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. B08, B12, B16, B18, B25	Digital Balance
PM_{10}	High Volume PM-10 Air Sampler No. B03, B07, B10, B15, B17	Digital Balance
$PM_{2.5}$	High Volume PM-2.5 Air Sampler No. B06, B07, B08, B13, B12	Digital Balance
Hydrogen Chloride	Gas Box No. B03, B05, B07, B10	Ion Chromatography
Sulfur Dioxide	SO_2 Analyzer No. R07, R10, B04, B05, B12	SO_2 Analyzer No. R07, R10, B04, B05, B12
Nitrogen Dioxide	NO_x Analyzer No. R07, B01, B07, B11, B21	NO_x Analyzer No. R07, B01, B07, B11, B21
2. คุณภาพอากาศจากปล่อง		
Particulate	Console No. B01 Pitot Tube No. B35	Digital Balance
PM_{10}	Console No. B01 Pitot Tube No. B35	Digital Balance
Sulfur Dioxide	Personal Pump No. B74 Rotameter No. H-B05	Digital Balance
Oxides of Nitrogen	Vacuum Gauge	Spectrophotometer
Carbon Monoxide	Personal Pump No. B05 Rotameter No. H-B05	CO Analyzer No. B02
3. ระดับเสียง		
L_{eq} 8 hr, L_{eq} 24 hr, L_{eq} 5 min, L_{max}, L_{90}, L_{dn} และระดับเสียงรบกวน	Acoustic Calibrator Sound Level Meter No. ACO-B33, B41, R40, R52 Sound Level Meter No. 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

ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง
และเครื่องมือตรวจวิเคราะห์คุณภาพสิ่งแวดล้อม (ต่อ)

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
4. คุณภาพน้ำ (ต่อ)		
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
5. คุณภาพอากาศในสถานประกอบการ		
Total Dust	Personal Pump No. B51	Digital Balance
	Rotameter No. H-B01	
Sulfur Dioxide	Personal Pump No. B69 Rotameter No. H-B01	Digital Balance
Carbon Monoxide	Personal Pump No. B69 Rotameter No. L-B01	Digital Balance
Hydrogen Chloride	Personal Pump No. B73 Rotameter No. L-B01	Digital Balance
6. ระดับความร้อนในสถานประกอบการ		
WBGT	Heat Stress WBGT Meter No. B12, B17, B31, B32	-

คุณภาพอากาศในบรรยากาศ

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High Volume Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard	Model : TE 5025A	S/N : 3440

Calibration Data				
High Volume Air Sampler Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (ft^3/min)	R^2
B01	B01	01/08/2025	y = 1.099x-3.517	0.999
B02	B02	01/08/2025	y = 1.142x-3.995	0.999
B03	B03	01/08/2025	y = 1.127x-5.756	0.997
B04	B04	01/08/2025	y = 1.137x-4.695	0.999
B05	B05	01/08/2025	y = 1.128x-5.472	0.999
B06	B06	01/08/2025	y = 1.177x-5.925	0.996
B07	B07	01/08/2025	y = 1.147x-5.407	0.999
B08	B08	01/08/2025	y = 1.152x-6.011	0.997
B09	B09	01/08/2025	y = 1.132x-4.325	0.998
B10	B10	07/08/2025	y = 1.123x-5.255	0.998
B11	B11	01/08/2025	y = 1.131x-3.867	0.997
B12	B12	01/08/2025	y = 1.128x-2.501	0.997
B13	B13	01/08/2025	y = 1.162x-4.037	0.996
B14	B14	01/08/2025	y = 1.144x-4.295	0.997
B15	B15	01/08/2025	y = 1.101x-3.061	0.998
B16	B16	07/08/2025	y = 1.039x-1.195	0.999
B17	B17	01/08/2025	y = 1.056x+0.573	0.998
B18	B18	01/08/2025	y = 1.176x-6.349	0.998
B19	B19	01/08/2025	y = 1.150x-4.805	0.996
B20	B20	04/08/2025	y = 1.043x+2.427	0.999
B21	B21	01/08/2025	y = 1.064x+0.460	0.997
B22	B22	01/08/2025	y = 1.146x-4.084	0.998
B23	B23	01/08/2025	y = 1.118x-2.441	0.999
B24	B24	01/08/2025	y = 1.085x-1.292	0.999
B25	B25	01/08/2025	Y = 1.074x+0.323	0.999
B26	B26	04/08/2025	y = 1.098x-3.782	0.997
B27	B27	01/08/2025	y = 1.173x-7.561	0.997
B28	B28	01/08/2025	y = 1.128x-5.410	0.998
B29	B29	01/08/2025	y = 1.134x-3.750	0.998
B30	B30	01/08/2025	y = 1.050x+1.266	0.999
B31	B31	04/08/2025	y = 1.166x-5.291	0.999
B32	B32	01/08/2025	y = 1.159x-4.739	0.996
B33	B33	01/08/2025	y = 1.173x-5.447	0.997
B34	B34	01/08/2025	y = 1.148x-4.099	0.999

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High Volume PM-10 Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard	Model : TE 5025A	S/N : 3440

