ภาคผนวกที่ 4

เอกสารสอบเทียบความถูกต้องของเครื่องมือตรวจวัดคุณภาพสิ่งแวดล้อม

1) คุณภาพอากาศในบรรยากาศ
2) คุณภาพอากาศจากปล่อง
3) ระดับเสียง
4) คุณภาพน้ำ
5) คุณภาพอากาศในสถานประกอบการ
6) ระดับความร้อนในสถานประกอบการ

ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง
และเครื่องมือตรวจวิเคราะห์คุณภาพสิ่งแวดล้อม

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
1. คุณภาพอากาศในบรรยากาศ		
Total Suspended Particulate	High Volume Air Sampler No. B11, B25, B37, B38, B44	Digital Balance
PM_{10}	High Volume PM-10 Air Sampler No. B12, B15, B18, B26, B29	Digital Balance
$PM_{2.5}$	High Volume PM-2.5 Air Sampler No. B04, B05, B11, B12,	Digital Balance
Hydrogen Chloride	Gas Box No. B01, B05, B06, B07, B11	Ion Chromatography
Sulfur Dioxide	SO_2 Analyzer No. B01, B02, B04, B06, B07	SO_2 Analyzer No. B01, B02, B04, B06, B07
Nitrogen Dioxide	NO_x Analyzer No. B05, B07, B10, B11, B22	NO_x Analyzer No. B05, B07, B10, B11, B22
2. คุณภาพอากาศจากปล่อง		
Particulate	Console No. B01, B02, B04 Pitot Tube No. B18, B35, B49	Digital Balance
PM_{10}	Console No. B01, B02 Pitot Tube No. B18, B35	Digital Balance
Sulfur Dioxide	Personal Pump No. B52, B62, B88 Rotameter No. H-B08	Digital Balance
Oxides of Nitrogen	Vacuum Gauge	Spectrophotometer
Carbon Monoxide	Personal Pump No. B42, B67, B85 Rotameter No. H-B08	CO Analyzer No. B01
3. ระดับเสียง		
L_{eq} 8 hr, L_{eq} 24 hr, L_{eq} 5 min, L_{max}, L_{90}, L_{dn}, ระดับเสียงรบกวน	Acoustic Calibrator Sound Level Meter No. ACO-B13, B33, B44, R55, ACO-C1-B01, B02, B03, B04, B05 Sound Level Meter No. CR-B07, B08	-
4. คุณภาพน้ำ		
Conductivity	-	Conductivity Meter
pH	-	pH Meter
Total Suspended Solids	-	Digital Balance
Total Dissolved Solids	-	Digital Balance
Grease & Oil	-	Digital Balance
BOD_5	-	BOD Analyzer
COD	-	COD Reactor
Manganese	-	Inductively Coupled Plasma
Chromium	-	Inductively Coupled Plasma
Total Iron	-	Inductively Coupled Plasma
Acidity	-	Digital Balance
Alkalinity	-	Digital Balance
Total Coliform Bacteria	-	Digital Balance
Silica	-	Spectrophotometer

ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง
และเครื่องมือตรวจวิเคราะห์คุณภาพสิ่งแวดล้อม (ต่อ)

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
5. คุณภาพอากาศในสถานประกอบการ		
Total Dust	Personal Pump No. B97 Rotameter No. H-B10	Digital Balance
Sulfur Dioxide	Personal Pump No. B96 Rotameter No. H-B10	Digital Balance
Carbon Monoxide	Personal Pump No. B82 Rotameter No. H-B10	Digital Balance
Hydrogen Chloride	Personal Pump No. R49 Rotameter No. H-B10	Digital Balance
6. ระดับความร้อนในสถานประกอบการ		
WBGT	-	Digital Thermometer No. B11, B21, B22, B28
		Heat Stress WBGT Meter No. B11, B21, B22, B28

คุณภาพอากาศในบรรยากาศ

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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)

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

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CALIBRATION REPORT

CHEMILUMINESCENT NO / NO_2 / NO_x ANALYZER

DATE :	17 September 2024	BRAND :	API	MODEL :	200E
NO.	NOX-B05			SERIAL NO.	2284

Calibrator (Dilution System)

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

Reference Standard Gas

Standard Gas	: Nitric Oxide (NO)			Cylinder No.	: A00726SV
Certified Date	: 05 January 2023	Expired Date	: 05 January 2026	Cylinder Conc.	: 48.8 ppm

CALIBRATING CONDITION

Pressure	1011 mmbar	Temp.	24.6 °C	% RH	50

CALIBRATION SETTING

Span Set Point	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
NO Span	400	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	509	cc/min	500 ± 50
OZONE FLOW	79	cc/min	80 ± 15
PMT	103.2	mV	-20 - 150
AZERO	94.0	mV	-20 - 150
HVPS	673	V	420 - 900 constant
RCELL TEMP	50.1	°C	50 ± 1
BOX TEMP	29.2	°C	8 - 48
PMT TEMP	7.3	°C	7 ± 2
MOLY TEMP	314.7	°C	315 ± 5
RCELL PRESS	8.4	IN-Hg-A	2 - 10 constant
SAMPLE PRESS	28.6	IN-Hg-A	25 - 30 constant
NO Span Conc	400	PPB	20 - 20,000
NO_x Span Conc	400	PPB	20 - 20,000
NO Slope	1.007	-	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)

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CALIBRATION REPORT

CHEMILUMINESCENT NO / NO_2 / NO_x ANALYZER

DATE :	17 September 2024	BRAND :	API	MODEL :	200E
NO.	NOX-B07			SERIAL NO.	4338

Calibrator (Dilution System)

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

Reference Standard Gas

Standard Gas	: Nitric Oxide (NO)			Cylinder No.	: A00726SV
Certified Date	: 05 January 2023	Expired Date	: 05 January 2026	Cylinder Conc.	: 48.8 ppm

CALIBRATING CONDITION

Pressure	1011 mmbar	Temp.	24.6 °C	% RH	50

CALIBRATION SETTING

Span Set Point	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.10	-	0	-
NO Span	400	399.6	-0.100	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	672	V	420 - 900 constant
RCELL TEMP	50.5	°C	50 ± 1
BOX TEMP	29.1	°C	8 - 48
PMT TEMP	7.4	°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	1.008	-	1.0 ± 0.3
NO Offset	1.1	mV	-20 to +150
NO_x Offset	0.7	mV	-20 to 150
Stability at Zero	0.1	PPB	< 0.2
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas

Calibrated by : Adul Dangklom (Mr.Adul Dangklom)

Approved by : (Mr.Peera Detudom)

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CALIBRATION REPORT

CHEMILUMINESCENT NO / NO_2 / NO_X ANALYZER

DATE : 17 September 2024 | BRAND : API | MODEL : 200E

NO. NOX-B10 | SERIAL NO. 4465

Calibrator (Dilution System)

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

Reference Standard Gas

Standard Gas	: Nitric Oxide (NO)			Cylinder No.	: A007265V
Certified Date	: 05 January 2023	Expired Date	: 05 January 2026	Cylinder Conc.	: 48.8 ppm

CALIBRATING CONDITION

Pressure 1011 mmbar | Temp. 24.6 °C | % RH 50

CALIBRATION SETTING

Span Set Point	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
NO Span	400	400.1	0.025	400.0	1.010
NO_X Span	400	400.3	0.075	400.0	1.013

API Model 200E NO_X Analyzer Check List

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	500 standard
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air
SAMPLE FLOW	511	cc/min	500 ± 50
OZONE FLOW	79	cc/min	80 ± 15
PMT	103.2	mV	-20 - 150
AZERO	93.8	mV	-20 - 150
HVPS	675	V	420 - 900 constant
RCELL TEMP	50.4	°C	50 ± 1
BOX TEMP	29.1	°C	8 - 48
PMT TEMP	7.3	°C	7 ± 2
MOLY TEMP	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	1.010	-	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 : (Mr.Peera Detudom)

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CALIBRATION REPORT

CHEMILUMINESCENT NO / NO_2 / NO_X ANALYZER

DATE : 17 September 2024 | BRAND : API | MODEL : 200E

NO. NOX-B11 | SERIAL NO. 4467

Calibrator (Dilution System)

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

Reference Standard Gas

Standard Gas	: Nitric Oxide (NO)			Cylinder No.	: A007265V
Certified Date	: 05 January 2023	Expired Date	: 05 January 2026	Cylinder Conc.	: 48.8 ppm

CALIBRATING CONDITION

Pressure 1011 mmbar | Temp. 24.6 °C | % RH 50

CALIBRATION SETTING

Span Set Point	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.10	-	0	-
NO Span	400	399.7	-0.075	400.0	1.005
NO_X Span	400	399.9	-0.025	400.0	1.009

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	512	cc/min	500 ± 50
OZONE FLOW	79	cc/min	80 ± 15
PMT	103.4	mV	-20 - 150
AZERO	94.1	mV	-20 - 150
HVPS	674	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	315.4	°C	315 ± 5
RCELL PRESS	8.3	IN-Hg-A	2 - 10 constant
SAMPLE PRESS	28.5	IN-Hg-A	25 - 30 constant
NO Span Conc	400	PPB	20 - 20,000
NO_X Span Conc	400	PPB	20 - 20,000
NO Slope	1.005	-	1.0 ± 0.3
NO_X Slope	1.009	-	1.0 ± 0.3
NO Offset	1.2	mV	-20 to +150
NO_X Offset	0.8	mV	-20 to 150
Stability at Zero	0.1	PPB	< 0.2
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas

Calibrated by : Adul Dangklom (Mr.Adul Dangklom)

Approved by : (Mr.Peera Detudom)

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CALIBRATION REPORT

CHEMILUMINESCENT NO / NO_2 / NO_X ANALYZER

DATE :	17 September 2024	BRAND :	API	MODEL :	TML-41M
NO.	NOX-B22			SERIAL NO.	NO1618

Calibrator (Dilution System)

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

Reference Standard Gas

Standard Gas	: Nitric Oxide (NO)			Cylinder No.	: A007265V
Certified Date	: 05 January 2023	Expired Date	: 05 January 2026	Cylinder Conc.	: 48.8 ppm

CALIBRATING CONDITION

Pressure	1011 mmbar	Temp.	24.6 °C	% RH	50

CALIBRATION SETTING

Span / Set Point	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	-0.11	-	0	-
NO Span	400	399.9	-0.025	400.0	1.007
NO_X Span	400	400.1	0.025	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	503	cc/min	500 ± 50
OZONE FLOW	78	cc/min	80 ± 15
PMT	103.4	mV	-20 - 150
AZERO	94.2	mV	-20 - 150
HVPS	675	V	420 - 900 constant
RCELL TEMP	50.4	°C	50 ± 1
BOX TEMP	29.3	°C	8 - 48
PMT TEMP	7.2	°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	1.007	-	1.0 ± 0.3
NO_X Slope	1.011	-	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)

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CALIBRATION REPORT

SO_2 FLUORESCENT ANALYZER

DATE :	17 September 2024	BRAND :	API	MODEL :	100A
NO.	SO_2-B01			SERIAL NO.	1749

Calibrator (Dilution System)

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

Reference Standard Gas

Standard Gas	: Sulphur Dioxide (SO_2)			Cylinder No.	: A008145K
Certified Date	: 21 June 2021	Expired Date	: 21 June 2029	Cylinder Conc.	: 49.8 ppm

CALIBRATING CONDITION

Pressure	1011 mmbar	Temp.	24.6 °C	% RH	50

CALIBRATION SETTING

Span / Set Point	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
SO_2 Span	400.0	399.7	-0.075	400.0	1.005

API Model 100A SO_2 Analyzer Check list

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	0-500
SAMPLE PRESS	28.5	in-Hg	25-35
SAMPLE FLOW	659	cc/min	650 ± 10%
PMT	103.0	mV	-20-150 with Zero Air
UV LAMP	3016.4	mV	1000-4900
STR. LGT	61.6	PPB	<100
DRK PMT	63.0	mV	-50 - 200
DRK LMP	57.8	mV	-50 - 200
HVPS	672	V	550-900 constant
DCPS	2525	mV	2500 ± 200
RCELL TEMP	50.4	℃	50 ± 1
BOX TEMP	29.1	℃	5-40
PMT TEMP	7.0	℃	7 ± 2.0
SO_2 Span Conc	400	PPB	20-20,000
SO_2 Slope	1.005	-	1.0 ± 0.3
SO_2 Offset	21.9	mV	<250
Stability at Zero	0.1	PPB	<0.2
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)

Calibrated by : Adul Dangklom
(Mr.Adul Dangklom)

Approved by :
(Mr.Peera Detudom)

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CALIBRATION REPORT

SO_2 FLUORESCENT ANALYZER

DATE :	17 September 2024	BRAND :	API	MODEL :	100A
NO.	SO_2-B02			SERIAL NO.	1847

Calibrator (Dilution System)

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

Reference Standard Gas

Standard Gas	: Sulphur Dioxide (SO_2)			Cylinder No.	: A00814SK
Certified Date	: 21 June 2021	Expired Date	: 21 June 2029	Cylinder Conc.	: 49.8 ppm

CALIBRATING CONDITION

Pressure	1011	mmbar	Temp. 24.6	°C	% RH 50

CALIBRATION SETTING

Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.11	-	0	-
SO_2 Span	400.0	400.2	0.050	400.0	1.011

API Model 100A SO_2 Analyzer Check list

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	0-500
SAMPLE PRESS	28.7	in-Hg	25-35
SAMPLE FLOW	655	cc/min	650 ± 10%
PMT	103.3	mV	-20-150 with Zero Air
UV LAMP	3030.8	mV	1000-4900
STR. LGT	61.8	PPB	<100
DRK PMT	63.3	mV	-50 - 200
DRK LMP	57.9	mV	-50 - 200
HVPS	674	V	550-900 constant
DCPS	2517	mV	2500 ± 200
RCELL TEMP	50.1	°C	50 ± 1
BOX TEMP	29.3	°C	5-40
PMT TEMP	7.2	°C	7 ± 2.0
SO_2 Span Conc	400	PPB	20-20,000
SO_2 Slope	1.011	-	1.0 ± 0.3
SO_2 Offset	22.2	mV	<250
Stability at Zero	0.1	PPB	<0.2
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)

