2,000	999	1,498	1,999	1.000x + 0.668	1.000			
819	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			
820	SKC	224-PCXR4	691587	03/10/2024	1,000	1,500	2,000	997	1,514	2,005	1.010x - 12.129	1.000			
821	SKC	224-PCXR4	691531	04/10/2024	1,000	1,500	2,000	996	1,499	2,000	1.001x - 1.875	1.000			
822	SKC	224-PCXR4	691654	03/10/2024	1,000	1,500	2,000	999	1,508	2,006	1.008x - 13.641	1.000			
823	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			
824	SKC	224-PCXR4	626363	02/10/2024	1,000	1,500	2,000	999	1,492	2,003	1.001x - 3.994	1.000			
825	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			
826	SKC	224-PCXR4	798479	03/10/2024	1,000	1,500	2,000	996	1,507	2,004	1.007x - 13.888	1.000			
827	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			
828	SKC	224-PCXR4	691570	03/10/2024	1,000	1,500	2,000	996	1,510	2,008	1.012x - 19.941	0.999			
829	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			
830	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			
831	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			
832	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			
833	SKC	224-PCXR4	091756	02/10/2024	1,000	1,500	2,000	998	1,512	2,005	1.007x - 10.478	1.000			
834	SKC	224-PCXR4	612962	02/10/2024	1,000	1,500	2,000	999	1,504	2,000	1.001x - 0.963	1.000			
835	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			
836	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			
837	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			
838	SKC	224-PCXR4	626167	04/10/2024	1,000	1,500	2,000	997	1,499	1,998	1.001x - 2.994	1.000			
839	SKC	224-PCXR4	034637	04/10/2024	1,000	1,500	2,000	998	1,504	1,999	1.004x - 8.599	1.000			
840	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 : <u>Adul Dangklom</u> (Mr. Adul Dangklom)						Approved by : <u>Peera Detudom</u> (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	
841	SKC	224-PCXR4	612669	02/10/2024	1,000	1,500	2,000	1,010	1,497	2,001	0.996x + 9.527	1.000	
842	SKC	224-PCXR4	626041	04/10/2024	1,000	1,500	2,000	998	1,507	2,005	1.009x - 14.416	0.999	
843	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	
844	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	
845	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	
846	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	
847	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	
848	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	
849	SKC	224-PCXR8	566780	04/10/2024	1,000	1,500	2,000	999	1,498	2,000	1.000x + 0.144	1.000	
850	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	
851	SKC	224-PCXR8	500363	04/10/2024	1,000	1,500	2,000	996	1,506	2,005	1.007x - 10.582	1.000	
852	SKC	224-PCXR8	093186	03/10/2024	1,000	1,500	2,000	998	1,509	2,003	1.006x - 10.386	1.000	
853	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	
854	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	
855	SKC	224-PCXR3	510710	04/10/2024	1,000	1,500	2,000	999	1,508	2,004	1.005x - 8.519	1.000	
856	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	
857	SKC	224-PCXR3	510798	02/10/2024	1,000	1,500	2,000	997	1,503	2,005	1.009x - 15.639	1.000	
858	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	
859	SKC	224-PCXR3	509862	04/10/2024	1,000	1,500	2,000	999	1,511	2,010	1.010x - 14.912	0.999	
860	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	
861	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	
862	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	
863	SKC	224-PCXR3	511432	02/10/2024	1,000	1,500	2,000	1,020	1,513	2,013	0.993x + 14.152	0.999	
864	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	
865	SKC	224-PCXR3	508310	02/10/2024	1,000	1,500	2,000	997	1,514	2,005	1.006x - 7.652	1.000	
866	SKC	224-PCXR3	509861	04/10/2024	1,000	1,500	2,000	996	1,499	2,003	1.009x - 13.421	1.000	
867	SKC	224-PCXR3	506295	03/10/2024	1,000	1,500	2,000	998	1,510	2,004	1.010x - 17.666	0.999	
868	SKC	224-PCXR3	505872	03/10/2024	1,000	1,500	2,000	998	1,494	1,997	0.996x + 2.043	1.000	
869	SKC	224-PCXR3	508375	04/10/2024	1,000	1,500	2,000	996	1,499	2,003	1.004x - 4.961	1.000	
870	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	
871	SKC	224-PCXR3	508367	03/10/2024	1,000	1,500	2,000	996	1,503	1,999	1.003x - 5.913	1.000	
872	SKC	224-PCXR3	505977	04/10/2024	1,000	1,500	2,000	997	1,499	1,996	0.998x - 0.140	1.000	
873	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	
874	SKC	224-PCXR3	505993	03/10/2024	1,000	1,500	2,000	998	1,504	2,002	1.005x - 10.110	1.000	
875	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	
876	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	
877	SKC	224-PCXR3	508301	02/10/2024	1,000	1,500	2,000	998	1,495	2,002	1.002x - 3.498	1.000	
878	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	
879	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 :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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Rotameter Calibration Report (For Personal Pump High Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Calibration Data