Calibration Data				
High Volume PM-10 Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (ft^3/min)	R^2
B01	B01	01/08/2025	y = 1.114x-2.914	0.997
B02	B02	07/08/2025	y = 1.013x+1.223	0.998
B03	B03	01/08/2025	y = 1.161x-6.637	0.997
B04	B04	01/08/2025	y = 1.104x-4.741	0.999
B05	B05	01/08/2025	y = 1.139x-4.983	0.999
B06	B06	07/08/2025	y = 1.115x-4.334	0.997
B07	B07	01/08/2025	y = 1.134x-5.274	0.999
B08	B08	07/08/2025	y = 1.118x-2.369	0.999
B09	B09	01/08/2025	y = 1.043x-0.834	0.999
B10	B10	01/08/2025	y = 1.096x-2.892	0.998
B11	B11	01/08/2025	y = 1.114x-3.605	0.997
B12	B12	06/08/2025	y = 1.096x-2.892	0.998
B13	B13	04/08/2025	y = 1.112x-4.752	0.996
B14	B14	01/08/2025	y = 1.104x-3.418	0.997
B15	B15	01/08/2025	y = 1.119x-2.509	0.996
B16	B16	01/08/2025	y = 1.012x+1.776	0.996
B17	B17	04/08/2025	y = 1.094x-0.874	0.999
B18	B18	07/08/2025	y = 1.140x-5.779	0.997
B19	B19	04/08/2025	y = 1.087x-0.543	0.999
B20	B20	01/08/2025	y = 1.108x-3.582	0.997
B21	B21	01/08/2025	y = 1.138x-4.442	0.996
B22	B22	01/08/2025	y = 1.097x-3.833	0.999
B23	B23	01/08/2025	y = 1.127x-4.713	0.999
B24	B24	01/08/2025	y = 1.117x-4.019	0.999
B25	B25	01/08/2025	y = 1.137x-5.745	0.996
B26	B26	01/08/2025	y = 1.029x-0.023	0.998
B27	B27	01/08/2025	y = 1.136x-6.732	0.996
B28	B28	01/08/2025	y = 1.114x-4.531	0.999
B29	B29	01/08/2025	y = 1.126x-5.420	0.999
B30	B30	01/08/2025	y = 1.119x-4.736	0.998
B31	B31	01/08/2025	y = 1.011x+2.394	0.998
B32	B32	01/08/2025	y = 1.047x-0.534	0.999
B33	B33	01/08/2025	y = 1.052x-0.474	0.998
B34	B34	07/08/2025	y = 1.028x+2.008	0.997

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CALIBRATION REPORT

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

DATE :	10 September 2025	BRAND :	BGI	MODEL :	PQ200
NO.	PM2.5-06			SERIAL NO.	164589 (VSCC)

CALIBRATING CONDITION

Pressure	1011	mmbar	Temp.	24.6 °C	% RH 50

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

CALIBRATION SETTING

detaCal	PM2.5 AIR SAMPLER		
Flowrate Reading,L/min	Initial Flowrate Reading (Before Adj.),L/min	%Dif.	Final Flowrate Reading (After Adj.),L/min
16.70	16.65	0.299	16.70

Calibrated by : [redacted]

Approved by : [redacted]

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CALIBRATION REPORT

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

DATE :	10 September 2025	BRAND :	BGI	MODEL :	PQ200
NO.	PM2.5-07			SERIAL NO.	152099 (VSCC)

CALIBRATING CONDITION

Pressure	1011	mmbar	Temp.	24.6 °C	% RH 50

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

CALIBRATION SETTING

detaCal	PM2.5 AIR SAMPLER		
Flowrate Reading,L/min	Initial Flowrate Reading (Before Adj.),L/min	%Dif.	Final Flowrate Reading (After Adj.),L/min
16.70	16.66	0.240	16.70

Calibrated by : [redacted]

Approved by : [redacted]

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CALIBRATION REPORT

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

DATE : 10 September 2025 BRAND : BGI MODEL : PQ200

NO. PM2.5-08 SERIAL NO. 159904 (VSCC)

CALIBRATING CONDITION

Pressure 1011 mmbar Temp. 24.6 °C % RH 50

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

CALIBRATION SETTING

detaCal	PM2.5 AIR SAMPLER		
Flowrate Reading,L/min	Initial Flowrate Reading (Before Adj.),L/min	%Dif.	Final Flowrate Reading (After Adj.),L/min
16.70	16.68	0.120	16.70

Calibrated by : [redacted] Approved by : [redacted]

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CALIBRATION REPORT

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

DATE : 10 September 2025 MODEL : CCZ--30

NO. PM2.5-12 SERIAL NO. 2024EN0242003

CALIBRATING CONDITION

Pressure 1011 mmbar Temp. 24.6 °C % RH 50

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

CALIBRATION SETTING

detaCal	PM2.5 AIR SAMPLER		
Flowrate Reading,L/min	Initial Flowrate Reading (Before Adj.),L/min	%Dif.	Final Flowrate Reading (After Adj.),L/min
16.70	16.65	0.299	16.70

Calibrated by : [redacted] Approved by : [redacted]

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CALIBRATION REPORT

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

DATE : 10 September 2025 MODEL : CCZ-30

NO. PM2.5-13 SERIAL NO. 2024EN0242004

CALIBRATING CONDITION

Pressure 1011 mmbar Temp. 24.6 °C % RH 50

Calibration Method : Dry Cal Primary Flowmeter	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 : [redacted]

Approved by : [redacted]

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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					
				Actual Flow Rate (ml/min)			
				Sampling Line A		Sampling Line B	
No.	Rotameter	Date	Setting (Constant Flow) (ml/min)	Normal Condition	Standard Condition	Normal Condition	Standard Condition
B01	2 (A&B)	02/06/2025	200	200.4	200.3	200.6	200.5
B02	2 (A&B)	03/06/2025	200	200.6	200.5	200.5	200.4
B03	2 (A&B)	03/06/2025	200	200.4	200.3	199.9	199.8
B04	2 (A&B)	02/06/2025	200	200.5	200.4	200.6	200.5
B05	2 (A&B)	04/06/2025	200	199.6	199.5	200.5	200.4
B06	2 (A&B)	02/06/2025	200	200.3	200.2	200.9	200.8
B07	2 (A&B)	03/06/2025	200	200.8	200.7	200.6	200.5
B08	2 (A&B)	02/06/2025	200	200.6	200.5	200.8	200.7
B09	2 (A&B)	04/06/2025	200	200.5	200.4	199.9	199.8
B10	2 (A&B)	04/06/2025	200	199.9	199.8	200.2	200.1
B11	2 (A&B)	05/06/2025	200	200.7	200.6	200.5	200.4
B12	2 (A&B)	02/06/2025	200	199.8	199.7	200.3	200.2
B13	2 (A&B)	05/06/2025	200	199.7	199.6	200.4	200.3
B14	2 (A&B)	02/06/2025	200	200.5	200.4	200.7	200.6
B15	2 (A&B)	03/06/2025	200	200.4	200.3	199.9	199.8
B16	2 (A&B)	03/06/2025	200	200.5	200.4	200.2	200.1
B17	2 (A&B)	03/06/2025	200	199.9	199.8	200.4	200.3

Calibrated by : [redacted]

Approved by : [redacted]

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CALIBRATION REPORT

SO_2 FLUORESCENT ANALYZER

DATE :	15 September 2025	BRAND :	TELEDYNE	MODEL :	TML-60
NO.	SO_2-R07			SERIAL NO.	TRS1068

Calibrator (Dilution System)