Calibrated by : Adul Dangklom
(Mr.Adul Dangklom)

Approved by :
(Mr.Peera Detudom)

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CALIBRATION REPORT

SO_2 FLUORESCENT ANALYZER

DATE :	17 September 2024	BRAND :	API	MODEL :	100E
NO.	SO_2-B04			SERIAL NO.	3159

Calibrator (Dilution System)

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

Reference Standard Gas

Standard Gas	: Sulphur Dioxide (SO_2)			Cylinder No.	: A00814SK
Certified Date	: 21 June 2021	Expired Date	: 21 June 2029	Cylinder Conc.	: 49.8 ppm

Pressure	1011	mmbar	Temp. 24.6	°C	% RH 50

CALIBRATION SETTING

Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.10	-	0	-
SO_2 Span	400.0	399.9	-0.025	400.0	1.007

API Model 100E SO_2 Analyzer Check list

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	0-500
SAMPLE PRESS	28.4	in-Hg	25-35
SAMPLE FLOW	657	cc/min	650 ± 10%
PMT	103.4	mV	-20-150 with Zero Air
UV LAMP	3038.1	mV	1000-4900
STR. LGT	61.5	PPB	<100
DRK PMT	62.9	mV	-50 - 200
DRK LMP	57.7	mV	-50 - 200
HVPS	669	V	550-900 constant
DCPS	2524	mV	2500 ± 200
RCELL TEMP	50.3	°C	50 ± 1
BOX TEMP	29.0	°C	5-40
PMT TEMP	7.4	°C	7 ± 2.0
SO_2 Span Conc	400	PPB	20-20,000
SO_2 Slope	1.007	-	1.0 ± 0.3
SO_2 Offset	21.7	mV	<250
Stability at Zero	0.1	PPB	<0.2
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)

Calibrated by : Adul Dangklom
(Mr.Adul Dangklom)

Approved by :
(Mr.Peera Detudom)

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CALIBRATION REPORT

SO_2 FLUORESCENT ANALYZER

DATE :	17 September 2024	BRAND :	API	MODEL :	100E
NO.	SO_2-B06			SERIAL NO.	3430

Calibrator (Dilution System)

Brand	: Teledyne	Model	: 700E
Last Cal. Date	: 30 October 2023	Serial No.	: 201-5

Reference Standard Gas

Standard Gas	: Sulphur Dioxide (SO_2)			Cylinder No.	: A00814SK
Certified Date	: 21 June 2021	Expired Date	: 21 June 2029	Cylinder Conc.	: 49.8 ppm

CALIBRATING CONDITION

Pressure	1011 mmbar	Temp.	24.6 °C	% RH	50

CALIBRATION SETTING

Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.10	-	0	-
SO_2 Span	400.0	399.8	-0.050	400.0	1.006

API Model 100E SO_2 Analyzer Check list

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	0-500
SAMPLE PRESS	28.5	in-Hg	25-35
SAMPLE FLOW	660	cc/min	650 ± 10%
PMT	103.5	mV	-20-150 with Zero Air
UV LAMP	3041.2	mV	1000-4900
STR. LGT	61.7	PPB	<100
DRK PMT	63.1	mV	-50 - 200
DRK LMP	57.9	mV	-50 - 200
HVPS	673	V	550-900 constant
DCPS	2518	mV	2500 ± 200
RCELL TEMP	50.0	℃	50 ± 1
BOX TEMP	28.8	℃	5-40
PMT TEMP	7.1	℃	7 ± 2.0
SO_2 Span Conc	400	PPB	20-20,000
SO_2 Slope	1.006	-	1.0 ± 0.3
SO_2 Offset	21.8	mV	<250
Stability at Zero	0.1	PPB	<0.2
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)

Calibrated by : Adul Dangklom
(Mr.Adul Dangklom)

Approved by :
(Mr.Peera Detudom)

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CALIBRATION REPORT

SO_2 FLUORESCENT ANALYZER

DATE :	17 September 2024	BRAND :	API	MODEL :	100E
NO.	SO_2-B07			SERIAL NO.	1706

Calibrator (Dilution System)

Brand	: Teledyne	Model	: 700E
Last Cal. Date	: 30 October 2023	Serial No.	: 201-5

Reference Standard Gas

Standard Gas	: Sulphur Dioxide (SO_2)			Cylinder No.	: A00814SK
Certified Date	: 21 June 2021	Expired Date	: 21 June 2029	Cylinder Conc.	: 49.8 ppm

CALIBRATING CONDITION

Pressure	1011 mmbar	Temp.	24.6 °C	% RH	50

CALIBRATION SETTING

Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
SO_2 Span	400.0	399.6	-0.100	400.0	1.003

API Model 100E SO_2 Analyzer Check list

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	0-500
SAMPLE PRESS	28.7	in-Hg	25-35
SAMPLE FLOW	656	cc/min	650 ± 10%
PMT	103.2	mV	-20-150 with Zero Air
UV LAMP	3028.7	mV	1000-4900
STR. LGT	61.4	PPB	<100
DRK PMT	62.9	mV	-50 - 200
DRK LMP	57.6	mV	-50 - 200
HVPS	671	V	550-900 constant
DCPS	2522	mV	2500 ± 200
RCELL TEMP	50.3	℃	50 ± 1
BOX TEMP	29.4	℃	5-40
PMT TEMP	7.1	℃	7 ± 2.0
SO_2 Span Conc	400	PPB	20-20,000
SO_2 Slope	1.003	-	1.0 ± 0.3
SO_2 Offset	21.6	mV	<250
Stability at Zero	0.1	PPB	<0.2
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)

Calibrated by : 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 :	17 September 2024	BRAND :	BGI	MODEL :	PQ200
NO.	PM2.5-04			SERIAL NO.	160810-4 (VSCC)

CALIBRATING CONDITION

Pressure	1011	mmbar	Temp.	24.5	°C	% RH	49

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)

บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900
Tel: (662) 939-4370 (Automatic 5 Lines) Fax: (662) 513-4221 E-mail: sale@spscon.com

CALIBRATION REPORT

PM2.5 AIR SAMPLER (VERY SHARP CUT CYCLONE-VSCC)

DATE :	17 September 2024	BRAND :	BGI	MODEL :	PQ200
NO.	PM2.5-05			SERIAL NO.	160810-14(VSCC)

CALIBRATING CONDITION

Pressure	1011	mmbar	Temp.	24.5	°C	% RH	49

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)

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CALIBRATION REPORT

PM2.5 AIR SAMPLER (VERY SHARP CUT CYCLONE-VSCC)

DATE :	17 September 2024	BRAND :	BGI	MODEL :	CCZ-30
NO.	PM2.5-11			SERIAL NO.	2024EN0242005

CALIBRATING CONDITION

Pressure	1011	mmbar	Temp.	24.5 °C	% RH 49

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)

บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
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CALIBRATION REPORT

PM2.5 AIR SAMPLER (VERY SHARP CUT CYCLONE-VSCC)

DATE :	17 September 2024	BRAND :	BGI	MODEL :	CCZ-30
NO.	PM2.5-12			SERIAL NO.	2024EN0242003

CALIBRATING CONDITION

Pressure	1011	mmbar	Temp.	24.5 °C	% RH 49

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)

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

NSC-TISI-TIS17025 CALIBRATION 0049

CERTIFICATE No : 24M2227
REFERENCE No : 72448-1

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.

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

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 ± 1mbar	**CALIBRATION DATE**	:	08-Mar-24
AMBIENT TEMPERATURE	:	25° C ± 1° C	**RELATIVE HUMIDITY**	:	53 %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 LINEARLITY 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 (± g)
0.00	0.00000	0.00000	0.000065
0.02	0.02001	-0.00001	0.000065
0.10	0.10002	-0.00002	0.000066
0.20	0.20001	-0.00001	0.000066
0.50	0.50001	-0.00001	0.000065
1.00	1.00003	-0.00003	0.000066
2.00	2.00001	-0.00001	0.000067
5.00	5.00001	-0.00001	0.000068
10.00	9.99994	0.00006	0.000070
20.00	20.00008	-0.00008	0.000078
50.00	50.0000	0.0000	0.00013
100.00	100.0001	-0.0001	0.00019
120.00	120.0001	-0.0001	0.00022

5. OFF CENTER LOADING ERROR



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

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

END OF CALIBRATION REPORT

F-G010 REV 03

ARCHEMICA

Certificate of Calibration

Aquion: Anion (ID#894)

This certificate is to verify that instrument below are calibrated

by Archemica Lab Co.,Ltd.

AQUION S/N : 190840059

AS-DV S/N : 190915235

for

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

ARCHEMICA LAB
บริษัท อาร์เคมีก้า แลบ จำกัด
ARCHEMICA LAB CO.,LTD.

Operator Signature: _____ Date: June 24, 2024

(Mr. Ponwut Kornthongnimit)

Test Engineer

คุณภาพอากาศจากปล่อง

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

Console Calibration Report

Calibration Method	Critical Orifices

Calibration Data

Console Data		Calibration Data		
No.	Serial No.	Date	y	$\Delta H_@$ (mmH_2O)
B01	1563	02/09/2024	0.998	50.16
B02	8002514	04/09/2024	1.002	50.08
B03	1503016	02/09/2024	1.005	50.02
B04	00006659	03/09/2024	0.997	49.84
B05	00007428	02/09/2024	1.003	49.95
R01	1561	03/09/2024	0.998	50.11
R02	8002513	04/09/2024	0.997	49.97
R03	1570	03/09/2024	1.004	49.82
R04	8002519	02/09/2024	0.996	49.74
R05	1503015	04/09/2024	0.999	49.88

Remark : Accept Value of y (test) is $0.97 < y < 1.03$

Accept Value of $\Delta H_@$ (test) is 46.7 ± 6.4 (mmH_2O)

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

บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
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Pitot Tube Calibration Report

Calibration Method	Standard Pitot Tube

Calibration Data

Pitot Tube Data			Calibration Data		
No.	Type of Pitot	Coefficience of Standard Pitot	Date	Avg. of Cp (test)	
				Side A	Side B
B03	S	0.99	02/08/2024	0.84	0.83
B04	S	0.99	02/08/2024	0.85	0.84
B05	S	0.99	05/08/2024	0.84	0.84
B07	S	0.99	05/08/2024	0.84	0.83
B08	S	0.99	02/08/2024	0.84	0.84
B09	S	0.99	02/08/2024	0.84	0.85
B11	S	0.99	02/08/2024	0.84	0.84
B16	S	0.99	01/08/2024	0.83	0.84
B18	S	0.99	01/08/2024	0.84	0.84
B19	S	0.99	05/08/2024	0.84	0.84
B21	S	0.99	07/08/2024	0.84	0.85
B24	S	0.99	05/08/2024	0.83	0.84
B27	S	0.99	05/08/2024	0.84	0.83
B30	S	0.99	07/08/2024	0.85	0.84
B31	S	0.99	02/08/2024	0.84	0.85
B33	S	0.99	01/08/2024	0.84	0.84
B35	S	0.99	02/08/2024	0.84	0.85

Remark : Accept value of Cp (test) is 0.84 ± 0.01

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

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

Pitot Tube Calibration Report

Calibration Method	Standard Pitot Tube

Calibration Data					
Pitot Tube Data			Calibration Data		
No.	Type of Pitot	Coefficience of Standard Pitot	Date	Avg. of Cp (test)	
				Side A	Side B
B36	S	0.99	02/08/2024	0.83	0.84
B37	S	0.99	02/08/2024	0.84	0.84
B38	S	0.99	01/08/2024	0.84	0.83
B39	S	0.99	05/08/2024	0.84	0.85
B40	S	0.99	08/08/2024	0.84	0.84
B41	S	0.99	05/08/2024	0.84	0.85
B44	S	0.99	05/08/2024	0.84	0.85
B45	S	0.99	05/08/2024	0.85	0.84
B46	S	0.99	02/08/2024	0.84	0.85
B47	S	0.99	05/08/2024	0.84	0.85
B48	S	0.99	07/08/2024	0.83	0.84
B49	S	0.99	07/08/2024	0.84	0.85
B54	S	0.99	07/08/2024	0.83	0.84
B56	S	0.99	02/08/2024	0.84	0.84
B57	S	0.99	06/08/2024	0.85	0.84
B58	S	0.99	02/08/2024	0.84	0.84

Remark : Accept value of Cp (test) is 0.84 ± 0.01

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

บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
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Rotameter Calibration Report (For Personal Pump High Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter	Model : Defender 510-H	S/N : 136164

Calibration Data											
Rotameter Data			Calibration Data								
No.	Brand	Model	Date	Flow Rate (ml/min)						Value From Calibration Curve	
				Flow Rate (Reading)			Actual (Q std.)				
				1	2	3	1	2	3	y	R^2
H-B01	Dwyer	VFB-65	04/07/2024	500	1,000	2,000	504.1	997.1	1991.2	0.995x + 6.628	1.000
H-B02	Dwyer	VFB-65	04/07/2024	500	1,000	2,000	497.3	1003.5	2015.2	0.998 + 5.168	1.000
H-B03	Dwyer	VFB-65	05/07/2024	500	1,000	2,000	498.4	994.8	2013.0	1.005x - 12.628	0.999
H-B04	Dwyer	VFB-65	02/07/2024	500	1,000	2,000	503.1	997.9	1992.5	0.996x + 6.085	1.000
H-B05	Dwyer	VFB-65	02/07/2024	500	1,000	2,000	497.9	1004.0	2014.2	0.998x + 4.472	1.000
H-B06	Dwyer	VFB-65	01/07/2024	500	1,000	2,000	499.7	997.9	2015.7	1.004x - 9.662	0.999
H-B07	Dwyer	VFB-65	01/07/2024	500	1,000	2,000	501.4	1002.3	1990.2	0.999x + 4.103	1.000
H-B08	Dwyer	VFB-65	04/07/2024	500	1,000	2,000	501.5	999.6	1988.9	0.991x + 12.846	1.000
H-B09	Dwyer	VFB-65	05/07/2024	500	1,000	2,000	502.7	1003.8	1984.8	0.997x + 6.523	0.999
H-B10	Dwyer	VFB-65	05/07/2024	500	1,000	2,000	501.5	999.7	1988.7	0.996x + 9.648	1.000