Rotameter Data				Calibration Data							
No.	Brand	Model	Date	Flow Rate (ml/min)						Value From Calibration Curve	
				Flow Rate (Reading)			Actual (Q std.)			y	R ²
				1	2	3	1	2	3		
H-801	Dwyer	VFB-65	02/10/2024	500	1,000	2,000	502.4	998.3	1992.4	0.996x + 5.889	1.000
H-802	Dwyer	VFB-65	04/10/2024	500	1,000	2,000	498.5	1001.9	2009.0	0.997x + 5.707	1.000
H-803	Dwyer	VFB-65	04/10/2024	500	1,000	2,000	499.2	996.1	2011.4	1.004x - 11.451	0.999
H-804	Dwyer	VFB-65	04/10/2024	500	1,000	2,000	504.0	999.2	1995.1	0.995x + 7.219	1.000
H-805	Dwyer	VFB-65	03/10/2024	500	1,000	2,000	498.7	1001.8	2007.6	0.997x + 4.568	1.000
H-806	Dwyer	VFB-65	03/10/2024	500	1,000	2,000	497.3	999.1	2012.1	1.005x - 11.101	0.999
H-807	Dwyer	VFB-65	01/10/2024	500	1,000	2,000	503.0	1004.1	1992.6	0.998x + 6.074	1.000
H-808	Dwyer	VFB-65	02/10/2024	500	1,000	2,000	503.7	1000.4	1994.6	0.992x + 12.996	1.000
H-809	Dwyer	VFB-65	01/10/2024	500	1,000	2,000	501.3	1001.6	1990.3	0.999x + 4.046	0.999
H-810	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 :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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

Rotameter Calibration Report (For Personal Pump High Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Calibration Data

Rotameter Data			Calibration Data								
No.	Brand	Model	Date	Flow Rate (ml/min)						Value From Calibration Curve	
				Flow Rate (Reading)			Actual (Q std.)				
				1	2	3	1	2	3	y	R ²
H-R01	Dwyer	VFB-65	03/10/2024	500	1,000	2,000	500.9	1000.8	1994.3	1.003x + 0.055	1.000
H-R02	Dwyer	VFB-65	01/10/2024	500	1,000	2,000	500.1	998.9	1992.4	1.002x - 3.472	0.999
H-R03	Dwyer	VFB-65	02/10/2024	500	1,000	2,000	501.6	999.3	2001.6	0.994x + 6.383	1.000
H-R04	Dwyer	VFB-65	03/10/2024	500	1,000	2,000	503.3	999.8	1993.2	1.001x - 1.914	0.999
H-R05	Dwyer	VFB-65	01/10/2024	500	1,000	2,000	500.2	1002.6	2000.4	1.002x - 0.160	1.000
H-R06	Dwyer	VFB-65	02/10/2024	500	1,000	2,000	503.1	1002.8	1999.6	0.999x + 5.589	1.000

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



QUALITY CALIBRATION CO., LTD.
235 Petchkasem 63/2 Road, Laksong, Bangkae, Bangkok 10160
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584
www.qcalibration.com



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

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



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	50.00000	0.00000	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

F-G010 REV 03

SITHIPORN ASSOCIATES CO., LTD. CALIBRATION LABORATORY

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

SITHIPORN
associates



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 :

T. Petchurai
(Thanakul Petchurai)

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

SITHIPORN ASSOCIATES CO., LTD. CALIBRATION LABORATORY

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



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

Petch

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Tel. +66 2433 8331 Email : calibration@sithiporn.com



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 ≤ 1.0 T(%), Absorbance ≥ 2.0 A