Brand	: Teledyne	Model	: 700E
Last Cal. Date	: 28 October 2024	Serial No.	: 201-S

Reference Standard Gas

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

CALIBRATING CONDITION

Pressure	1011 mmbar	Temp.	24.6 °C	% RH	50

CALIBRATION SETTING

Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
SO_2 Span	400.0	399.6	-0.100	400.0	1.005

API Model TML-60 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	655	cc/min	650 ± 10%
PMT	103.4	mV	-20-150 with Zero Air
UV LAMP	3042.5	mV	1000-4900
STR. LGT	61.7	PPB	<100
DRK PMT	63.2	mV	-50 - 200
DRK LMP	58.0	mV	-50 - 200
HVPS	669	V	550-900 constant
DCPS	2519	mV	2500 ± 200
RCELL TEMP	50.4	°C	50 ± 1
BOX TEMP	29.2	°C	5-40
PMT TEMP	7.1	°C	7 ± 2.0
SO_2 Span Conc	400	PPB	20-20,000
SO_2 Slope	1.005	-	1.0 ± 0.3
SO_2 Offset	21.7	mV	<250
Stability at Zero	0.1	PPB	<0.2
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)

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CALIBRATION REPORT

SO_2 FLUORESCENT ANALYZER

DATE :	15 September 2025	BRAND :	TELEDYNE	MODEL :	100E
NO.	SO_2-R10			SERIAL NO.	TRS1065

Calibrator (Dilution System)

Brand	: Teledyne	Model	: 700E
Last Cal. Date	: 28 October 2024	Serial No.	: 201-S

Reference Standard Gas

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

CALIBRATING CONDITION

Pressure	1011 mmbar	Temp.	24.6 °C	% RH	50

CALIBRATION SETTING

Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.10	-	0	-
SO_2 Span	400.0	400.1	0.025	400.0	1.011

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	658	cc/min	650 ± 10%
PMT	103.3	mV	-20-150 with Zero Air
UV LAMP	3035.6	mV	1000-4900
STR. LGT	61.9	PPB	<100
DRK PMT	63.4	mV	-50 - 200
DRK LMP	58.2	mV	-50 - 200
HVPS	675	V	550-900 constant
DCPS	2528	mV	2500 ± 200
RCELL TEMP	50.2	°C	50 ± 1
BOX TEMP	29.3	°C	5-40
PMT TEMP	7.4	°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)

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CALIBRATION REPORT

SO_2 FLUORESCENT ANALYZER

DATE :	15 September 2025	BRAND :	API	MODEL :	100E
NO.	SO_2-B04			SERIAL NO.	3159

Calibrator (Dilution System)

Brand	: Teledyne	Model	: 700E
Last Cal. Date	: 28 October 2024	Serial No.	: 201-S

Reference Standard Gas

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

CALIBRATING CONDITION

Pressure	1011 mmbar	Temp.	24.6 °C	% RH	50

CALIBRATION SETTING

Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
SO_2 Span	400.0	399.8	-0.050	400.0	1.009

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	654	cc/min	650 ± 10%
PMT	103.1	mV	-20-150 with Zero Air
UV LAMP	3021.7	mV	1000-4900
STR. LGT	61.5	PPB	<100
DRK PMT	63.0	mV	-50 - 200
DRK LMP	57.9	mV	-50 - 200
HVPS	673	V	550-900 constant
DCPS	2516	mV	2500 ± 200
RCELL TEMP	50.2	°C	50 ± 1
BOX TEMP	29.1	°C	5-40
PMT TEMP	7.4	°C	7 ± 2.0
SO_2 Span Conc	400	PPB	20-20,000
SO_2 Slope	1.009	-	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)

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CALIBRATION REPORT

SO_2 FLUORESCENT ANALYZER

DATE :	15 September 2025	BRAND :	API	MODEL :	100E
NO.	SO_2-B05			SERIAL NO.	3270

Calibrator (Dilution System)

Brand	: Teledyne	Model	: 700E
Last Cal. Date	: 28 October 2024	Serial No.	: 201-S

Reference Standard Gas

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

CALIBRATING CONDITION

Pressure	1011 mmbar	Temp.	24.6 °C	% RH	50

CALIBRATION SETTING

Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.10	-	0	-
SO_2 Span	400.0	399.6	-0.100	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	28.6	in-Hg	25-35
SAMPLE FLOW	660	cc/min	650 ± 10%
PMT	103.0	mV	-20-150 with Zero Air
UV LAMP	3017.9	mV	1000-4900
STR. LGT	61.9	PPB	<100
DRK PMT	63.2	mV	-50 - 200
DRK LMP	58.1	mV	-50 - 200
HVPS	670	V	550-900 constant
DCPS	2523	mV	2500 ± 200
RCELL TEMP	50.0	°C	50 ± 1
BOX TEMP	28.9	°C	5-40
PMT TEMP	7.1	°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	21.6	mV	<250
Stability at Zero	0.1	PPB	<0.2
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)

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CALIBRATION REPORT

SO_2 FLUORESCENT ANALYZER

DATE :	15 September 2025	BRAND :	TELEDYNE	MODEL :	TML-50
NO.	SO_2-B12			SERIAL NO.	1886

Calibrator (Dilution System)

Brand	: Teledyne	Model	: 700E
Last Cal. Date	: 28 October 2024	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	399.9	-0.025	400.0	1.010

API Model TML-50 SO_2 Analyzer Check list

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	0-500
SAMPLE PRESS	28.6	in-Hg	25-35
SAMPLE FLOW	659	cc/min	650 ± 10%
PMT	103.2	mV	-20-150 with Zero Air
UV LAMP	3027.8	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	2525	mV	2500 ± 200
RCELL TEMP	50.3	°C	50 ± 1
BOX TEMP	29.2	°C	5-40
PMT TEMP	7.0	°C	7 ± 2.0
SO_2 Span Conc	400	PPB	20-20,000
SO_2 Slope	1.010	-	1.0 ± 0.3
SO_2 Offset	22.1	mV	<250
Stability at Zero	0.1	PPB	<0.2
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)

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CALIBRATION REPORT

CHEMILUMINESCENT NO / NO_2 / NO_X ANALYZER

DATE :	15 September 2025	BRAND :	API	MODEL :	200E
NO.	NOX-R07			SERIAL NO.	4468

Calibrator (Dilution System)