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

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

Calibration Report
Non-Dispersive Infrared CO Analyzer

Date :	02 September 2024	Brand :	API	Model :	300E
No.	CO-801			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. 24.5	°C	% RH 50

Calibration Setting

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

API Model 300E CO Analyzer Check List

Parameter	Observed Value	Units	Nominal Range
Range	50	PPM	0-1000 ppm
Stability	0.10	PPM	< 1 ppm With Zero Air
CO Measure	4014.1	mV	2500-4800 mV
CO Reference	3947.3	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	809	CC/Min	800 ± 10%
Sample Temperature	48.5	°C	48 ± 4
Bench Temperature	48.2	°C	48 ± 2
Wheel Temperature	68.5	°C	68 ± 2
Box Temperature	30.6	°C	Ambient Temp + 7 ± 10
Photo-Drive	3035.1	mV	250 mV to 4750 mV
Slope	1.017	-	1.0 ± 0.3
Offset	0.2	-	0 ± 0.3

Calibrated by : Adul Dangklom
(Mr.Adul Dangklom)

Approved by :
(Mr. Peera Detudom)

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

CLC Accredited ISO/IEC 17025

ilac-MRA

ANAB ACCREDITED ISO/IEC 17025 CALIBRATION AND DIMENSIONAL MEASUREMENT ACDM-2814

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE	:	VACUUM GAUGE
MANUFACTURER	:	HI-LIGHT
MODEL / TYPE	:	N/A
SERIAL NO.	:	N/A[64-220066-2]
CLID. NO.	:	212201113
JOB CONTROL NO.	:	240730078440
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 : 30 July 2024 DATE OF ISSUED : 02 August 2024

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

Calibrated By : Sittipong Pimdee
Calibration Engineer

Approved By : Mongkol Yotsoontorn
Authorized Signatory
02 August 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. Q24078440

@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

REPORT OF CALIBRATION

FOR

NOMENCLATURE	:	VACUUM GAUGE
MANUFACTURER	:	HI-LIGHT
MODEL / TYPE	:	N/A
SERIAL NO.	:	N/A[64-220066-2]
DATE OF CALIBRATION	:	31 July 2024
DUE DATE OF CALIBRATION	:	31 July 2025

ENVIRONMENT CONDITIONS :

Temperature : (23 ± 2) °C Relative Humidity : (55 ± 10) %RH

PROCEDURE USED :

This instrument was calibrated under procedure No. **CLC-CPPP-05** according to **DKD-R 6-1** as calibration guidelines.

The calibration was performed by direct measurement with Document Process Calibrator and Pressure Module which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

Document Process Calibrator, Fluke Model 741B S/N. 8295020 with Pressure Module Model 700PD5 S/N. 89404505.

TRACEABILITY :

The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand). Certificate No. MP-0040-24, Due Date 08 February 2025.

UNCERTAINTY :

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor of $k = 2$. It has been evaluated according to the "Calibration of Pressure Gauges (DKD-R 6-1)" which provides a level of confidence approximately 95%.

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 DUC was exercised by applying a known pressure from its zero to full scale 1 times. Then 2 series of known gauge pressure were applied. The STD reading were recorded and the means value were reported in the table below.

CALIBRATION DATA

CORRECTION OF PRESSURE

DUC Test point	STD Reading (kPa)		Conversion to inHg		Correction (inHg)	
(inHg)	Up	Down	Up	Down	Up	Down
0	0.000	0.000	0.0	0.0	0.0	0.0
-5	-16.591	-16.930	-4.9	-5.0	+0.1	0.0
-10	-33.521	-33.521	-9.9	-9.9	+0.1	+0.1
-15	-50.113	-50.113	-14.8	-14.8	+0.2	+0.2
-20	-66.704	-67.043	-19.7	-19.8	+0.3	+0.2
-25	-83.634	-83.973	-24.7	-24.8	+0.3	+0.2
-30	-100.564	-100.564	-29.7	-29.7	+0.3	+0.3

Uncertainty of measurement ± 0.2 inHg

Transmitting fluid : Air.

Technical Note. Conversion factor 1 kPa ; 0.2953003 inHg

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 012 Page 43 of 67

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

End of Certificate

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

NSC-TISI-TIS17025 CALIBRATION 0049

CERTIFICATE No : 24M2227
REFERENCE No : 72448-1

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.

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

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 ± 1mbar	**CALIBRATION DATE**	:	08-Mar-24
AMBIENT TEMPERATURE	:	25° C ± 1° C	**RELATIVE HUMIDITY**	:	53 %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 LINEARLITY 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 (± g)
0.00	0.00000	0.00000	0.000065
0.02	0.02001	-0.00001	0.000065
0.10	0.10002	-0.00002	0.000066
0.20	0.20001	-0.00001	0.000066
0.50	0.50001	-0.00001	0.000065
1.00	1.00003	-0.00003	0.000066
2.00	2.00001	-0.00001	0.000067
5.00	5.00001	-0.00001	0.000068
10.00	9.99994	0.00006	0.000070
20.00	20.00008	-0.00008	0.000078
50.00	50.0000	0.0000	0.00013
100.00	100.0001	-0.0001	0.00019
120.00	120.0001	-0.0001	0.00022

5. OFF CENTER LOADING ERROR



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

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

END OF CALIBRATION REPORT

F-G010 REV 03

SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY

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

NSC-TISI-TIS 17025
CALIBRATION 0394

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.

SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY

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

NSC-TISI-TIS 17025
CALIBRATION 0394

Cert. No. : SP24020
Job No. : VC67SP0013
Pages : 2 of 3

Calibration Method :

This instrument was calibrated by using on-site calibration procedure In-house method : CP-SP-01
The calibration procedure to direct measurement wavelength accuracy by using wavelength standard solution, Photometric accuracy by using absorbance standard filter and absorbance standard solution
The calibration procedure used was based on ASTM E275-01,ASTM E925-02

Condition of this result of calibration :

1. Certified reference materials

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

2. This result of calibration was found accurate as shown on date and place of calibration only.
3. This certificate is traceable to the international system of unit maintained at :
   3.1 The UK National Physical Laboratory (NPL)
   3.2 The National Institute of Standards and Technology,NIST.

Result of calibration : Wavelength Accuracy

(Without adjustment)

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

UUC* = Unit Under Calibration

SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY

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SITHIPORN associates

NSC-TISI-TIS 17025
CALIBRATION 0394

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	
Transimission T(%)	**Absorbance(A)**
0.0117	3.8659

**Specific Acceptance :
Transmission $\leq$ 1.0 T(%), Absorbance $\geq$ 2.0 A
**Stray light not TISI Accredited

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

End of Calibration Certificate

T. Ketch-

ระดับเสียง

精密騒音計
Precision Sound Level Meter
TYPE 6238

検査成績書
INSPECTION CERTIFICATE

Serial No. of boy : 223038

Serial No. of Microphone: 80280
Ver:5.0 22-01-08

Date:June 2,2024

承認 Approved	点検 Passed	担当 Inspected
R. nagata	K. Ishimoto	J. Nagano

株式会社 アコー
ACO CO., LTD.

宮崎県西諸県郡高原町大字蒲牟田1-8
株式会社アコー
代表取締役　寺薗信一
1-8 Kamamuta Takaharucho
Nishimorokatagun Miyazaki Japan
President : Shinichi Terazono
ACO CO., LTD.

1. Inspection Date : June 2,2024

2. Inspection Condition

Temperature :　26 °C

Humidity :　44%

Barometric pressure :　995 hPa

3. Inspection Results

1) RANGE The RANGE Shifting Error

RANGE : 20-100dB 70dB ±0.5dB

Within ±0.5dB of the value at 70dB input, Range 20-100dB.

RANGE (dB)	Input level (dB)	Frequency (Hz)		
		31.5	1000	12500
20-80	70	0.0	-0.1	-0.1
20-90	70	0.1	0.0	0.0
20-100	70	0.0	0.0	0.0
20-110	70	0.1	0.0	0.1
30-120	70	0.0	-0.1	0.1
40-130	70	-0.1	-0.1	0.0
Passed		Pass		

2)Stability Caracteristic

RANGE : 20-100dB ±0.5dB

Within ±0.5dB of the value one minute later, Range 20-100dB.

	ten minutes later
Error (dB)	0.0
Passed	Pass

3) The Scale Error

RANGE : 30-120dB 31.5Hz 75.0dB 1kHz, 12.5kHz 95dB

31.5Hz is 75.0dB input standard 1kHz 12.5kHz is 95dB input standard

A weighting

Input (dB)	Standard (dB)	Frequency (Hz) 31.5
120		
118		
115		
110		
105		
100		
95		
90		
85		
80	±0.3	0.0
75	0.0	0.0
70	±0.3	-0.1
65	±0.3	-0.2
60	±0.3	-0.1
55	±0.3	0.0
50	±0.3	-0.1
45	±0.3	-0.1
40	±0.3	-0.1
35	±0.3	0.1
Passed		Pass

A weighting

Input (dB)	Standard (dB)	Frequency (Hz) 1000	12500
120	±0.3	0.0	
118	±0.3		0.0
115	±0.3	0.0	0.0
110	±0.3	-0.1	-0.1
105	±0.3	-0.1	0.0
100	±0.3	-0.2	0.0
95	0.0	0.0	0.0
90	±0.3	-0.1	-0.1
85	±0.3	-0.1	0.0
80	±0.3	0.0	0.1
75	±0.3	0.0	0.0
70	±0.3	-0.3	0.0
65	±0.3	-0.2	-0.1
60	±0.3	-0.2	-0.1
55	±0.3	-0.1	0.0
50	±0.3	-0.1	0.0
45	±0.3	0.0	-0.1
40	±0.3	-0.2	-0.1
35	±0.3	-0.1	0.0
Passed		Pass	

4) Dynamic Characteristic

RANGE 20-100dB 100dB, 1kHz

When 100dB input, Range 20-100dB at 1kHz.

	Standard	Measured Value
FAST	-1.0 $^{+0.5}_{-1.0}$ (dB)	-1.5
SLOW	-4.0±1.0 (dB)	-4.5
Passed		Pass

5) Frequency Response

RANGE : 20-100dB 95dB

When 95dB input, including Microphone value, Range 20-100dB

Frequency (Hz)	A Standard (dB)	A Response (dB)	A Deviation (dB)	C Standard (dB)	C Response (dB)	C Deviation (dB)	Z Response (dB)	Tolerance (dB)
10	-70.4	-69.0	1.4	-14.3	-12.5	1.8	-0.4	+3.0, -∞
20	-50.5	-50.6	-0.1	-6.2	-5.7	0.5	-0.2	±2.0
40	-34.6	-34.9	-0.3	-2.0	-2.1	-0.1	-0.1	±1.0
100	-19.1	-19.3	-0.2	-0.3	-0.3	0.0	0.0	±1.0
250	-8.6	-8.8	-0.2	0.0	-0.1	-0.1	-0.1	±1.0
500	-3.2	-3.3	-0.1	0.0	0.0	0.0	-0.1	±1.0
1000	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	±0.7
2k	1.2	1.2	0.0	-0.2	-0.3	-0.1	-0.1	±1.0
4k	1.0	0.5	-0.5	-0.8	-1.5	-0.7	-0.4	±1.0
5k	0.5	0.2	-0.3	-1.3	-1.8	-0.5	-0.2	±1.5
6.3k	-0.1	-0.5	-0.4	-2.0	-2.6	-0.6	-0.2	+1.5, -2.0
8k	-1.1	-1.9	-0.8	-3.0	-3.9	-0.9	-0.5	+1.5, -2.5
10k	-2.5	-3.2	-0.7	-4.4	-5.3	-0.9	-0.9	+2.0, -3.6
12.5k	-4.3	-4.6	-0.3	-6.2	-6.5	-0.3	-0.9	+2.0, -5.0
16k	-6.6	-6.8	-0.2	-8.5	-8.9	-0.4	-1.5	+2.5, -16.0
20k	-9.3	-10.4	-1.1	-11.2	-12.1	-0.9	-2.6	+3.0, -∞
Passed	Pass							

6) 1.0dB

Within 1.0dB on the Burst signal of the peak factor 3, Ragne 20-100dB.

Frequency 2kHz, Repeat frequency 40Hz

Effective value Error (dB)	Passed
0.3	Pass

7) Self-noise

RANGE : 20-80dB

RANGE : 20-80dB (Including Microphone value)	A	C	Z
Standard (dB)	Below 20	Below 29	Below 31
Self-noise (dB)	17.7	28.5	30.5
Passed	Pass		

精密騒音計
Precision Sound Level Meter
TYPE 6238

検査成績書
INSPECTION CERTIFICATE

Serial No. of boy : 223039

Serial No. of Microphone: 80281
Ver:5.0 22-01-08

Date: June 2,2024

承認 Approved	点検 Passed	担当 Inspected

株式会社 アコー
ACO CO., LTD.

宮崎県西諸県郡高原町大字蒲牟田1-8
株式会社アコー
代表取締役 寺薗信一
1-8 Kamamuta Takaharucho
Nishimorokatagun Miyazaki Japan
President : Shinichi Terazono
ACO CO., LTD.