**Stray light not TISI Accredited

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

End of Calibration Certificate

Petch



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

Calibration Report			
Non-Dispersive Infrared CO Analyzer			
Date :	02 October 2024	Brand :	API
No.	CO-801	Model :	300E
		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	Initial Reading (Before Adj.), PPM		Final Reading (After Adj.), PPM
Set Point	Expected Concentration	Analyzer Response	%Diff
Zero	0	-0.10	-
CO Span	40.00	40.04	0.100
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 :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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

Calibration Report			
Non-Dispersive Infrared CO Analyzer			
Date :	02 October 2024	Brand :	API
No.	CO-802	Model :	300E
		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	%Diff
Zero	0	-0.10	-
CO Span	40.00	39.97	-0.075
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 :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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7 Soi Phaholyothin 24, Phaholyothin Rd., Jomol, Chatuchak, Bangkok 10000
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Calibration Report
Total Hydrocarbon Analyzer

Date : 04 October 2024 Brand : HORIBA Model : APHA-360CE
No. : B01 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 (CH₄) 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/1013h100)-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 : Adul Dangklom
(Mr. Adul Dangklom)

Approved by : Peera Detudom
(Mr. Peera Detudom)



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Calibration Report
Total Hydrocarbon Analyzer

Date : 02 October 2024 Brand : HORIBA Model : APHA-370
No. : R01 Serial No. : WDDN38N

Calibrator (Dilution System)

Brand : Teledyne Model : 700E
Last Cal. Date : 30 October 2023 Serial No. : 201-S

Reference Standard Gas

Standard Gas : Methane (CH₄) 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/1013h100)-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 : Adul Dangklom
(Mr. Adul Dangklom)

Approved by : Peera Detudom
(Mr. Peera Detudom)

ภาคผนวก ฉ-2

เอกสารสอบเทียบความถูกต้องของเครื่องมือตรวจวัดระดับเสียง

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

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.

Ambient Environment

Temperature : (23 ± 3) °C

Relative Humidity : (50 ± 15) %

Ambient Pressure : (101.325 ± 1.500) kPa

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

1/2

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

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

FM.BL.MTC.002 Rev.4

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Office/Laboratory
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Amphoe Muang, Changwat Samutprakan 10280, Thailand
Tel. (66) 0 2323 1672-80 ext. 115, 116
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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

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 20µPa at 1000 Hz

Acoustic Output in dB re 20µPa, 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	±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	±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 :


(Mr.Prawate Kluaypa)
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.

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FM.BL.MTC.002 Rev.4

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Fax. (66) 0 2579 8592
E-mail : sumalee@tistr.or.th

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 : Adul Dangklom
(Mr. Adul Dangklom)

Approved by : Peera Detudom
(Mr. Peera Detudom)

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 : Adul Dangklom
(Mr. Adul Dangklom)

Approved by : Peera Detudom
(Mr. Peera Detudom)

ภาคผนวก ฉ-3

เอกสารสอบเทียบความถูกต้องของเครื่องมือวิเคราะห์คุณภาพน้ำ

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%

- olo -





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 : 
Approved Signatory
() 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).

Instruments	Serial No.	ID No.	Certificate No.	Due date
1) Thermo-Hygrograph	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

Material	Manufacturer	Lot No.	Assay
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 (± NTU)	Coverage Factor k
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 %.

-o0o-



a 1205398

**QUALITY CALIBRATION CO., LTD.**235 Petchkasem 63/2 Road, Laksong, Bangkac, Bangkok 10160
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584CERTIFICATE 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 : PONGSAK J.

ISSUED DATE : 27-Jun-24

RECEIVED DATE : 24-Jun-24

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF
QUALITY CALIBRATION CO., LTD.**QUALITY CALIBRATION CO., LTD.**235 Petchkasem 63/2 Road, Laksong, Bangkac, 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 INSTITUTE OF METROLOGY (THAILAND)

RESULT OF CALIBRATION : ADJUSTMENT**1. DISPLAY UNIT ONLY**SLOPE FACTOR $k = 2.303 \text{ RT/F} = 59 \text{ mV/pH}$

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



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



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 Sechanart
Calibration Engineer



Approved By :

Mongkol Yotsoontorn

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





CALIBRATION LABORATORY Co.,LTD.