Brand	: Teledyne	Model	: 700E
Last Cal. Date	: 28 October 2024	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	400.2	0.050	400.0	1.012

API Model 200E NO_X Analyzer Check List

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	500 standard
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air
SAMPLE FLOW	503	cc/min	500 ± 50
OZONE FLOW	78	cc/min	80 ± 15
PMT	102.9	mV	-20 - 150
AZERO	93.6	mV	-20 - 150
HVPS	673	V	420 - 900 constant
RCELL TEMP	50.4	°C	50 ± 1
BOX TEMP	29.0	°C	8 - 48
PMT TEMP	7.3	°C	7 ± 2
MOLY TEMP	315.3	°C	315 ± 5
RCELL PRESS	8.2	IN-Hg-A	2 - 10 constant
SAMPLE PRESS	28.5	IN-Hg-A	25 - 30 constant
NO Span Conc	400	PPB	20 - 20,000
NO_x Span Conc	400	PPB	20 - 20,000
NO Slope	1.010	-	1.0 ± 0.3
NO_x Slope	1.012	-	1.0 ± 0.3
NO Offset	1.6	mV	-20 to +150
NO_x Offset	1.0	mV	-20 to 150
Stability at Zero	0.1	PPB	< 0.2
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas

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CALIBRATION REPORT

CHEMILUMINESCENT NO / NO_2 / NO_X ANALYZER

DATE : 15 September 2025 BRAND : API MODEL : 200A

NO. NOX-B01 SERIAL NO. 2368

Calibrator (Dilution System)

Brand	: Teledyne	Model	: 700E
Last Cal. Date	: 28 October 2024	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	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.10	-	0	-
NO Span	400	399.8	-0.050	400.0	1.008
NO_x Span	400	400.2	0.050	400.0	1.011

API Model 200A NO_x Analyzer Check List

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	500 standard
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air
SAMPLE FLOW	510	cc/min	500 ± 50
OZONE FLOW	79	cc/min	80 ± 15
PMT	103.2	mV	-20 - 150
AZERO	94.0	mV	-20 - 150
HVPS	671	V	420 - 900 constant
RCELL TEMP	50.2	°C	50 ± 1
BOX TEMP	29.3	°C	8 - 48
PMT TEMP	7.0	°C	7 ± 2
MOLY TEMP	315.2	°C	315 ± 5
RCELL PRESS	8.2	IN-Hg-A	2 - 10 constant
SAMPLE PRESS	28.4	IN-Hg-A	25 - 30 constant
NO Span Conc	400	PPB	20 - 20,000
NO_x Span Conc	400	PPB	20 - 20,000
NO Slope	1.008	-	1.0 ± 0.3
NO_x Slope	1.011	-	1.0 ± 0.3
NO Offset	1.5	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

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CALIBRATION REPORT

CHEMILUMINESCENT NO / NO_2 / NO_X ANALYZER

DATE : 15 September 2025 BRAND : API MODEL : 200E

NO. NOX-B07 SERIAL NO. 4338

Calibrator (Dilution System)

Brand	: Teledyne	Model	: 700E
Last Cal. Date	: 28 October 2024	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	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.10	-	0	-
NO Span	400	399.6	-0.100	400.0	1.004
NO_x Span	400	399.8	-0.050	400.0	1.008

API Model 200E NO_x Analyzer Check List

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	500 standard
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air
SAMPLE FLOW	509	cc/min	500 ± 50
OZONE FLOW	79	cc/min	80 ± 15
PMT	103.0	mV	-20 - 150
AZERO	93.7	mV	-20 - 150
HVPS	674	V	420 - 900 constant
RCELL TEMP	50.1	°C	50 ± 1
BOX TEMP	28.9	°C	8 - 48
PMT TEMP	7.2	°C	7 ± 2
MOLY TEMP	314.8	°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	1.004	-	1.0 ± 0.3
NO_x Slope	1.008	-	1.0 ± 0.3
NO Offset	1.0	mV	-20 to +150
NO_x Offset	0.7	mV	-20 to 150
Stability at Zero	0.1	PPB	< 0.2
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas

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CALIBRATION REPORT

CHEMILUMINESCENT NO / NO_2 / NO_X ANALYZER

DATE :	15 September 2025	BRAND :	API	MODEL :	200E
NO.	NOX-B11			SERIAL NO.	4467

Calibrator (Dilution System)

Brand	: Teledyne	Model	: 700E
Last Cal. Date	: 28 October 2024	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	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.10	-	0	-
NO Span	400	400.1	0.025	400.0	1.010
NO_x Span	400	400.3	0.075	400.0	1.014

API Model 200E NO_X Analyzer Check List

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	500 standard
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air
SAMPLE FLOW	508	cc/min	500 ± 50
OZONE FLOW	78	cc/min	80 ± 15
PMT	103.3	mV	-20 - 150
AZERO	94.1	mV	-20 - 150
HVPS	675	V	420 - 900 constant
RCELL TEMP	50.0	°C	50 ± 1
BOX TEMP	29.1	°C	8 - 48
PMT TEMP	7.3	°C	7 ± 2
MOLY TEMP	315.4	°C	315 ± 5
RCELL PRESS	8.3	IN-Hg-A	2 - 10 constant
SAMPLE PRESS	28.6	IN-Hg-A	25 - 30 constant
NO Span Conc	400	PPB	20 - 20,000
NO_x Span Conc	400	PPB	20 - 20,000
NO Slope	1.010	-	1.0 ± 0.3
NO_x Slope	1.014	-	1.0 ± 0.3
NO Offset	1.6	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

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CALIBRATION REPORT

CHEMILUMINESCENT NO / NO_2 / NO_X ANALYZER

DATE :	15 September 2025	BRAND :	API	MODEL :	TML-41M
NO.	NOX-B21			SERIAL NO.	N02374

Calibrator (Dilution System)

Brand	: Teledyne	Model	: 700E
Last Cal. Date	: 28 October 2024	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	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.10	-	0	-
NO Span	400	399.9	-0.025	400.0	1.009
NO_x Span	400	400.2	0.050	400.0	1.012