1. Inspection Date : June 2,2024

2. Inspection Condition

Temperature : 26 ℃

Humidity: 44%

Barometric pressure : 995 hPa

3. Inspection Results

1) RANGE The RANGE Shifting Error

RANGE : 20-100dB 70dB ±0.5dB

Within ±0.5dB of the value at 70dB input, Range 20-100dB.

RANGE (dB)	Input level (dB)	Frequency (Hz)		
		31.5	1000	12500
20-80	70	0.0	-0.1	-0.1
20-90	70	0.1	0.0	0.0
20-100	70	0.0	0.0	0.0
20-110	70	0.1	0.0	0.1
30-120	70	0.0	-0.1	0.0
40-130	70	-0.1	-0.1	0.0
Passed		Pass		

2)Stability Caracteristic

RANGE : 20-100dB ±0.5dB

Within ±0.5dB of the value one minute later, Range 20-100dB.

	ten minutes later
Error (dB)	0.0
Passed	Pass

3) The Scale Error

RANGE : 30-120dB 31.5Hz 75.0dB 1kHz, 12.5kHz 95dB

31.5Hz is 75.0dB input standard 1kHz, 12.5kHz is 95dB input standard

A weighting

Input (dB)	Standard (dB)	Frequency (Hz) 31.5
120		
118		
115		
110		
105		
100		
95		
90		
85		
80	±0.3	0.1
75	0.0	0.0
70	±0.3	-0.1
65	±0.3	-0.2
60	±0.3	-0.1
55	±0.3	0.0
50	±0.3	0.0
45	±0.3	0.0
40	±0.3	0.0
35	±0.3	0.1
Passed		Pass

A weighting

Input (dB)	Standard (dB)	Frequency (Hz) 1000	12500
120	±0.3	0.1	
118	±0.3		0.0
115	±0.3	0.1	0.1
110	±0.3	-0.1	-0.1
105	±0.3	0.0	0.0
100	±0.3	-0.1	0.0
95	0.0	0.0	0.0
90	±0.3	-0.1	-0.1
85	±0.3	0.0	0.1
80	±0.3	0.0	0.0
75	±0.3	0.0	0.0
70	±0.3	-0.1	0.0
65	±0.3	-0.2	-0.1
60	±0.3	-0.1	-0.1
55	±0.3	0.0	0.0
50	±0.3	-0.1	0.0
45	±0.3	0.0	0.0
40	±0.3	0.0	-0.1
35	±0.3	0.1	0.2
Passed		Pass	

4) Dynamic Characteristic

RANGE 20-100dB 100dB, 1kHz

When 100dB input, Range 20-100dB at 1kHz.

	Standard	Measured Value
FAST	-1.0 $^{+0.5}_{-1.0}$ (dB)	-1.5
SLOW	-4.0±1.0 (dB)	-4.5
Passed		Pass

5) Frequency Response

RANGE : 20-100dB 95dB

When 95dB input, including Microphone value, Range 20-100dB

Frequency (Hz)	A Standard (dB)	A Response (dB)	A Deviation (dB)	C Standard (dB)	C Response (dB)	C Deviation (dB)	Z Response (dB)	Tolerance (dB)
10	-70.4	-69.1	1.3	-12.5	-12.5	1.8	-0.5	+3.0, -∞
20	-50.5	-50.6	-0.1	-6.2	-5.7	0.5	-0.3	±2.0
40	-34.6	-34.8	-0.2	-2.0	-2.1	-0.1	0.0	±1.0
100	-19.1	-19.3	-0.2	-0.3	-0.3	0.0	-0.1	±1.0
250	-8.6	-8.9	-0.3	0.0	-0.1	-0.1	-0.1	±1.0
500	-3.2	-3.4	-0.2	0.0	0.0	0.0	-0.1	±1.0
1000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	±0.7
2k	1.2	1.2	0.0	-0.2	-0.3	-0.1	-0.1	±1.0
4k	1.0	0.6	-0.4	-0.8	-1.4	-0.6	-0.2	±1.0
5k	0.5	0.1	-0.4	-1.3	-1.9	-0.6	-0.2	±1.5
6.3k	-0.1	-0.4	-0.3	-2.0	-2.5	-0.5	-0.1	+1.5, -2.0
8k	-1.1	-1.6	-0.5	-3.0	-3.6	-0.6	-0.2	+1.5, -2.5
10k	-2.5	-3.0	-0.5	-4.4	-5.0	-0.6	-0.4	+2.0, -3.6
12.5k	-4.3	-4.3	0.0	-6.2	-6.2	0.0	-0.5	+2.0, -5.0
16k	-6.6	-7.5	-0.9	-8.5	-9.6	-1.1	-2.1	+2.5, -16.0
20k	-9.3	-11.7	-2.4	-11.2	-11.1	0.1	-4.0	+3.0, -∞
Passed	Pass							

6) 1.0dB

Within 1.0dB on the Burst signal of the peak factor 3, Ragne 20-100dB.

Frequency 2kHz, Repeat frequency 40Hz

Effective value Error (dB)	Passed
0.3	Pass

7) Self-noise

RANGE : 20-80dB

RANGE : 20-80dB (Including Microphone value)	A	C	Z
Standard (dB)	Below 20	Below 29	Below 31
Self-noise (dB)	17.9	28.6	30.2
Passed	Pass		

精密騒音計
Precision Sound Level Meter
TYPE 6238

検査成績書
INSPECTION CERTIFICATE

Serial No. of boy : 223040

Serial No. of Microphone: 80282
Ver:5.0 22-01-08

Date: June 2,2024

承認 Approved	点検 Passed	担当 Inspected
A. nagata	K. Tokumoto	J. Nagami

株式会社 アコー
ACO CO., LTD.

宮崎県西諸県郡高原町大字蒲牟田1-8
株式会社アコー
代表取締役 寺薗信一
1-8 Kamamuta Takaharucho
Nishimorokatagun Miyazaki Japan
President : Shinichi Terazono
ACO CO., LTD.

1.Inspection Date : June 2,2024

2.Inspection Condition

Temperature : 26 °C

Humidity: 44%

Barometric pressure : 995 hPa

3. Inspection Results

1) RANGE The RANGE Shifting Error

RANGE : 20-100dB 70dB ±0.5dB

Within ±0.5dB of the value at 70dB input, Range 20-100dB.

RANGE (dB)	Input level (dB)	Frequency (Hz)		
		31.5	1000	12500
20-80	70	0.0	-0.1	-0.1
20-90	70	0.0	0.0	0.0
20-100	70	0.0	0.0	0.0
20-110	70	0.1	0.0	0.1
30-120	70	0.0	0.0	0.0
40-130	70	-0.1	-0.1	0.0
Passed		Pass		

2)Stability Caracteristic

RANGE : 20-100dB ±0.5dB

Within ±0.5dB of the value one minute later, Range 20-100dB.

	ten minutes later
Error (dB)	0.0
Passed	Pass

3) The Scale Error

RANGE : 30-120dB 31.5Hz 75.0dB 1kHz, 12.5kHz 95dB

31.5Hz is 75.0dB input standard 1kHz, 12.5kHz is 95dB input standard

A weighting

Input (dB)	Standard (dB)	Frequency (Hz) 31.5
120		
118		
115		
110		
105		
100		
95		
90		
85		
80	±0.3	0.1
75	0.0	0.0
70	±0.3	0.2
65	±0.3	0.0
60	±0.3	-0.1
55	±0.3	0.0
50	±0.3	0.0
45	±0.3	0.0
40	±0.3	0.0
35	±0.3	0.2
Passed		Pass

A weighting

Input (dB)	Standard (dB)	Frequency (Hz) 1000	12500
120	±0.3	0.0	
118	±0.3		0.0
115	±0.3	0.0	0.0
110	±0.3	-0.1	-0.1
105	±0.3	-0.1	0.1
100	±0.3	0.0	0.0
95	0.0	0.0	0.0
90	±0.3	-0.1	-0.1
85	±0.3	-0.1	0.1
80	±0.3	0.0	0.0
75	±0.3	0.0	0.0
70	±0.3	-0.1	0.0
65	±0.3	-0.2	-0.1
60	±0.3	-0.3	-0.1
55	±0.3	-0.1	0.2
50	±0.3	-0.2	0.0
45	±0.3	-0.1	-0.1
40	±0.3	-0.1	0.0
35	±0.3	0.1	0.1
Passed		Pass	

4) Dynamic Characteristic

RANGE 20-100dB 100dB, 1kHz

When 100dB input, Range 20-100dB at 1kHz.

	Standard	Measured Value
FAST	-1.0 $^{+0.5}_{-1.0}$ (dB)	-1.5
SLOW	-4.0±1.0 (dB)	-4.5
Passed		Pass

5) Frequency Response

RANGE : 20-100dB 95dB

When 95dB input, including Microphone value, Range 20-100dB

Frequency (Hz)	A Standard (dB)	A Response (dB)	A Deviation (dB)	C Standard (dB)	C Response (dB)	C Deviation (dB)	Z Response (dB)	Tolerance (dB)
10	-70.4	-69.2	1.2	-14.3	-12.5	1.8	-0.4	+3.0, -cxJ
20	-50.5	-50.7	-0.2	-6.2	-5.8	0.4	-0.2	±2.0
40	-34.6	-34.8	-0.2	-2.0	-2.1	-0.1	-0.1	±1.0
100	-19.1	-19.3	-0.2	-0.3	-0.4	-0.1	-0.1	±1.0
250	-8.6	-8.8	-0.2	0.0	-0.1	-0.1	-0.1	±1.0
500	-3.2	-3.3	-0.1	0.0	0.1	0.1	0.0	±1.0
1000	**0.0**	0.0	0.0	0.0	-0.1	-0.1	-0.1	±0.7
2k	1.2	1.2	0.0	-0.2	-0.3	-0.1	-0.1	±1.0
4k	1.0	0.4	-0.6	-0.8	-1.6	-0.8	-0.5	±1.0
5k	0.5	0.1	-0.4	-1.3	-1.9	-0.6	-0.3	±1.5
6.3k	-0.1	-0.8	-0.7	-2.0	-2.8	-0.8	-0.4	+1.5, -2.0
8k	-1.1	-2.1	-1.0	-3.0	-4.1	-1.1	-0.9	+1.5, -2.5
10k	-2.5	-3.6	-1.1	-4.4	-5.6	-1.2	-1.2	+2.0, -3.6
12.5k	-4.3	-5.0	-0.7	-6.2	-6.9	-0.7	-1.2	+2.0, -5.0
16k	-6.6	-7.7	-1.1	-8.5	-9.6	-1.1	-2.3	+2.5, -16.0
20k	-9.3	-12.9	-3.6	-11.2	-12.9	-1.7	-3.8	+3.0, -cxJ
Passed		Pass						

6) l.OdB

Within l.OdB on the Burst signal of the peak factor 3, Ragne 20-100dB.

Frequency 2kHz, Repeat frequency 40Hz

Effective value Error (dB)	Passed
0.3	Pass

7) Self-noise

RANGE : 20-80dB

RANGE : 20-80dB (Including Microphone value)	A	C	Z
Standard (dB)	Below 20	Below 29	Below 31
Self-noise (dB)	17.4	28.0	30.6
Passed	Pass		

精密騒音計
Precision Sound Level Meter
TYPE 6238

検査成績書
INSPECTION CERTIFICATE

Serial No. of boy : 223041

Serial No. of Microphone: 80283
Ver:5.0 22-01-08

Date:June 2,2024

承認 Approved	点検 Passed	担当 Inspected
A. nagata	K. Kohmyama	J. Nagami

株式会社 アコー
ACO CO., LTD.

宮崎県西諸県郡高原町大字蒲牟田1-8
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代表取締役 寺薗信一
1-8 Kamamuta Takaharucho
Nishimorokatagun Miyazaki Japan
President : Shinichi Terazono
ACO CO., LTD.

1.Inspection Date : June 2,2024

2.Inspection Condition

Temperature : 26 °C

Humidity: 44%

Barometric pressure : 995 hPa

3. Inspection Results

1) RANGE The RANGE Shifting Error

RANGE : 20-100dB 70dB ±0.5dB

Within ±0.5dB of the value at 70dB input, Range 20-100dB.

RANGE (dB)	Input level (dB)	Frequency (Hz)		
		31.5	1000	12500
20-80	70	-0.1	-0.1	-0.1
20-90	70	0.0	0.0	0.0
20-100	70	0.0	0.0	0.0
20-110	70	0.1	0.1	0.1
30-120	70	-0.1	-0.1	0.0
40-130	70	-0.1	-0.1	0.0
Passed		Pass		

2)Stability Caracteristic

RANGE : 20-100dB ±0.5dB

Within ±0.5dB of the value one minute later, Range 20-100dB.

	ten minutes later
Error (dB)	0.0
Passed	Pass

3) The Scale Error

RANGE : 30-120dB 31.5Hz 75.0dB 1kHz, 12.5kHz 95dB

31.5Hz is 75.0dB input standard 1kHz, 12.5kHz is 95dB input standard

A weighting

Input (dB)	Standard (dB)	Frequency (Hz) 31.5
120		
118		
115		
110		
105		
100		
95		
90		
85		
80	±0.3	0.0
75	0.0	0.0
70	±0.3	-0.1
65	±0.3	-0.2
60	±0.3	-0.2
55	±0.3	0.1
50	±0.3	-0.2
45	±0.3	0.0
40	±0.3	0.0
35	±0.3	0.2
Passed		Pass

A weighting

Input (dB)	Standard (dB)	Frequency (Hz) 1000	12500
120	±0.3	0.0	
118	±0.3		0.0
115	±0.3	-0.1	0.0
110	±0.3	-0.1	-0.1
105	±0.3	0.2	0.1
100	±0.3	0.0	0.1
95	0.0	0.0	0.0
90	±0.3	-0.1	0.0
85	±0.3	-0.1	0.1
80	±0.3	-0.1	0.1
75	±0.3	0.1	0.1
70	±0.3	-0.1	0.1
65	±0.3	-0.2	-0.2
60	±0.3	-0.2	-0.1
55	±0.3	-0.1	0.1
50	±0.3	-0.1	0.1
45	±0.3	-0.1	-0.1
40	±0.3	-0.1	-0.1
35	±0.3	0.0	0.0
Passed		Pass	

4) Dynamic Characteristic

RANGE 20-100dB 100dB, 1kHz

When 100dB input, Range 20-100dB at 1kHz.