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



REPORT OF CALIBRATION

FOR

NOMENCLATURE : 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 IPTT 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, Kambie Model OB-22/2 ULT S/N. 17115653.
5. Precision Thermometer, ASL Model F200-A-8 S/N. 014433/03.
6. IPTT, ASL Model T100-250-1D S/N. L0193A-1-1.

Certificate No. Q24016389

F3-011-05/12-23

page 2 of 4



@clccalibration



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



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)"

Certificate No. Q24016389

F3-011-05/12-23

page 3 of 4



@clccalibration



CALIBRATION LABORATORY CO.,LTD.

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



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 µS/cm	84.05 µS/cm [Cell Constant 0.548589]	± 1.00 µS/cm
1414.0 µS/cm	1415 µS/cm [Cell Constant 0.548589]	± 21.0 µS/cm
12.83 mS/cm	12.75 mS/cm [Cell Constant 0.548589]	± 0.19 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 ± (°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



QUALITY CALIBRATION CO.,LTD.
235 Petchkasem 63/2 Road, Laksong, Bangkai, Bangkok 10160
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584
www.qcalibration.com



PAGE : 1 OF 2

CERTIFICATE No : 24M2229
REFERENCE No : 72448-3

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 : PONGSAK J.
ISSUED DATE : 14-Mar-24
RECEIVED DATE : 08-Mar-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 03



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 ± 1mbar CALIBRATION DATE : 08-Mar-24
AMBIENT TEMPERATURE : 25° C ± 1° C RELATIVE HUMIDITY : 55 %RH ± 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 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (± 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

F-G010 REV 03



CERT.No.: HS-V015C

Calibration Date : 20 Mar 24

Submitted by : ASIA LAB @ CONSULTANT CO.,LTD

184 Soi Phutthamonthon Sai 2 Soi 12,

Bangphai, Bangkoe, 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 : PONGSAK J.

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

**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 : 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

13	14	15
10	11	12
7	8	9
4	5	6
1	2	3
BLOCK No.1 FRONT		

13	14	15
10	11	12
7	8	9
4	5	6
1	2	3
BLOCK No.2 FRONT		

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

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-G010 REV : 02



Cert. No. : SP24020
Pages 1 of 3

Calibration Certificate

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

Condition As Found : GOOD

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

Location : WET CHEMISTRY LABORATORY IV

Ambient Temperature : (28.1 ± 5) °C
Relative Humidity : (47.2 ± 25) %

Received Date : 27 AUGUST 2024
Calibration Date : 27 AUGUST 2024
Date of Issue : 27 AUGUST 2024

Calibrated by : Nathakorn Pisutpaisan

Approved by : 
(Thanakul Petchurai)

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



Cert. No. : 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
RM-DL	640.50	640.4	-0.10	0.16	2.00
	740.09	739.9	-0.19	0.16	2.00
	864.94	865.2	0.26	0.16	2.00

UUC* = Unit Under Calibration



Cert. No. : SP24020
Job No. : VC67SP0013
Pages : 3 of 3

Result of calibration : Photometric Accuracy
(Without adjustment)

Material	Wavelength (nm)	Filter S/N	Nominal	Certified	UUC* Reading	Error	Uncertainty	k
			Absorbance (A)	Absorbance (A)	Absorbance (A)	(A)	± (A)	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 ≤ 1.0 T(%), Absorbance ≥ 2.0 A
**Stray light not TISI Accredited

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

End of Calibration Certificate

[Signature]



MAINTENANCE AND TEST CERTIFICATE MODEL
OPTIMA 5300DV

WO-02612424/2024

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

CONFIGURATION TESTED

MODEL SERIAL NUMBER
OPTIMA 5300DV 077C7042401

TESTED EQUIPMENT CALIBRATION NUMBER EXPIRATION
IPV Methods

TEST STANDARD USED PART NUMBER EXPIRATION DATE
Multielement Standard N069-1579 December 30, 2024
Wavecal Solution N058-2152 September 30, 2024
VIS Wavecal solution N930-2946 January 30, 2025
Instrument Cal. STD4 N930-0221 November 30, 2024

CUSTOMER SUPPLIED COMMENTS CUSTOMER INITIALS
2 % HNO3
10 % HNO3



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 : 077C7042401
DATE 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:

Wiphan Promlumda

(Wiphan Promlumda)

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
Recommendation Recertification

Address : 7 Soi Phaholyothin 24 Period 6 Months

Paholyothin Road Recertification Due: January 4, 2025

Jompol Chatuchak, Bangkok 10900 Date Last Certified: January 4, 2024

User Name: K.Phenpha Vipasthawatt Visit Number: 2 OF 2

Phone: 083-9269252 PerkinElmer Phone: 02-719-6420 ext 204

Email: 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		<input type="checkbox"/>	OK
B. Grating Condition		<input type="checkbox"/>	OK
C. Replace or Clean Dust Filter		<input type="checkbox"/>	OK
D. Cleaning the Contact Cylinders		<input type="checkbox"/>	OK
E. Cleaning the Furnace Windows		<input type="checkbox"/>	OK
F. Cleaning the Burner Head		<input type="checkbox"/>	OK
G. Cleaning the Nebulizer		<input type="checkbox"/>	OK
H. Cleaning the Drain System		<input type="checkbox"/>	OK
2. AUTOSAMPLE CHECK			
A. Sampling and Arm		<input type="checkbox"/>	OK
B. Sampling & Rinse Pump		<input type="checkbox"/>	OK
C. Sample Position & Clean		<input type="checkbox"/>	OK
3. COOLING SYSTEM CHECKS			
A. Clean and Change Distill water		<input type="checkbox"/>	OK
B. Themensor		<input type="checkbox"/>	OK
4. FIAS CHECKS			
A. Pump and 5 Port Valve		<input type="checkbox"/>	N/A
B. Chemifold and Tubing		<input type="checkbox"/>	N/A
C. Power Supply		<input type="checkbox"/>	N/A
D. Flow meter and Gas system		<input type="checkbox"/>	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 :	0.2042	Abs. + 5%	0.1815 Abs.
Neutral Density Filter 1.0 :	0.9798	Abs. + 5%	1.0220 Abs.
2. Baseline Noise at 1 Abs with Barium (553.55 nm) (at an integration time of 0.5 seconds and 99 replicates)			
	SD \leq 0.010 Abs.		0.0016 Abs.
3. AA Baseline with Copper (Cu 324.75 nm) (at an integration time of 0.5 seconds and 99 replicates)			
	SD \leq 0.001 Abs.		0.0001 Abs.
4. D ₂ Background Compensation (Copper 324.75 nm) with Neutral Density Filter 1.0			
	Absorbance \leq 0.010 Abs		0.0079 Abs.
5. AA-BG Baseline Noise with Copper (324.75 nm) (at an integration time of 2.0 seconds and 99 replicates)			
	SD \leq 0.005 Abs.		0.0007 Abs.
6. AA-BG Baseline Noise with Arsenic (193.70 nm) (at an integration time of 2.0 seconds and 99 replicates)			
	SD \leq 0.005 Abs.		0.0024 Abs.

MAINTENANCE REPORT AND CALIBRATION CERTIFICATE

ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL

PinAAcle 900T

SERIAL NUMBER	PTCS14111103	DATE TESTED	July 4, 2024
PARAMETER	SPECIFICATION	ACTUAL VAULE	
7. Flame Interlock Shutdown	Shutdown correct?	<input checked="" type="checkbox"/>	OK
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 \geq 0.250 Abs.	0.3118	Abs.
(2 mg/L Cu Standard a read time of 10 seconds			
10 replicates, standard burner and High sensitivity nebulizer)	Sensitivity \geq 0.250 Abs.	N/A	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 \pm 25 mL/min	250	mL/min
External Flow	100 \pm 10 mL/min	100	mL/min
2. Chromium Baseline Noise (357.87 nm)			
(mesure 5 furnace dry firings without any sample)			
	Baseline \leq 0.005 Int.Abs	0.0021	
	SD \leq 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)			
	m_0 Results \leq 7.0 pg/0.0044A-s	7	pg/0.0044A-s
	Precision \leq 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)			
	m_0 Results \leq 16.5 pg/0.0044A-s	14.4	pg/0.0044A-s
	Zeeman Ratio 0.52 \pm 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:

วิพนธ์ พรหมลุมดา

(Wiphan Promlumda)

Service Engineer



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:

Sarayuth T.