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	505	cc/min	500 ± 50
OZONE FLOW	78	cc/min	80 ± 15
PMT	103.1	mV	-20 - 150
AZERO	93.9	mV	-20 - 150
HVPS	670	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	314.9	°C	315 ± 5
RCELL PRESS	8.2	IN-Hg-A	2 - 10 constant
SAMPLE PRESS	28.5	IN-Hg-A	25 - 30 constant
NO Span Conc	400	PPB	20 - 20,000
NO_x Span Conc	400	PPB	20 - 20,000
NO Slope	1.009	-	1.0 ± 0.3
NO_x Slope	1.012	-	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

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-TISI 2025
CALIBRATION 0349

CERTIFICATE No : 25M2254
REFERENCE No : 76365-1

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	:	07-Mar-25
APPROVED BY	:	[redacted]
ISSUED DATE	:	13-Mar-25
RECEIVED DATE	:	07-Mar-25

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

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 : 25M2254

Calibration Report

EQUIPMENT	:	DIGITAL BALANCE	**MODEL**	:	XS105DU
MANUFACTURER	:	METTLER TOLEDO	**S/N**	:	1126422905
ID No	:	BA05/50	**RECEIVED DATE**	:	07-Mar-25
AIR PRESSURE	:	1009mbar ± 1mbar	**CALIBRATION DATE**	:	07-Mar-25
AMBIENT TEMPERATURE	:	24° C ± 1° C	**RELATIVE HUMIDITY**	:	54 %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	C02250116	28-Jan-27
2) STANDARD WEIGHT	E2	15843	C02250117	29-Jan-27

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

RESULT OF CALIBRATION : WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL
2. TARE FUNCTION : NORMAL
3. REPEATABILITY OF READING AT 120 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	0.01999	0.00001	0.000065
0.10	0.10001	-0.00001	0.000066
0.20	0.20001	-0.00001	0.000066
0.50	0.50002	-0.00002	0.000065
1.00	1.00003	-0.00003	0.000066
2.00	2.00001	-0.00001	0.000067
5.00	5.00002	-0.00002	0.000068
10.00	10.00000	0.00000	0.000070
20.00	20.00004	-0.00004	0.000078
50.00	50.0000	0.0000	0.00013
100.00	100.0001	-0.0001	0.00019
120.00	120.0002	-0.0002	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

[redacted]

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.



คุณภาพอากาศจากปล่อง

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

Console Calibration Report

Calibration Method	Critical Orifices

Calibration Data				
Console Data		Calibration Data		
No.	Serial No.	Date	y	$\Delta H_@$ (mmH_2O)
B01	1563	05/09/2025	1.004	49.67
B02	8002514	01/09/2025	1.002	49.85
B03	1503016	01/09/2025	1.005	49.77
B04	00006659	04/09/2025	0.997	49.93
B05	00007428	02/09/2025	1.003	49.51
R01	1561	01/09/2025	0.999	49.82
R02	8002513	01/09/2025	0.996	49.94
R03	1570	04/09/2025	0.998	50.02
R04	8002519	04/09/2025	1.002	49.89
R05	1503015	02/09/2025	0.996	50.10

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)

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

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	04/08/2025	0.84	0.84
B04	S	0.99	01/08/2025	0.84	0.83
B05	S	0.99	01/08/2025	0.84	0.84
B07	S	0.99	04/08/2025	0.85	0.84
B08	S	0.99	01/08/2025	0.84	0.84
B09	S	0.99	04/08/2025	0.84	0.83
B11	S	0.99	05/08/2025	0.84	0.84
B16	S	0.99	04/08/2025	0.84	0.83
B18	S	0.99	01/08/2025	0.84	0.84
B19	S	0.99	01/08/2025	0.84	0.83
B21	S	0.99	04/08/2025	0.84	0.83
B24	S	0.99	01/08/2025	0.84	0.84
B27	S	0.99	04/08/2025	0.84	0.83
B30	S	0.99	01/08/2025	0.85	0.84
B31	S	0.99	01/08/2025	0.84	0.85
B33	S	0.99	01/08/2025	0.83	0.84
B35	S	0.99	01/08/2025	0.84	0.85

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

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

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							
				Flow Rate (ml/min)						
				Flow Rate (Reading)			Actual (Q std.)			Value From Calibration Curve
No.	Brand	Model	Date	1	2	3	1	2	3	y / R^2
H-B01	Dwyer	VFB-65	02/07/2025	500	1,000	2,000	498.8	1001.4	2005.7	0.996x + 4.876 / 1.000
H-B02	Dwyer	VFB-65	02/07/2025	500	1,000	2,000	501.6	1001.3	1997.6	0.997x + 5.643 / 1.000
H-B03	Dwyer	VFB-65	03/07/2025	500	1,000	2,000	499.3	1001.9	1990.3	0.998x + 3.307 / 0.999
H-B04	Dwyer	VFB-65	04/07/2025	500	1,000	2,000	501.3	997.3	2005.9	1.000x + 1.052 / 1.000
H-B05	Dwyer	VFB-65	02/07/2025	500	1,000	2,000	501.6	998.8	2005.5	1.003x - 1.210 / 1.000
H-B06	Dwyer	VFB-65	03/07/2025	500	1,000	2,000	500.9	1001.3	1990.6	0.997x + 5.814 / 0.999
H-B07	Dwyer	VFB-65	04/07/2025	500	1,000	2,000	501.9	1001.7	2009.2	0.999x - 1.217 / 1.000
H-B08	Dwyer	VFB-65	04/07/2025	500	1,000	2,000	499.0	998.4	2006.7	1.002x - 9.084 / 0.999
H-B09	Dwyer	VFB-65	02/07/2025	500	1,000	2,000	498.8	1000.5	1998.8	1.001x - 1.402 / 1.000
H-B10	Dwyer	VFB-65	02/07/2025	500	1,000	2,000	500.2	1000.6	2001.7	0.999x + 3.178 / 1.000

[redacted]

CALIBRATION LABORATORY Co.,LTD.
2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-G353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com

CLC Accredited ISO/IEC 17025

ilac-MRA

ANAB ACCREDITED ACCREDITATION AND CALIBRATION LABORATORY ACDM-28 14

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE	VACUUM GAUGE
MANUFACTURER	HI-LIGHT
MODEL/TYPE	N/A
SERIAL NO.	N/A[64-220066-2]
CLID.NO.	212301420
JOB CONTROL NO.	240720076549

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

DATE OF RECEIVED : 19 July 2025 **DATE OF ISSUED: 24 July 2025**

The report or calibration shall not be reproduced except in full without approval of the Calib.-ation Laborator-y Co., Ltd.