	Standard	Measured Value
FAST	-1.0 $^{+0.5}_{-1.0}$ (dB)	-1.5
SLOW	-4.0±1.0 (dB)	-4.5
Passed		Pass

5) Frequency Response

RANGE : 20-100dB 95dB

When 95dB input, including Microphone value, Range 20-100dB

Frequency (Hz)	A Standard (dB)	A Response (dB)	A Deviation (dB)	C Standard (dB)	C Response (dB)	C Deviation (dB)	Z Response (dB)	Tolerance (dB)
10	-70.4	-69.5	0.9	-14.3	-12.8	1.5	-0.2	+3.0, -cxJ
20	-50.5	-50.9	-0.4	-6.2	-5.8	0.4	-0.3	±2.0
40	-34.6	-35.0	-0.4	-2.0	-2.0	0.0	-0.1	±1.0
100	-19.1	-19.5	-0.4	-0.3	-0.4	-0.1	-0.1	±1.0
250	-8.6	-8.9	-0.3	0.0	0.0	0.0	0.0	±1.0
500	-3.2	-3.4	-0.2	0.0	0.1	0.1	0.1	±1.0
1000	**0_0**	0 0	0 0	0.0	0.0	0.0	-0.1	±0.7
2k	1.2	1.2	0.0	-0.2	-0.2	0.0	0.0	±1.0
4k	1.0	0.7	-0.3	-0.8	-1.3	-0.5	-0.2	±1.0
5k	0.5	0.2	-0.3	-1.3	-1.8	-0.5	-0.3	±1.5
6.3k	-0.1	-0.5	-0.4	-2.0	-2.5	-0.5	-0.3	+1.5, -2.0
8k	-1.1	-1.7	-0.6	-3.0	-3.7	-0.7	-0.5	+1.5, -2.5
10k	-2.5	-3.0	-0.5	-4.4	-4.9	-0.5	-0.7	+2.0, -3.6
12.5k	-4.3	-4.7	-0.4	-6.2	-6.6	-0.4	-1.1	+2.0, -5.0
16k	-6.6	-7.0	-0.4	-8.5	-9.0	-0.5	-1.7	+2.5, -16.0
20k	-9.3	-11.6	-2.3	- 11.2	-12.2	-1.0	-4.4	+3.0, -cxJ
Passed	Pass							

6) l.OdB

Within l.OdB on the Burst signal of the peak factor 3, Ragne 20-100dB.

Frequency 2kHz, Repeat frequency 40Hz

Effective value Error (dB)	Passed
0.3	Pass

7) Self-noise

RANGE : 20-80dB

RANGE : 20-80dB (Including Microphone value)	A	C	z
Standard (dB)	Below 20	Below 29	Below 31
Self-noise (dB)	17.9	28.0	30.3
Passed	Pass		

精密騒音計
Precision Sound Level Meter
TYPE 6238

検査成績書
INSPECTION CERTIFICATE

Serial No. of boy : 223042

Serial No. of Microphone: 80284
Ver:5.0 22-01-08

Date: June 2,2024

承認 Approved	点検 Passed	担当 Inspected
A. nagata	K. Tokumoto	J. Nagami

株式会社 アコー
ACO CO., LTD.

宮崎県西諸県郡高原町大字蒲牟田1-8
株式会社アコー
代表取締役 寺薗信一
1-8 Kamamuta Takaharucho
Nishimorokatagun Miyazaki Japan
President : Shinichi Terazono
ACO CO., LTD.

1.Inspection Date : June 2,2024

2.Inspection Condition

Temperature : 26 °C

Humidity: 44%

Barometric pressure : 995 hPa

3. Inspection Results

1) RANGE The RANGE Shifting Error

RANGE : 20-100dB 70dB ±0.5dB

Within ±0.5dB of the value at 70dB input, Range 20-100dB.

RANGE (dB)	Input level (dB)	Frequency (Hz)		
		31.5	1000	12500
20-80	70	-0.1	-0.1	-0.1
20-90	70	0.0	0.0	0.0
20-100	70	0.0	0.0	0.0
20-110	70	0.1	0.0	0.1
30-120	70	-0.1	-0.1	0.0
40-130	70	-0.2	-0.2	0.0
Passed		Pass		

2)Stability Caracteristic

RANGE : 20-100dB ±0.5dB

Within ±0.5dB of the value one minute later, Range 20-100dB.

	ten minutes later
Error (dB)	0.0
Passed	Pass

3) The Scale Error

RANGE : 30-120dB 31.5Hz 75.0dB 1kHz, 12.5kHz 95dB

31.5Hz is 75.0dB input standard 1kHz, 12.5kHz is 95dB input standard

A weighting

Input (dB)	Standard (dB)	Frequency (Hz) 31.5
120		
118		
115		
110		
105		
100		
95		
90		
85		
80	±0.3	0.1
75	0.0	0.0
70	±0.3	-0.1
65	±0.3	0.0
60	±0.3	-0.1
55	±0.3	-0.1
50	±0.3	-0.1
45	±0.3	0.0
40	±0.3	-0.1
35	±0.3	0.2
Passed		Pass

A weighting

Input (dB)	Standard (dB)	Frequency (Hz) 1000	12500
120	±0.3	0.0	
118	±0.3		0.0
115	±0.3	-0.1	0.0
110	±0.3	-0.1	-0.1
105	±0.3	-0.1	-0.1
100	±0.3	-0.2	-0.1
95	0.0	0.0	0.0
90	±0.3	0.1	-0.1
85	±0.3	-0.1	-0.1
80	±0.3	0.0	-0.1
75	±0.3	-0.1	-0.1
70	±0.3	-0.3	-0.1
65	±0.3	-0.2	-0.2
60	±0.3	-0.2	-0.2
55	±0.3	-0.2	-0.2
50	±0.3	-0.2	0.3
45	±0.3	0.0	-0.2
40	±0.3	-0.2	-0.1
35	±0.3	0.2	0.1
Passed		Pass	

4) Dynamic Characteristic

RANGE 20-100dB 100dB, 1kHz

When 100dB input, Range 20-100dB at 1kHz.

	Standard	Measured Value
FAST	-1.0 $^{+0.5}_{-1.0}$ (dB)	-1.5
SLOW	-4.0±1.0 (dB)	-4.5
Passed		Pass

5) Frequency Response

RANGE : 20-100dB 95dB

When 95dB input, including Microphone value, Range 20-100dB

Frequency (Hz)	A Standard (dB)	A Response (dB)	A Deviation (dB)	C Standard (dB)	C Response (dB)	C Deviation (dB)	Z Response (dB)	Tolerance (dB)
10	-70.4	-68.5	1.9	-14.3	-12.3	2.0	-0.9	+3.0, -cxJ
20	-50.5	-50.7	-0.2	-6.2	-5.7	0.5	-0.1	±2.0
40	-34.6	-34.9	-0.3	-2.0	-2.0	0.0	-0.1	±1.0
100	-19.1	-19.4	-0.3	-0.3	-0.3	0.0	-0.1	±1.0
250	-8.6	-8.9	-0.3	0.0	-0.1	-0.1	-0.1	±1.0
500	-3.2	-3.5	-0.2	0.0	-0.1	-0.1	-0.1	±1.0
1000	**0.0**	0.0	0.0	0.0	-0.1	-0.1	-0.1	±0.7
2k	1.2	1.1	-0.1	-0.2	-0.3	-0.1	-0.1	±1.0
4k	1.0	0.4	-0.6	-0.8	-1.5	-0.7	-0.4	±1.0
5k	0.5	0.1	-0.4	-1.3	-1.9	-0.6	-0.3	±1.5
6.3k	-0.1	-0.5	-0.4	-2.0	-2.6	-0.6	-0.3	+1.5, -2.0
8k	-1.1	-1.8	-0.7	-3.0	-3.8	-0.8	-0.5	+1.5, -2.5
10k	-2.5	-3.0	-0.5	-4.4	-5.0	-0.6	-0.7	+2.0, -3.6
12.5k	-4.3	-4.4	-0.1	-6.2	-6.4	-0.2	-0.8	+2.0, -5.0
16k	-6.6	-6.5	0.1	-8.5	-8.4	0.1	-1.2	+2.5, -16.0
20k	-9.3	-9.2	0.1	-11.2	-10.0	1.2	-2.8	+3.0, -cxJ
Passed	Pass							

6) l.OdB

Within l.OdB on the Burst signal of the peak factor 3, Ragne 20-100dB.

Frequency 2kHz, Repeat frequency 40Hz

Effective value Error (dB)	Passed
0.3	Pass

7) Self-noise

RANGE : 20-80dB

RANGE : 20-80dB (Including Microphone value)	A	C	Z
Standard (dB)	Below 20	Below 29	Below 31
Self-noise (dB)	17.8	28.2	30.7
Passed	Pass		

JNAC JIRANATE ASSOCIATES CO.,LTD
บริษัท จิรนที แอสโซซิเอสท์ จำกัด (สำนักงานใหญ่)
JIRANATE ASSOCIATES CO.,LTD.(Head office)
63/14-15,67/35-36 ซอยเพชรเกษม7,7/1 ถนนเพชรเกษม แขวงวัดท่าพระ เขตบางกอกใหญ่ กรุงเทพฯ 10600 โทร: (66) 02-8680812ต่อ13 แฟกซ์: (66) 02-8680860
63/14-15,67/35-36 Soi Petchkasem7,7/1, Petchkasem Rd, Watthapra, Bangkokyai, Bangkok 10600 Thailand Tel. : (66) 02-8680812ต่อ13 Fax. : (66) 02-8680860

Sound level Calibration report

Instrument Calibrated

Description	: Sound Level Meter
Manufacturer	: Cirrus
Model	: CR161B
Serial No.	: G301397
Microphone No.	: 216922A
Peramplifier No.	: 13417F

Ambient Enviroment

Temperature	: (24±3)°C
Relative Humidity	: (55±15)%
Ambient Pressure	: (1008±5)hPa

Standards Used

- Sound Level Calibrator Delta ohm HD 2020 S/N : 15030521

Measurement Result

Method	Standard Reference (dB)	Reading (dB)	Error (dB)	After Adjustment ± (dB)
Sound level	94.0	93.70	0.30	93.70

JNAC JIRANATE ASSOCIATES CO.,LTD

CALIBRATION BY :		Data :	16/5/24
APPROVED BY :		Data :	16/5/24

ต้องการข้อมูลทางด้านเทคนิคเพิ่มเติม : นายสันติ มีมานะ โทร 086-303-3140

63/14-15,67/35-36 ซอยเพชรเกษม 7,7/1 ถนนเพชรเกษม แขวงวัดท่าพระ เขตบางกอกใหญ่ กรุงเทพฯ 10600

Cirrus Research plc
dedicated to noise measurement

Service Report

Instrument Manufacturer: Cirrus Research Plc
Job Reference Number: 91884
Instrument Type: CR:161B
Serial Number: G301397

Customer Name: Jiranatee Associates Co., Ltd.
Customer Address: 63/14-15, 67/35-36
Soi Petchkasem 7,7/1
Thailand
10600

Issue	Action	Result	Engineer
Mic and pre-amp s/n incorrect. RW Low reading, not responding. Works fine with known good pre-amp. Replaced AD1, fixed issue. RW	Replaced AD1, fixed issue. RW	Autotested passed RW	Mark Berry

Engineer: M.BERRY

Date: 07 May 2024

We hope that you are satisfied with the service you have received from Cirrus Research plc.
If you have any concerns, would like further information or have any feedback do not hesitate to contact us.

Cirrus Research plc, Acoustic House, Bridlington Road, Hunmanby, North Yorkshire, YO14 0PH
Telephone: +44 (0) 1723 891655 Fax: +44 (0) 1723 891742
Email: support@cirrusresearch.com

CERTIFICATE OF CALIBRATION

ISSUED BY **Cirrus Research plc**

DATE OF ISSUE **07 May 2024** CERTIFICATE NUMBER **213784**

Cirrus Research plc
Acoustic House
Bridlington Road
Hunmanby
North Yorkshire
YO14 0PH
United Kingdom

Approved signatory
R.Woodall
Electronically signed:

R. Woodall

Sound Level Meter : IEC 61672-3:2013

Instrument information

Manufacturer:	Cirrus Research plc	Notes:
Model:	CR:161B	
Serial number:	G301397	
Class:	1	
Firmware version:	5.8.3251	

Test summary

Date of calibration: 16 April 2024

The calibration was performed respecting the requirements of ISO/IEC 17025:2017.
Periodic tests were performed in accordance with procedures from IEC 61672-3:2013.

The sound level meter submitted for testing successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed.

However, no general statement or conclusion can be made about conformance of the sound level meter to the full specifications of IEC 61672-1:2013 because (a) evidence was not publicly available, from an independent testing organisation responsible for pattern approvals, to determine that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:2013 or correction data for acoustical test of frequency weighting were not provided in the Instruction Manual and (b) because the periodic tests of IEC 61672-3:2013 cover only a limited subset of the specifications in IEC 61672-1:2013.

Notes

This certificate provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a coverage probability of approximately 95%.