(Sarayuth Tochua)



Certificate No. : S2024090374-0003

Environment : Ambient Temperature : Start record 23.7 °C, Stop record 23.5 °C
Relative Humidity : Start record 54.6 %RH, Stop record 54.4 %RH

Calibration Temperature (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Stability ¹ (°C)	Measured Uniformity ² (°C)	Overall Variation ³ (°C)
35	35.0	35.0	0.04	0.21	0.38
41.5	41.5	41.5	0.07	0.19	0.30

Without adjustment

Calibration Temperature (°C)	STD No. 1 (°C)	STD No. 2 (°C)	STD No. 3 (°C)	STD No. 4 (°C)	STD No. 5 (°C)	STD No. 6 (°C)	STD No. 7 (°C)	STD No. 8 (°C)	STD No. 9 (°C)	Uncertainty ⁴ ±°C
35	34.81	35.12	34.93	34.92	35.02	34.82	34.92	35.13	34.98	0.23
41.5	41.31	41.49	41.33	41.34	41.41	41.31	41.52	41.32	41.46	0.23

Decision Rule with Guard Band

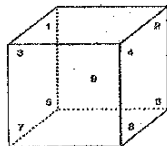
Calibration Temperature (°C)	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	MPE (±°C)
35	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	0.5
41.5	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	0.5

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

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

Note : Probe No. 9 is Reference Probe

Setting Air Fresh No. 0



Condition As-Received : Used Item

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

Measurement Standards Used & Traceability :

The International System of Units (SI) through

MIT Certificate No. L202407373-0005 for Temperature Indicator with Sensor Serial No. US37020317, Due 31-Jan-25

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

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

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

4. The uncertainty of measurement is included temperature stability.

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

End of Certificate

Page 2 of 2



QUALITY CALIBRATION CO.,LTD.

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

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

www.qcalibration.com



CERTIFICATE No : 24T2234

REFERENCE No : 72448-8

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : WATER BATH

MANUFACTURER : MEMMERT

MODEL : WNB29

SERIAL No : L614.0123

ID No : WB-05/58

CONDITION AS RECEIVED : USED ITEM

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

CALIBRATED BY : CHAICHARN CH.

CALIBRATION DATE : 08-Mar-24

APPROVED BY : PONGSAK J.

ISSUED DATE : 14-Mar-24

RECEIVED DATE : 08-Mar-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 : 03



Calibration Report

EQUIPMENT : WATER BATH
MANUFACTURER : MEMMERT
ID NUMBER : WB-05/58
RECEIVED DATE : 08-Mar-24
AMBIENT TEMPERATURE : 25 °C ± 1 °C

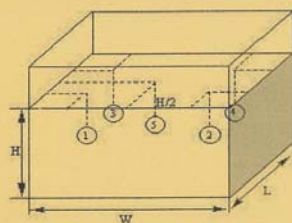
MODEL : WNB29
SERIAL NUMBER : L614.0123
CALIBRATION DATE : 08-Mar-24
RELATIVE HUMIDITY : 56 %RH ± 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

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

- | INSTRUMENT | MODEL | SERIAL No | CERTIFICATE No | DUE DATE |
|-------------------------|-------|-----------|----------------|-----------|
| 1) DATA LOGGER WITH RTD | 2635A | 7286308 | 23T6641 | 14-Jul-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 THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO.,LTD.

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



PROBE INSTALLATION
POSITION IN THE BATH

GENERAL INFORMATION

Overall Variation of Ambient Temperature around the Bath (°C) : 2.1
Overall Variation of Line Voltage (V) : 14
Instrument Condition : Normal
Bath Inner Size (W*L*H) : 60*40*6 cm

BATH PERFORMANCE

Controller Temperature (°C)	Temperature Stability (±°C)	Radius Uniformity (°C)	Axial Uniformity (°C)	Overall Variation (°C)
50.0	0.05	0.06	0.04	0.11
60.0	0.07	0.19	0.03	0.30

TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Indicating Temp (°C)	Measured Temperature (°C) at Spread Locations					Uncertainty (± °C)
		#1	#2	#3	#4	Ref. 5	
50.0	50.0	49.61	49.62	49.63	49.67	49.65	0.15
60.0	60.0	59.48	59.67	59.52	59.60	59.59	0.16

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

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

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

END OF CALIBRATION REPORT