Calibrated By : **Sittipong Pimdee**
Calibration Engineer

Approved By : [redacted]

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. Q24076549

CALIBRATION LABORATORY Co., LTD.
211Q-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-Q353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com
CLC Accredited ISO/IEC 17025
ilac-MRA ANAB CALIBRATION AND DIMENSIONAL MEASUREMENT ACDM-2814

REPORT OF CALIBRATION

FOR

NOMENCLATURE	VACUUM GAUGE
MANUFACTURER	HI-LIGHT
MODEL/TYPE	N/A
SERIAL NO.	N/A [64-220066-2]
DATE OF CALIBRATION	23 July 2025
DUE DATE OF CALIBRATION	23 July 2026

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 74 1B *SIN.* 8295020 with Pressure Module Model 700PD5 *SIN.* 89404505.

TRACEABILITY :

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

UNCERTAINTY :

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

CALIBRATION LABORATORY Co., LTD.
2/1Q-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-D353-4 Fax 02-578-2672 ww.w.caHaboratory.com E-mail:sale@cal-laboratory.com
CLC Accredited ISO/IEC 17025
ilac-MRA ANAB ACCREDITED CALIBRATION AND DIMENSIONAL MEASUREMENT ACDM-2814

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	0.00	0.00	0.0	0.0	0.0	0.0
-5	-17.61	-17.95	-5.2	-5.3	+0.2	+0.3
-10	-34.54	-34.54	-10.2	-10.2	+0.2	+0.2
-15	-51.13	-51.47	-15.1	-15.2	+0.1	+0.2
-20	-67.72	-68.06	-20.0	-20.1	+0.0	+0.1
-25	-84.31	-84.31	-24.9	-24.9	+0.1	+0.1
-30	-101.24	-101.24	-29.9	-29.9	+0.1	+0.1

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-28!4 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
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www.qcalibration.com

ilac-MRA NSC-TISI-TISI 2025 CALIBRATION 0349

CERTIFICATE No : 25M2254
REFERENCE No : 76365-1

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	:	07-Mar-25
APPROVED BY	:	[redacted]
ISSUED DATE	:	13-Mar-25
RECEIVED DATE	:	07-Mar-25

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

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 : 25M2254

Calibration Report

EQUIPMENT	:	DIGITAL BALANCE	**MODEL**	:	XS105DU
MANUFACTURER	:	METTLER TOLEDO	**S/N**	:	1126422905
ID No	:	BA05/50	**RECEIVED DATE**	:	07-Mar-25
AIR PRESSURE	:	1009mbar ± 1mbar	**CALIBRATION DATE**	:	07-Mar-25
AMBIENT TEMPERATURE	:	24° C ± 1° C	**RELATIVE HUMIDITY**	:	54 %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	C02250116	28-Jan-27
2) STANDARD WEIGHT	E2	15843	C02250117	29-Jan-27

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

RESULT OF CALIBRATION : WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL
2. TARE FUNCTION : NORMAL
3. REPEATABILITY OF READING AT 120 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	0.01999	0.00001	0.000065
0.10	0.10001	-0.00001	0.000066
0.20	0.20001	-0.00001	0.000066
0.50	0.50002	-0.00002	0.000065
1.00	1.00003	-0.00003	0.000066
2.00	2.00001	-0.00001	0.000067
5.00	5.00002	-0.00002	0.000068
10.00	10.00000	0.00000	0.000070
20.00	20.00004	-0.00004	0.000078
50.00	50.0000	0.0000	0.00013
100.00	100.0001	-0.0001	0.00019
120.00	120.0002	-0.0002	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

[redacted]

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. : SP25026
Pages : 1 of 4

Calibration Certificate

Equipment :	UV-VIS SPECTROPHOTOMETER
Manufacturer :	PERKINELMER
Model :	LAMBDA 25
Serial No.:	501S14123010
ID No.:	SP03/58
Calibration Mode :	WAVELENGTH ACCURACY PHOTOMETRIC ACCURACY STRAY LIGHT
Condition As Found :	GOOD
Customer :	S.P.S CONSULTING SERVICE CO., LTD. 7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN ROAD, CHOMPHON SUB-DISTRICT, CHATUCHAK DISTRICT, BANGKOK PROVINCE 10900 THAILAND.
Location :	ORGANIC LABORATORY IV
Ambient Temperature :	(22.9 ± 5) °C
Relative Humidity :	(53.7 ± 25) %
Received Date :	22 AUGUST 2025
Calibration Date :	22 AUGUST 2025
Date of Issue :	25 AUGUST 2025

Calibrated by : Nitinun Srihawan

Approved by :

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

Cert. No. : SP25026
Job No. : VC68SP0019
Pages : 2 of 4

Calibration Method :

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

Condition of this result of calibration :

1. Certified reference materials

Material	Ref. type	Cell serial No.	Cert. No.	Due Date
Holmium liquid	RM-HL	29706	126461	24/10/2026
Didymium liquid	RM-DL	28912	126462	24/10/2026
Neutral density filter	RM-1N2N3N	13877	126457	24/10/2026
Potassium dichromate solutions	RM-0204060810	14204	126497	25/10/2026
Potassium Iodide solution	-	KI-0701-001	CI-0185-24	14/05/2026

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

Result of calibration : Wavelength Accuracy

(Without adjustment)

Material	Certified Values of Reference Material (nm)	UUC* Reading (nm)	Error (nm)	Uncertainty ± (nm)	*k* Factor
RM-HL	278.13	278.21	0.08	0.16	2.00
	361.25	361.39	0.14	0.16	2.00
	467.82	467.71	-0.11	0.16	2.00
	536.56	536.50	-0.06	0.16	2.00
	640.50	640.36	-0.14	0.16	2.00
RM-DL	740.09	739.85	-0.24	0.16	2.00
	864.94	865.12	0.18	0.16	2.00