CERTIFICATE OF CALIBRATION

Environmental conditions

The following conditions were recorded at the time of the test:

Before	Pressure:	100.61 kPa	Temperature:	21.8 °C	Humidity:	41 %
After	Pressure:	100.65 kPa	Temperature:	21.8 °C	Humidity:	41.8 %

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	SIGLENT	SDG1032X	SDG1XDDC7R0237
Attenuator	Cirrus Research	ZE:952	78135
Environmental Monitor	Comet	T7510	16966334

Additional instrument information

Instruction manual:
Reference level range: Single range
Pattern approval: No
Source of pattern approval: -

Preamplifier

Model: MV:200F
Serial number: 13417F

Microphone

Model: MK:224
Serial number: 216922A

Test results summary

Test	Result
Toneburst response	Complies
Electrical noise-floor	Complies
Linearity	Complies
Electrical Frequency weightings	Complies
Frequency and time weightings at 1 kHz	Complies
C-weighted peak	Complies
Overload indication	Complies
High level stability	Complies
Long-term stability	Complies
Acoustic Frequency weightings	Complies

CERTIFICATE OF CALIBRATION

ISSUED BY **Cirrus Research plc**

DATE OF ISSUE **07 May 2024** CERTIFICATE NUMBER **213788**

Cirrus Research plc
Acoustic House
Bridlington Road
Hunmanby
North Yorkshire
YO14 0PH
United Kingdom

Test engineer:
D.Swalwell
Electronically signed:

Microphone

Microphone capsule

Manufacturer: Cirrus Research plc

Model: MK:224

Serial Number: 216922A

Calibration procedure

Open circuit: 39.6 mV/Pa

Sensitivity at 1 kHz: -28.1 dB rel 1 V/Pa

The microphone capsule detailed above has been calibrated to the published data as described in the operating manual of the associated sound level meter (where applicable).

The frequency response was measured using an electrostatic actuator in accordance with BS EN 61094-6:2005 with the free-field response derived via standard correction data traceable to a National Measurement Institute.

The absolute sensitivity at 1 kHz was measured using an acoustic calibrator conforming to IEC 60942:2003 Class 1.

Environmental conditions

Pressure: 101.60 kPa

Temperature: 20.0 °C

Humidity: 51.0 %

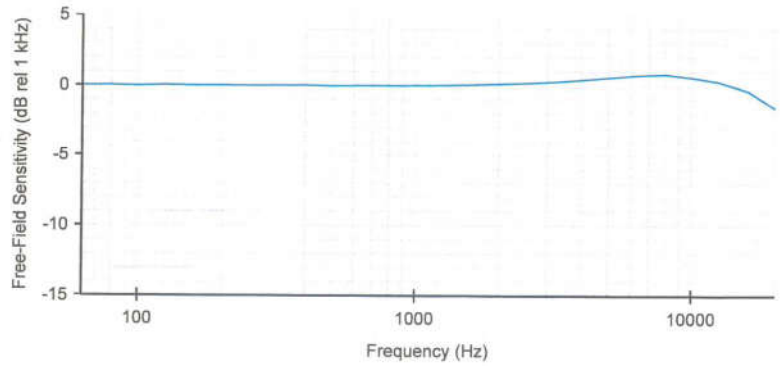
CERTIFICATE OF CALIBRATION

Certificate Number: **213788**

Free-Field Frequency Response : Tabular

Frequency (Hz)	Free-Field Sensitivity (dB rel 1 kHz)	Actuator Response (dB)
63	**-0.01**	**-0.21**
80	0.00	-0.10
100	-0.03	-0.04
125	**0.02**	**0.01**
160	-0.01	0.00
200	-0.02	0.01
250	**-0.02**	**0.02**
315	-0.00	0.01
400	-0.00	0.03
500	**-0.03**	**-0.02**
630	-0.02	-0.01
800	-0.01	-0.01
1 000	**0.00**	**-0.02**
1 250	0.02	-0.04
1 600	0.06	-0.07
2 000	**0.12**	**-0.10**
2 500	0.18	-0.17
3 150	0.27	-0.31
4 000	**0.43**	**-0.51**
5 000	0.58	-0.82
6 300	0.75	-1.38
8 000	**0.82**	**-2.40**
10 000	0.59	-4.11
12 500	0.30	-6.17
16 000	**-0.38**	**-8.23**
20 000	-1.60	-10.65

Free-Field Frequency Response : Graphical



METROLOGY SYSTEM (THAILAND) CO.,LTD.

Certificate of Calibration

Certificate Number : SPR23120187-3 Page : 1 of 3

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

Equipment Name	: Sound Level Meter		
Manufacturer	: Cirrus		
Model	: N/A		
Serial Number	: G301167		
ID. Number	: CR-B07		
Environmental Conditions			
Ambient Temperature	: 23 °C ± 3 °C	Received Date	: 13 Dec 2023
Relative Humidity	: 50 % ± 15 %	Calibration Date	: 15 Dec 2023
Location of Calibration	: In-Lab	Recommend Due Date	: 15 Dec 2024
Calibration Procedure	: SP-CPE-04-01	Date of Issue	: 16 Dec 2023

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received.Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full,without written approval of SP Metrology System (Thailand).

Calibrated by : Mr.Karoon Pengsalung
Calibration Officer

Approved by :
(Mr.Prayoon Topart)
Authorized Signatory

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 (Thailand) Tel: (662) 193-2220 5 สาย www.สอบเทียบเครื่องมือวัด.com

METROLOGY SYSTEM (THAILAND) CO.,LTD.

Calibration Report

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	ST-120	211203773	EEL.BP. 114/0166	17 Jan 2024

Traceability

This certification is traceable to the International System of Unit maintained at :
TISTR - Thailand Institute of Scientific and Technological Research

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 (Thailand) Tel: (662) 193-2220 5 สาย www.สอบเทียบเครื่องมือวัด.com

METROLOGY SYSTEM (THAILAND) CO.,LTD.

Result of Calibration

Certificate No. : SPR23120187-3 Page : 3 of 3

Range : 94 to 114 dB Function : @1kHz

Select A Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	93.7	93.7	-0.3	-0.3	0.15
114	113.7	113.7	-0.3	-0.3	0.15

Select C Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	93.7	93.7	-0.3	-0.3	0.15
114	113.7	113.7	-0.3	-0.3	0.15

Select Z Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	93.7	93.7	-0.3	-0.3	0.15
114	113.7	113.7	-0.3	-0.3	0.15

Note :

The result of calibration was found accurate as show on date and place of calibration only. This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor k = 2.00, providing a level of confidence approximately 95%.

- End of Certificate -

SP-FM-04-15 REV.0

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 (Thailand) Tel: (662) 193-2220 5 สายๆ www.สอบเทียบเครื่องมือวัด.com

METROLOGY SYSTEM (THAILAND) CO.,LTD.

ID LINE : IEC17025

Certificate of Calibration

Certificate Number : SPR24050262-2 Page : 1 of 3

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

Equipment Name	: Sound Level Meter		
Manufacturer	: ACO		
Model	: 6236		
Serial Number	: 182015		
ID. Number	: ACO-B33		
Environmental Conditions			
Ambient Temperature	: 23 °C ± 3 °C	Received Date	: 17 May 2024
Relative Humidity	: 50 % ± 15 %	Calibration Date	: 20 May 2024
Location of Calibration	: In-Lab	Recommend Due Date	: 20 May 2025
Calibration Procedure	: SP-CPE-04-01	Date of Issue	: 21 May 2024

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received.Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full,without written approval of SP Metrology System (Thailand).

Calibrated by : Mr.Chumpon Dokpikul
Calibration Officer

Approved by :
(Mr.Prayoon Topart)
Authorized Signatory

SP-FM-04-15 rev.0

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 (Thailand) Tel: (662) 193-2220 5 สายๆ www.สอบเทียบเครื่องมือวัด.com

METROLOGY SYSTEM (THAILAND) CO.,LTD.

ID LINE : IEC17025

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 (Thailand) Tel: (662) 193-2220 5 สายๆ www.สอบเทียบเครื่องมือวัด.com

Calibration Report

Certificate Number : SPR24050262-2

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	ST-120	211203773	EEL.BP. 140/0167	26 Jan 2025

Traceability

This certification is traceable to the International System of Unit maintained at :

TISTR - Thailand Institute of Scientific and Technological Research

METROLOGY SYSTEM (THAILAND) CO.,LTD.

ID LINE : IEC17025

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 (Thailand) Tel: (662) 193-2220 5 สายๆ www.สอบเทียบเครื่องมือวัด.com

Result of Calibration

Certificate Number : SPR24050262-2

Range : 94 to 114 dB Function : @1kHz

Select A

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.7	113.7	-0.3	-0.3	0.15

Select C

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.1	94.1	0.1	0.1	0.15
114	113.7	113.7	-0.3	-0.3	0.15

Select Z

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.1	94.1	0.1	0.1	0.15
114	113.8	113.8	-0.2	-0.2	0.15

Note :

The result of calibration was found accurate as show on date and place of calibration only. This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor k = 2.00, providing a level of confidence approximately 95%.

- End of Certificate -

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

Noise B_368/24

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-B13	ACO	6236	00152084	17 September 2024	93.9	93.9
ACO-B33	ACO	6236	00182015	17 September 2024	94.1	93.9
ACO-B44	ACO	6236	00222302	17 September 2024	94.0	93.9
ACO-R55	ACO	6236	00222309	17 September 2024	93.9	93.9
ACO-C1-B01	ACO	6238	00223038	17 September 2024	94.0	93.9
ACO-C1-B02	ACO	6238	00223039	17 September 2024	94.0	93.9
ACO-C1-B03	ACO	6238	00223040	17 September 2024	93.9	93.9
ACO-C1-B04	ACO	6238	00223041	17 September 2024	93.9	93.9
ACO-C1-B05	ACO	6238	00223042	17 September 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 :
(Mr. Peera Detudom)

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

Noise B_368_1/24

Sound Level Meter Calibration Report

Acoustic Calibrator Data			
Brand	CIRRUS	Number	AC-CR01/63
Model	CR515	Serial No.	92002
Calibration Range	94 dB, 1000 Hz	Last Calibration	05 March 2024
		Due Date	05 March 2025

Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
CR-B07	Cirrus	CR161B	G301167	17 September 2024	94.0	94.0
CR-B08	Cirrus	CR161B	G301397	17 September 2024	94.0	94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					94.04 ± 0.10 dB	

Calibrated by : Adul Dangklom
(Mr. Adul Dangklom)

Approved by :
(Mr. Peera Detudom)

คุณภาพน้ำ

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
CLC Accredited ISO/IEC 17025
NSC-TISI-TIS 17025 CALIBRATION 0059 CLC

CERTIFICATE OF CALIBRATION

FOR

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

CALIBRATION SERVICE : ☑ IN-LABORATORY ☐ ON-SITE

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

DATE OF RECEIVED : 13 February 2024 DATE OF ISSUED : 16 February 2024

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

Calibrated By : Sukgasem Seehanart
Calibration Engineer

Approved By : 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)

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
CLC Accredited ISO/IEC 17025
NSC-TISI-TIS 17025 CALIBRATION 0059 CLC

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 ± 2.5) °C Relative Humidity : (50 ± 15) % RH

PROCEDURE USED :

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

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

REFERENCE STANDARD USED :

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

TRACEABILITY :

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

Certificate No. 20F21 , Due Date June 2025 .

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

Certificate No. HC30595403 , Due Date 31 January 2026 .

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

Certificate No. HC20111554 , Due Date 30 September 2025.

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

Certificate No. Q23136342, Due Date 20 December 2024.

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

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

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

UNCERTAINTY :

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

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

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
CLC Accredited ISO/IEC 17025
NSC-TISI-TIS 17025 CALIBRATION 0059 CLC

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

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

NSC-TISI-TTS17025 CALIBRATION 0049

CERTIFICATE No : 24E6416
REFERENCE No : 73694-1

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, Bangkae, Bangkok 10160
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584

CERTIFICATE No : 24E6416

Calibration Report

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

CONDITION OF THIS RESULTS OF CALIBRATION

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

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

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

RESULT OF CALIBRATION : ADJUSTMENT

1. DISPLAY UNIT ONLY

SLOPE FACTOR k = 2.303 RT/F = 59 mV/pH

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

END OF CALIBRATION REPORT PAGE 2 OF 3

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

CERTIFICATE No : 24E6416

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 (± 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 (°C)	UUC READING (°C)	CORRECTION (°C)	VALUE BEFORE ADJUSTMENT	UNCERTAINTY OF MEASUREMENT (± °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

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

NSC-TISI-TIS17025
CALIBRATION 0049

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.

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 : 24M2229

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 LINEARLITY 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

Copy

HARIKUL SCIENCE

Harikul Science Co.,Ltd.
694 Soi Ratchadanivet 24 , Pracharatbamphen,
Samsaennok , Huaikhwang, Bangkok 10310
Tel: 0-2274-2456 Fax: 0-2274-2443
Email: info@harikul.com www.harikul.com

Certificate of Calibration

CERT.No.: HS-V015C

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

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

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

Technician : Kittipong M.

Calibration Details

Calibration Point	100% air sat. (@20 °C, DO = 9.09 mg/l)	(status)		(status)
Measurement 1 (mg/l)	9.08	(PASS)	-	-
Measurement 2 (mg/l)	9.08	(PASS)	-	-
Measurement 3 (mg/l)	9.08	(PASS)	-	-
Measurement 4 (mg/l)	9.08	(PASS)	-	-
Measurement 5 (mg/l)	9.08	(PASS)	-	-
Measurement 6 (mg/l)	9.08	(PASS)	-	-
Measurement 7 (mg/l)	9.08	(PASS)	-	-
Measurement 8 (mg/l)	9.08	(PASS)	-	-
Measurement 9 (mg/l)	9.08	(PASS)		-
Measurement 10 (mg/l)	9.08	(PASS)	-	-
Mean Measurement	9.08	mg/l	-	-
Inaccuracy	0.01	mg/l	-	-
Overall Status	(PASS)			

Manufacturer Specification

Accuracy = +/- 0.02 mg/l

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

Technician Signature
(Kittipong Maekwong)

Laboratory Manager
(Supreecha Sumaritam)

QUALITY CALIBRATION CO.,LTD.
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Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584
www.qcalibration.com

CERTIFICATE No : 24T0774
REFERENCE No : 71986-2

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.