UUC* = Unit Under Calibration

Cert. No. : SP25026
Job No. : VC68SP0019
Pages : 3 of 4

Result of calibration : Photometric Accuracy

Material	Wavelength (nm)	Filter S/N	Nominal Absorbance (A)	Certified Absorbance (A)	UUC* Reading Absorbance (A)	Error (A)	Uncertainty ± (A)	*k* Factor
Neutral Density glass filter	440.0	29381	0.5	0.5443	0.5413	-0.0030	0.0043	2.00
		29914	0.7	0.7484	0.7455	-0.0029	0.0054	2.00
		29360	1.0	1.0527	1.0535	0.0008	0.0032	2.00
	465.0	29381	0.5	0.4948	0.4922	-0.0026	0.0041	2.00
		29914	0.7	0.6906	0.6877	-0.0029	0.0050	2.00
		29360	1.0	0.9695	0.9709	0.0014	0.0031	2.00
	546.1	29381	0.5	0.5090	0.5068	-0.0022	0.0036	2.00
		29914	0.7	0.6985	0.6960	-0.0025	0.0041	2.00
		29360	1.0	0.9814	0.9825	0.0011	0.0031	2.00
	590.0	29381	0.5	0.5375	0.5353	-0.0022	0.0034	2.00
		29914	0.7	0.7256	0.7231	-0.0025	0.0037	2.00
		29360	1.0	1.0213	1.0219	0.0006	0.0032	2.00
	635.0	29381	0.5	0.5223	0.5202	-0.0021	0.0033	2.00
		29914	0.7	0.6927	0.6901	-0.0026	0.0036	2.00
		29360	1.0	0.9744	0.9750	0.0006	0.0032	2.00

UUC* = Unit Under Calibration

Nichou B.

SITHIPORN associates

SITHIPORN ASSOCIATES
CALIBRATION LABORATORY

Cert. No. : SP25026
Job No. : VC68SP0019
Pages : 4 of 4

Result of calibration : Photometric Accuracy

(Without adjustment)

Material	Wavelength (nm)	Solution (mg/l)	Certified Absorbance (A)	UUC* Reading Absorbance (A)	Error (A)	Uncertainty ± (A)	*k* Factor
Potassium dichromate solutions	235.0	20	0.2415	0.2443	0.0028	0.0101	2.00
		40	0.4866	0.4871	0.0005	0.0115	2.00
		60	0.7415	0.7295	-0.0120	0.0067	2.00
		80	0.9854	0.9844	-0.0010	0.0071	2.00
		100	1.2444	1.2425	-0.0019	0.0073	2.00

UUC* = Unit Under Calibration

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

Resolution of Wavelength Mode	0.1 nm
Resolution of Photometric Mode	0.001 A
Parameter Setting	
Measurement Mode	Wavelength, Absorbance
Wavelength Scan	190 nm - 1100 nm
Scanning Speed	7.5 nm/min
Band width(Wavelength)	1.0
Band width(Vis)	1.0
Band width(Uv)	1.0

Stray Light** UUC* Reading at 220.0 nm	
Transimission T(%)	**Absorbance(A)**
0.020	3.7032

**Specific Acceptance :
Transmission ≤ 1.0 T(%), Absorbance ≥ 2.0 A
**Stray light not TISI Accredited

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

End of Calibration Certificate

บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
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Calibration Report

Non-Dispersive Infrared CO Analyzer

Date :	01 September 2025	Brand :	API	Model :	300E
No.	CO-B02			Serial No.	965

Calibrator (Dilution System)

Brand	: Teledyne	Model	: 700E
Last Cal. Date	: 28 October 2024	Serial No.	: 201-5

Reference Standard Gas

Standard Gas	: Carbon Monoxide (CO)			Cylinder No.	: D711839
Certified Date	: 14 March 2024	Expired Date	: 14 March 2032	Cylinder Conc.	: 4,580 ppm

Calibrating Condition

Pressure	1011	mmbar	Temp.	24.6	°C	% RH	50

Calibration Setting

Span	Initial Reading (Before Adj.), PPM			Final Reading (After Adj.), PPM
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response
Zero	0	0.10	-	0
CO Span	40.00	39.96	-0.100	40.00

API Model 300E CO Analyzer Check List

Parameter	Observed Value	Units	Nominal Range
Range	50	PPM	0-1000 ppm
Stability	0.10	PPM	< 1 ppm With Zero Air
CO Measure	4016.5	mV	2500-4800 mV
CO Reference	3948.4	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	806	CC/Min	800 ± 10%
Sample Temperature	48.3	°C	48 ± 4
Bench Temperature	48.1	°C	48 ± 2
Wheel Temperature	68.5	°C	68 ± 2
Box Temperature	30.6	°C	Ambient Temp + 7 ± 10
Photo-Drive	3036.9	mV	250 mV to 4750 mV
Slope	1.017	-	1.0 ± 0.3
Offset	0.2	-	0 ± 0.3

[redacted]

ระดับเสียง

Request No. 21-68/0220 **MTC No.** EEL. BP. 44/0268

CALIBRATION CERTIFICATE

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

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

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

Instrument Calibrated :

Description : Sound Calibrator

Manufacturer : ACO

Model : 2127

Serial No. : 130006

Ambient Environment

Temperature : (23 + 3) °C

Relative Humidity : (50 ± 15) %

Ambient Pressure : (101.325 ± 1.500) kPa

Standards used :

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

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

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

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

Date of Receipt : 19 Feb. 2025

Date of Calibration : 21 Feb. 2025

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

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0220 **MTC No.** EEL. BP. 44/0268

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

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

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

1. Sound Pressure Level

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

2. Frequency

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

3. Total Distortion

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

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by : [redacted]

Approved b [redacted]

Electr [redacted] **ratory**

Industrial Metrology and Testing Service Centre

Date of Calibration : 21 Feb. 2025

Date of Issue : 24 Feb. 2025

Ref : 20112680219007390O1

End of Certificate

The results relate only to the items tested/calibrated or value assigned.
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Noise B_454/25

Sound Level Meter Calibration Report

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

Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-B33	ACO	6236	00182015	10 September 2025	93.9	93.9
ACO-B41	ACO	6236	00192032	10 September 2025	93.7	93.9
ACO-R40	ACO	6236	00192052	10 September 2025	93.8	93.9
ACO-R52	ACO	6236	00192064	10 September 2025	93.9	93.9
ACO-C1-B01	ACO	6238	00223038	10 September 2025	93.7	93.9
ACO-C1-B02	ACO	6238	00223039	10 September 2025	93.8	93.9
ACO-C1-B03	ACO	6238	00223040	10 September 2025	93.8	93.9
ACO-C1-B04	ACO	6238	00223041	10 September 2025	93.9	93.9
ACO-C1-B05	ACO	6238	00223042	10 September 2025	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.81 ± 0.10 dB	