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

Calibration Report

EQUIPMENT	:	COD REACTOR			
MANUFACTURER	:	HACH	**MODEL**	:	DRB 200
ID NUMBER	:	CRB 05/59	**SERIAL NUMBER**	:	15110C0235
RECEIVED DATE	:	5-Feb-24	**CALIBRATION DATE**	:	5-Feb-24
AMBIENT TEMPERATURE	:	23° C ± 1° C	**RELATIVE HUMIDITY**	:	52 %RH ± 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

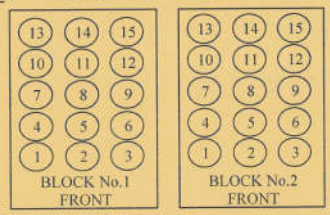
1. THIS INSTRUMENT WAS CALIBRATED BY DIRECT MEASUREMENT TEMPERATURE RECORDER WITH THERMOCOUPLE TYPE K UNDER NO LOAD CONDITION. THE THERMOCOUPLES WERE PLACED ON 15 POINTS AND LOCATED ONE THERMOCOUPLE IN EACH OF THE FOUR CORNERS OF THE REACTOR AND PLACED THE EIGHTH THERMOCOUPLE AT THE CENTER OF THE REACTOR.

2. REFERENCE STANDARD INSTRUMENTS :-

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

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

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



TEMPERATURE MEASUREMENT ACCURACY TEST

Block No.		1	2
Controller temperature (°C)		145	145
Indicating Temperature		145	145
Measured Temperature (° C) at Spread Locations	1	150.2	150.1
	2	150.2	150.1
	3	150.2	149.8
	4	149.9	150.3
	5	150.1	149.8
	6	150.7	149.6
	7	149.9	150.2
	8	149.9	149.6
	9	150.8	150.4
	10	149.5	150.1
	11	150.2	150.6
	12	150.0	150.1
	13	149.5	149.6
	14	149.5	149.4
	15	149.6	149.5
Uncertainty of Measurement(± °C)		0.86	0.86

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT EXCLUDED TEMPERATURE UNIFORMITY OF THE CHAMBER.
NOTE 2 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.
THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k =2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT

PerkinElmer

MAINTENANCE AND TEST CERTIFICATE MODEL

OPTIMA 5300DV

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 Viphasthawat**	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		**ACCESSORIES/COMPONENT NOT INCLUDED**
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		

PerkinElmer Scientific (Thailand) Co., Ltd.
290 Soi Soonvijai 4, Bangkapi, Huay Kwang, Bangkok 10310 Head Office

WO-02612424/2024

PerkinElmer

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 reqiured, 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

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PerkinElmer

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	

PerkinElmer Scientific (Thailand) Co., Ltd.
290 Soi Soonvijai 4, Bangkapi, Huay Kwang, Bangkok 10310 Head Office

WO-02612424/2024

PerkinElmer

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 perfomed 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)

Service Engineer

PerkinElmer Scientific (Thailand) Co., Ltd.
290 Soi Soonvijai 4, Bangkapi, Huay Kwang, Bangkok 10310 Head Office

SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY

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

NSC-TISI-TIS 17025
CALIBRATION 0394

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.

SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY

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

NSC-TISI-TIS 17025
CALIBRATION 0394

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

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CALIBRATION LABORATORY

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

SITHIPORN associates

NSC-TISI-TIS 17025
CALIBRATION 0394

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	
Transimission T(%)	**Absorbance(A)**
0.0117	3.8659

**Specific Acceptance :
Transmission $\leq$ 1.0 T(%), Absorbance $\geq$ 2.0 A
**Stray light not TISI Accredited

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

End of Calibration Certificate

T. Ketch-

คุณภาพอากาศในสถานประกอบการ

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

Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter | Model : Defender 510-H | S/N : 136164

Environmental Conditions

Temperature	.	25	± 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
B80	SKC	224-PCXR3	504569	04/07/2024	1,000	1,500	2,000	1,006	1,505	2,003	1.009x – 14.904	0.999
B81	SKC	224-PCXR3	503680	02/07/2024	1,000	1,500	2,000	1,006	1,503	2,006	1.011x - 19.229	0.999
B82	SKC	224-PCXR3	505673	02/07/2024	1,000	1,500	2,000	1,004	1,504	2,007	1.010x – 14.060	1.000
B83	SKC	224-PCXR3	510785	02/07/2024	1,000	1,500	2,000	998	1,504	2,002	1.000x – 0.396	1.000
B84	SKC	224-PCXR3	508333	04/07/2024	1,000	1,500	2,000	998	1,508	2,005	1.009x - 17.242	0.999
B85	SKC	224-PCXR3	505757	04/07/2024	1,000	1,500	2,000	1,009	1,493	2,004	0.999x + 1.151	1.000
B86	SKC	224-PCXR3	512625	05/07/2024	1,000	1,500	2,000	1,000	1,495	2,003	1.002x - 3.458	1.000
B87	SKC	224-PCXR3	504324	03/07/2024	1,000	1,500	2,000	1,003	1,505	2,006	1.005x – 5.057	1.000
B88	SKC	224-PCXR3	508307	03/07/2024	1,000	1,500	2,000	999	1,517	2,000	0.999x + 2.575	0.999
B89	SKC	224-PCXR3	509860	03/07/2024	1,000	1,500	2,000	998	1,518	2,006	1.010x – 14.096	0.999
B90	SKC	224-PCXR3	508366	03/07/2024	1,000	1,500	2,000	1,000	1,501	2,000	1.005x – 8.991	1.000
B91	SKC	224-PCXR3	510919	03/07/2024	1,000	1,500	2,000	1,006	1,503	2,008	1.014x - 22.160	0.999
B92	SKC	224-PCXR3	510987	02/07/2024	1,000	1,500	2,000	1,006	1,503	2,006	1.012x - 20.401	0.999
B93	SKC	224-PCXR3	509845	02/07/2024	1,000	1,500	2,000	1,003	1,504	2,008	1.006x – 6.113	1.000
B94	SKC	224-PCXR8	A127871	02/07/2024	1,000	1,500	2,000	1,012	1,496	1,998	0.997x – 0.876	0.999
B95	SKC	224-PCXR8	A127921	01/07/2024	1,000	1,500	2,000	999	1,502	2,000	1.001x – 0.460	1.000
B96	SKC	224-PCXR8	A127942	01/07/2024	1,000	1,500	2,000	997	1,501	2,001	1.005x – 7.496	1.000
B97	SKC	224-PCXR8	A127955	02/07/2024	1,000	1,500	2,000	1,011	1,496	1,998	0.998x – 1.995	0.999
B98	SKC	224-PCXR8	A127956	02/07/2024	1,000	1,500	2,000	1,011	1,496	1,998	0.997x – 0.476	0.999

Calibrated by : Adul Dangklom (Mr. Adul Dangklom)

Approved by : (Mr. Peera Detudom)

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

Rotameter Calibration Report (For Personal Pump High Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter | Model : Defender 510-H | S/N : 136164

Calibration Data												
Rotameter Data			Calibration Data									
No.	Brand	Model	Date	Flow Rate (ml/min)						Value From Calibration Curve		
				Flow Rate (Reading)			Actual (Q std.)					
				1	2	3	1	2	3	y	R^2
H-B01	Dwyer	VFB-65	04/07/2024	500	1,000	2,000	504.1	997.1	1991.2	0.995x + 6.628	1.000
H-B02	Dwyer	VFB-65	04/07/2024	500	1,000	2,000	497.3	1003.5	2015.2	0.998 + 5.168	1.000
H-B03	Dwyer	VFB-65	05/07/2024	500	1,000	2,000	498.4	994.8	2013.0	1.005x - 12.628	0.999
H-B04	Dwyer	VFB-65	02/07/2024	500	1,000	2,000	503.1	997.9	1992.5	0.996x + 6.085	1.000
H-B05	Dwyer	VFB-65	02/07/2024	500	1,000	2,000	497.9	1004.0	2014.2	0.998x + 4.472	1.000
H-B06	Dwyer	VFB-65	01/07/2024	500	1,000	2,000	499.7	997.9	2015.7	1.004x - 9.662	0.999
H-B07	Dwyer	VFB-65	01/07/2024	500	1,000	2,000	501.4	1002.3	1990.2	0.999x + 4.103	1.000
H-B08	Dwyer	VFB-65	04/07/2024	500	1,000	2,000	501.5	999.6	1988.9	0.991x + 12.846	1.000
H-B09	Dwyer	VFB-65	05/07/2024	500	1,000	2,000	502.7	1003.8	1984.8	0.997x + 6.523	0.999
H-B10	Dwyer	VFB-65	05/07/2024	500	1,000	2,000	501.5	999.7	1988.7	0.996x + 9.648	1.000

Calibrated by : Adul Dangklom (Mr.Adul Dangklom)

Approved by : (Mr. Peera Detudom)

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

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
R40	SKC	224-PCXR4	612753	02/07/2024	1,000	1,500	2,000	1,000	1,507	2,005	1.008x – 14.072	0.999
R41	SKC	224-PCXR4	626140	02/07/2024	1,000	1,500	2,000	1,005	1,498	2,004	0.998x +3.290	1.000
R42	SKC	224-PCXR4	626463	03/07/2024	1,000	1,500	2,000	1,005	1,506	2,010	1.011x - 15.343	0.999
R43	SKC	224-PCXR4	626129	03/07/2024	1,000	1,500	2,000	1,004	1,503	2,002	1.004x – 8.463	0.999
R44	SKC	224-PCXR4	602753	01/07/2024	1,000	1,500	2,000	999	1,500	2,001	0.999x + 1.755	1.000
R45	SKC	224-PCXR4	626137	01/07/2024	1,000	1,500	2,000	1,000	1,500	2,000	1.002x – 3.046	1.000
R47	SKC	224-PCXR4	A129234	05/07/2024	1,000	1,500	2,000	1,005	1,503	2,004	1.007x – 10.710	1.000
R48	SKC	224-PCXR4	A129253	05/07/2024	1,000	1,500	2,000	1,005	1,494	1,994	0.992x + 8.239	1.000
R49	SKC	224-PCXR4	A129168	05/07/2024	1,000	1,500	2,000	1,014	1,494	1,998	0.993x + 6.081	0.999
R50	SKC	224-PCXR4	A129282	01/07/2024	1,000	1,500	2,000	1,014	1,494	1,998	0.991x + 10.238	0.999
R51	SKC	224-PCXR4	A129284	01/07/2024	1,000	1,500	2,000	1,005	1,494	2,002	0.999x + 2.639	1.000

Calibrated by :	Approved by :
Adul Dangklom	
(Mr. Adul Dangklom)	(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

ilac-MRA
NSC-TISI-TIS17025 CALIBRATION 0049

CERTIFICATE No : 24M2227
REFERENCE No : 72448-1

Certificate of Calibration

EQUIPMENT	:	DIGITAL BALANCE
MANUFACTURER	:	METTLER TOLEDO
MODEL	:	XS105DU
SERIAL No	:	1126422905
ID No	:	BA05/50
CONDITION AS RECEIVED	:	USED ITEM
SUBMITTED BY	:	S.P.S. CONSULTING SERVICE CO., LTD. 7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD., JOMPOL, CHATUCHAK, BANGKOK 10900
CALIBRATED BY	:	ATSAWIN Y.
CALIBRATION DATE	:	08-Mar-24
APPROVED BY	:	PONGSAK J.
ISSUED DATE	:	14-Mar-24
RECEIVED DATE	:	08-Mar-24

Certificate

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

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

CERTIFICATE No : 24M2227

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 ± 1mbar	**CALIBRATION DATE**	:	08-Mar-24
AMBIENT TEMPERATURE	:	25° C ± 1° C	**RELATIVE HUMIDITY**	:	53 %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 LINEARLITY 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 (± g)
0.00	0.00000	0.00000	0.000065
0.02	0.02001	-0.00001	0.000065
0.10	0.10002	-0.00002	0.000066
0.20	0.20001	-0.00001	0.000066
0.50	0.50001	-0.00001	0.000065
1.00	1.00003	-0.00003	0.000066
2.00	2.00001	-0.00001	0.000067
5.00	5.00001	-0.00001	0.000068
10.00	9.99994	0.00006	0.000070
20.00	20.00008	-0.00008	0.000078
50.00	50.0000	0.0000	0.00013
100.00	100.0001	-0.0001	0.00019
120.00	120.0001	-0.0001	0.00022

5. OFF CENTER LOADING ERROR



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

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

END OF CALIBRATION REPORT

ระดับความร้อนในสถานประกอบการ

METROLOGY SYSTEM (THAILAND) CO.,LTD.

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 (Thailand) Tel: (662) 193-2220 5 สายwww.สอบเทียบเครื่องมือวัด.com

Certificate of Calibration

Certificate Number : SPR23110155-2 Page : 1 of 3

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

Equipment Name	:	Area Heat Stress Monitor		
Manufacturer	:	Quest Technologies		
Model	:	QUESTemp 34		
Serial Number	:	TEL080034		
ID. Number	:	B11		
Environmental Conditions				
Ambient Temperature	:	23 °C ± 2 °C	Received Date	: 10 Nov 2023
Relative Humidity	:	50 % ± 15 %	Calibration Date	: 11 Nov 2023
Location of Calibration	:	In-Lab	Recommend Due Date	: 11 Nov 2024
Calibration Procedure	:	SP-CPT-04-13	Date of Issue	: 12 Nov 2023

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received.Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.
The calibration certificate shall not be reproduced except in full,without written approval of SP Metrology System (Thailand).

Calibrated by : Mr.Navaporn Uengseng
Calibration Officer

Approved by :
(Mr. Sombut Srikampa)
Authorized Signatory

METROLOGY SYSTEM (THAILAND) CO.,LTD.

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 (Thailand) Tel: (662) 193-2220 5 สายwww.สอบเทียบเครื่องมือวัด.com

Calibration Report

Certificate Number : SPR23110155-2 Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Humidity Chamber	TH-80S	N/A	SPR23010480-5	22 Feb 2024
THERMO-HYGROMETER	5020A	A47046	QR23-0176	26 Jan 2024

Traceability

This certification is traceable to the International System of Unit maintained at :
SP Metrology - SP Metrology system (Thailand) Co.Ltd.
Quality Reborn Co., Ltd

SP-FM-04-15 rev.0

Result of Calibration

Certificate No. : SPR23110155-2 Page : 3 of 3

Temperature Accuracy in the Measurement. (WET) Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.011	30.3	0.289	0.20
35.0	35.014	35.3	0.286	0.20
40.0	40.017	40.3	0.283	0.20

Temperature Accuracy in the Measurement. (DRY) Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.011	30.3	0.289	0.20
35.0	35.014	35.3	0.286	0.20
40.0	40.017	40.3	0.283	0.20

Temperature Accuracy in the Measurement. (GLOBE) Unit : °C

Humidity Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.011	30.5	0.489	0.20
35.0	35.014	35.5	0.486	0.20
40.0	40.017	40.5	0.483	0.20

Note:

The result of calibration was found accurate as show on date and place of calibration only. This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor k = 2, providing a level of confidence approximately 95%.

- End of Certificate -

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 (Thailand) Tel: (662) 193-2220 5 สายๆ www.สอบเทียบเครื่องมือวัด.com

METROLOGY SYSTEM (THAILAND) CO.,LTD.

ID LINE : IEC17025

Certificate of Calibration

Certificate Number : SPR24030285-8 Page : 1 of 3

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

Equipment Name	: Area Heat Stress Monitor		
Manufacturer	: Metrosonics		
Model	: hs-32		
Serial Number	: MCE030011		
ID. Number	: B21		
Environmental Conditions			
Ambient Temperature	: 23 °C ± 2 °C	Received Date	: 19 Mar 2024
Relative Humidity	: 50 % ± 15 %	Calibration Date	: 20 Mar 2024
Location of Calibration	: In-Lab	Recommend Due Date	: 20 Mar 2025
Calibration Procedure	: SP-CPT-04-13	Date of Issue	: 21 Mar 2024

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received.Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full,without written approval of SP Metrology System (Thailand).

Calibrated by : Mr.Navaporn Uengseng
Calibration Officer

Approved by :
(Ms.Bussakorn Chaikaew)
Authorized Signatory

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 (Thailand) Tel: (662) 193-2220 5 สายๆ www.สอบเทียบเครื่องมือวัด.com

METROLOGY SYSTEM (THAILAND) CO.,LTD.
ID LINE : IEC17025
69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 (Thailand) Tel: (662) 193-2220 5 คู่สาย www.สอบเทียบเครื่องมือวัด.com

Calibration Report

Certificate Number : SPR24030285-8

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Humidity Chamber	TH-80S	N/A	SPR24020149-7	23 Feb 2025
THERMO-HYGROMETER	5020A	A47046	QR24-0167	26 Jan 2025

Traceability

This certification is traceable to the International System of Unit maintained at :

SP Metrology - SP Metrology system (Thailand) Co.Ltd.

Quality Reborn Co., Ltd

METROLOGY SYSTEM (THAILAND) CO.,LTD.
ID LINE : IEC17025
69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 (Thailand) Tel: (662) 193-2220 5 คู่สาย www.สอบเทียบเครื่องมือวัด.com

Result of Calibration

Certificate No. : SPR24030285-8

Temperature Accuracy in the Measurement. (WET) Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.012	29.8	-0.212	0.20
35.0	35.010	34.8	-0.210	0.20
40.0	40.015	39.9	-0.115	0.20

Temperature Accuracy in the Measurement. (DRY) Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.012	29.7	-0.312	0.20
35.0	35.010	34.7	-0.310	0.20
40.0	40.015	39.8	-0.215	0.20

Temperature Accuracy in the Measurement. (GLOBE) Unit : °C

Humidity Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.012	29.7	-0.312	0.20
35.0	35.010	34.7	-0.310	0.20
40.0	40.015	39.7	-0.315	0.20

Note :

The result of calibration was found accurate as show on date and place of calibration only. This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor k = 2, providing a level of confidence approximately 95%.

- End of Certificate -

METROLOGY SYSTEM (THAILAND) CO.,LTD.

ID LINE : IEC17025

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 (Thailand) Tel: (662) 193-2220 5 คู่สาย www.สอบเทียบเครื่องมือวัด.com

Certificate of Calibration

Certificate Number : SPR24090395-2

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

Equipment Name	: Area Heat Stress Monitor		
Manufacturer	: Quest Technologies		
Model	: QUESTemp 32		
Serial Number	: TPK040059		
ID. Number	: B22-TPK040059		
Environmental Conditions			
Ambient Temperature	: 23 °C ± 2 °C	Received Date	: 20 Sep 2024
Relative Humidity	: 50 % ± 15 %	Calibration Date	: 23 Sep 2024
Location of Calibration	: In-Lab	Recommend Due Date	: 23 Sep 2025
Calibration Procedure	: SP-CPT-04-13	Date of Issue	: 24 Sep 2024

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received.Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.
The calibration certificate shall not be reproduced except in full,without written approval of SP Metrology System (Thailand).

Calibrated by : Mr.Navaporn Uengseng
Calibration Officer

Approved by :
(Mr.Poothipong A.)
Authorized Signatory

METROLOGY SYSTEM (THAILAND) CO.,LTD.

ID LINE : IEC17025

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 (Thailand) Tel: (662) 193-2220 5 คู่สาย www.สอบเทียบเครื่องมือวัด.com

Calibration Report

Certificate Number : SPR24090395-2

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Humidity Chamber	TH-80S	N/A	SPR24020149-7	23 Feb 2025
THERMO-HYGROMETER	5020A	A47046	QR24-0167	26 Jan 2025

Traceability

This certification is traceable to the International System of Unit maintained at :
SP Metrology - SP Metrology system (Thailand) Co.Ltd.
Quality Reborn Co., Ltd

METROLOGY SYSTEM (THAILAND) CO.,LTD.

ID LINE : IEC17025

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 (Thailand) Tel: (662) 193-2220 5 สายตรง www.สอบเทียบเครื่องมือวัด.com

Result of Calibration

Certificate Number : SPR24090395-2

Temperature Accuracy in the Measurement. (WET)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.014	30.1	0.086	0.20
35.0	35.012	35.1	0.088	0.20
40.0	40.017	40.1	0.083	0.20

Temperature Accuracy in the Measurement. (DRY)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.014	30.2	0.186	0.20
35.0	35.012	35.2	0.188	0.20
40.0	40.017	40.2	0.183	0.20

Temperature Accuracy in the Measurement. (GLOBE)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.014	30.1	0.086	0.20
35.0	35.012	35.1	0.088	0.20
40.0	40.017	40.1	0.083	0.20

Note :

The result of calibration was found accurate as show on date and place of calibration only. This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor k = 2, providing a level of confidence approximately 95%.

- End of Certificate -

METROLOGY SYSTEM (THAILAND) CO.,LTD.

ID LINE : IEC17025

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 (Thailand) Tel: (662) 193-2220 5 สายตรง www.สอบเทียบเครื่องมือวัด.com

Certificate of Calibration

Certificate Number : SPR24090395-6

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

Equipment Name	: Area Heat Stress Monitor		
Manufacturer	: Quest Technologies		
Model	: QUESTemp 32		
Serial Number	: TPH050046		
ID. Number	: B28-TPH050046		
Environmental Conditions			
Ambient Temperature	: 23 °C ± 2 °C	Received Date	: 20 Sep 2024
Relative Humidity	: 50 % ± 15 %	Calibration Date	: 23 Sep 2024
Location of Calibration	: In-Lab	Recommend Due Date	: 23 Sep 2025
Calibration Procedure	: SP-CPT-04-13	Date of Issue	: 24 Sep 2024

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received.Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full,without written approval of SP Metrology System (Thailand).

Calibrated by : Mr.Navaporn Uengseng
Calibration Officer

Approved by :
(Mr.Pootthipong A.)
Authorized Signatory

METROLOGY SYSTEM (THAILAND) CO.,LTD.

ID LINE : IEC17025

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 (Thailand) Tel: (662) 193-2220 5 สายๆ www.สอบเทียบเครื่องมือวัด.com

Calibration Report

Certificate Number : SPR24090395-6

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Humidity Chamber	TH-80S	N/A	SPR24020149-7	23 Feb 2025
THERMO-HYGROMETER	5020A	A47046	QR24-0167	26 Jan 2025

Traceability

This certification is traceable to the International System of Unit maintained at :

SP Metrology - SP Metrology system (Thailand) Co.Ltd.

Quality Reborn Co., Ltd

METROLOGY SYSTEM (THAILAND) CO.,LTD.

ID LINE : IEC17025

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 (Thailand) Tel: (662) 193-2220 5 สายๆ www.สอบเทียบเครื่องมือวัด.com

Result of Calibration

Certificate Number : SPR24090395-6

Temperature Accuracy in the Measurement. (WET) Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.014	30.2	0.186	0.20
35.0	35.012	35.2	0.188	0.20
40.0	40.017	40.2	0.183	0.20

Temperature Accuracy in the Measurement. (DRY) Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.014	30.2	0.186	0.20
35.0	35.012	35.2	0.188	0.20
40.0	40.017	40.2	0.183	0.20

Temperature Accuracy in the Measurement. (GLOBE) Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.014	30.2	0.186	0.20
35.0	35.012	35.2	0.188	0.20
40.0	40.017	40.2	0.183	0.20

Note :

The result of calibration was found accurate as show on date and place of calibration only. This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor k = 2, providing a level of confidence approximately 95%.

- End of Certificate -

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

Heat 344_1

Heat Stress WBGT Meter Verification Report						
Verification Data						
Heat Stress WBGT Meter No.	:	B11	Verification Date	:	18 August 2024	
Brand	:	Quest Technologies	Ambient Temp.	:	24.5	°C
Model	:	QUESTemp°34	Barometric Pressure	:	1011	mmbar
Serial No.	:	TEL080034	Relative Humidity	:	49	%

Verification Module (Electronic Sensor Check) :
Verification Module No. : 21 WB = 12.5 °C, DB = 47.1 °C, G = 69.3 °C

Result of Verification : Without Adjustment

Wet Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
12.5	12.7	-0.2	± 0.5
Dry Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
47.1	47.2	-0.1	± 0.5
Globe Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
69.3	69.2	0.1	± 0.5

UUC* = UNIT UNDER CALIBRATION

Verified by : (Mr.Adul Dangklom)

Approved by : (Mr. Peera Detudom)

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

Heat 344_2

Heat Stress WBGT Meter Verification Report						
Verification Data						
Heat Stress WBGT Meter No.	:	B21	Verification Date	:	18 August 2024	
Brand	:	METROSNICS	Ambient Temp.	:	24.5	°C
Model	:	hs-32	Barometric Pressure	:	1011	mmbar
Serial No.	:	MCE030011	Relative Humidity	:	49	%

Verification Module (Electronic Sensor Check) :
Verification Module No. : 21 WB = 12.5 °C, DB = 47.1 °C, G = 69.3 °C

Result of Verification : Without Adjustment

Wet Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
12.5	12.6	-0.1	± 0.5
Dry Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
47.1	47.0	0.1	± 0.5
Globe Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
69.3	69.5	-0.2	± 0.5

UUC* = UNIT UNDER CALIBRATION

Verified by : (Mr.Adul Dangklom)

Approved by : (Mr. Peera Detudom)

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

Heat B_505_1

Heat Stress WBGT Meter Verification Report						
Verification Data						
Heat Stress WBGT Meter No.	:	B22	Verification Date	:	09 December 2024	
Brand	:	Quest Technologies	Ambient Temp.	:	24.5	°C
Model	:	QUESTemp°32	Barometric Pressure	:	1011	mmbar
Serial No.	:	TPK040059	Relative Humidity	:	49	%

Verification Module (Electronic Sensor Check) :
Verification Module No. : 21 WB = 12.5 °C, DB = 47.1 °C, G = 69.3 °C

Result of Verification : Without Adjustment

Wet Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
12.5	12.7	-0.2	± 0.5
Dry Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
47.1	47.2	-0.1	± 0.5
Globe Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
69.3	69.2	0.1	± 0.5

UUC* = UNIT UNDER CALIBRATION

Verified by : Adul Dangklom (Mr.Adul Dangklom)

Approved by : (Mr. Peera Detudom)

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

Heat B_505_2

Heat Stress WBGT Meter Verification Report						
Verification Data						
Heat Stress WBGT Meter No.	:	B28	Verification Date	:	09 December 2024	
Brand	:	Quest Technologies	Ambient Temp.	:	24.5	°C
Model	:	QUESTemp°32	Barometric Pressure	:	1011	mmbar
Serial No.	:	TPH050046	Relative Humidity	:	49	%

Verification Module (Electronic Sensor Check) :
Verification Module No. : 21 WB = 12.5 °C, DB = 47.1 °C, G = 69.3 °C

Result of Verification : Without Adjustment

Wet Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
12.5	12.6	-0.1	± 0.5
Dry Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
47.1	47.3	-0.2	± 0.5
Globe Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
69.3	69.3	0.0	± 0.5

UUC* = UNIT UNDER CALIBRATION

Verified by : Adul Dangklom (Mr.Adul Dangklom)

Approved by : (Mr. Peera Detudom)