[redacted]

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0220 **MTC No.** EEL. BP. 45/0268

CALIBRATION CERTIFICATE

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

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

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

Instrument Calibrated :

Description : Acoustic Calibrator

Manufacturer : Cirrus Research plc

Model : CR:515

Serial No. : 92002

Ambient Environment

Temperature : (23 + 3) °C

Relative Humidity : (50 ± 15) %

Ambient Pressure : (101.325 ± 1.500) kPa

Standards used :

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

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

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

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

Date of Receipt : 19 Feb. 2025

Date of Calibration : 21 Feb. 2025

The results relate only to the items tested/calibrated or value assigned.
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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0220 **MTC No.** EEL. BP. 45/0268

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

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

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

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	93.98	-0.02	± 0.10	±0.40 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	1000.1	0.1	± 1.5	±1.0%

3. Total Distortion

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	0.65	± 0.50	±3.0%

Note : 1. No adjustment.
2. The calibrator pressure correction was not included.
3. The microphone volume correction was not included.

Calibrated [redacted] **Approved** [redacted]

Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Date of Calibration : 21 Feb. 2025
Date of Issue : 24 Feb. 2025
Ref : 2011268021900739002

End of Certificate 2 / 2

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Noise B_454_1/25

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	21 February 2025
		Due Date	21 February 2026

Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
CR-B07	Cirrus	CR161B	G301167	10 September 2025	94.0	94.0
CR-B08	Cirrus	CR161B	G301397	10 September 2025	94.0	94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.98 ± 0.10 dB	

[redacted]

คุณภาพน้ำ

CALIBRATION LABORATORY CO., LTD.
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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[CD 05/65]
CLID. NO.	:	272300452
JOB CONTROL NO.	:	250204013412
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 : 04 February 2025 DATE OF ISSUED : 06 February 2025

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

Calibrated By : Sukgasem Seehanart
Wenick Inchaisri
Calibration Engineer

Approved By : [redacted]

06 February 2025

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

Certificate No. Q25013412

F3-011-05/12-23

@clccalibration

CALIBRATION LABORATORY CO., LTD.
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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[CD 05/65]
DATE OF CALIBRATION	:	05 February 2025

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 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 F201 S/N. 016168/09.
6. IPRT, ASL Model T100-250-1D S/N. PO106346-1-13.

Certificate No. Q25013412

F3-011-05/12-23

@clccalibration

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. Q24120999, Due Date 26 November 2025.

5. The measurements are traceable to International System of Units (SI) , through Thailand Institute of Scientific and Technological Research (TISTR). Certificate No. PSL-T 0424/67, Due Date 21 February 2025.

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

Certificate No. TT-0035-24, Due Date 01 March 2025.

UNCERTAINTY :

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

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

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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	*k* Factor
*84.00 µS/cm	84.02 µS/cm [Cell Constant 0.548589]	± 1.00 µS/cm	2,00
1414.0 µS/cm	1414 µS/cm [Cell Constant 0.548589]	± 21.0 µS/cm	2,00
12.83 mS/cm	12.84 mS/cm [Cell Constant 0.548589]	± 0.19 mS/cm	2,00

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

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

***2. TEMPERATURE RESULT**

Immersion depth (mm)	Actual Temperature (°C)	DUC Reading (°C)	Correction (°C)	Uncertainty ± (°C)
100	25.01	24.9	+0.11	0.07

Technical Note. Type of sensor : Conductivity Probe

Probe Ø 12 mm

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

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

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 ANSI National Accreditation Board ACCREDITED ISO/IEC 17025 CALIBRATION AND DIMENSIONAL MEASUREMENT ACDM-2814

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE	:	pH METER
MANUFACTURER	:	HANNA
MODEL / TYPE	:	HI3512/HI1332/HI7662-T
SERIAL NO.	:	08685754/11250B7M/092806BN[PH04/56]
CLID. NO.	:	272501562
JOB CONTROL NO.	:	250617070523
CALIBRATION SERVICE	:	☑ IN-LABORATORY ☐ ON-SITE

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

DATE OF RECEIVED : 17 June 2025 DATE OF ISSUED : 20 June 2025

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

Calibrated By : Sukgasem Seehanart
Wenick Inchaisri
Calibration Engineer





Approved By :
Authorized Signatory
20 June 2025

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

Certificate No. Q25070523

@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

CLC Accredited ISO/IEC 17025

ilac-MRA

ANAB ANSI National Accreditation Board ACCREDITED ISO/IEC 17025 CALIBRATION AND DIMENSIONAL MEASUREMENT ACDM-2814

REPORT OF CALIBRATION

FOR

NOMENCLATURE	:	pH METER
MANUFACTURER	:	HANNA
MODEL / TYPE	:	HI3512/HI1332/HI7662-T
SERIAL NO.	:	08685754/11250B7M/092806BN[PH04/56]
DATE OF CALIBRATION	:	18 June 2025

ENVIRONMENT CONDITIONS :

Temperature : (25 ± 2.5) °C Relative Humidity : (50 ± 15) % RH

PROCEDURE USED :

This instrument was calibrated under procedure No. **CLC-CPCH-01** [pH Meter]. The calibration was performed by direct measurement with Certified Reference Material (CRM).

This instrument was calibrated under procedure No. **CLC-CPTH-04** [Temperature] based on **ASTM E 644-04** as calibration guidelines. The calibration was performed by using Calibration Bath, Precision Thermometer and IPRT which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. pH Standard Solution, NIMT TRM CODE TRM-S-2003, TRM CODE TRM-S-2007.
2. pH Standard Solution, Control Company Catalog Number 06664260,11754256, Lot Number CC787362.
3. Calibration Bath, Kambic Model OB-22/2 ULT S/N. 17115653.
4. Precision Thermometer, ASL Model F250 S/N. 1334023800.
5. IPRT, Wika Model CTP5000-250-D S/N. PO00043543-1-10-1.

Certificate No. Q25070523

@clccalibration

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI) , through National Institute of Metrology (Thailand). Lot Number. 080124 , 120124. Due Date 23 January 2026.

2. The measurements are traceable to International System of Units (SI) , through Control Company. Certificate No. 4281-14495731 , Due Date 27 September 2025.

3. The measurements are traceable to International System of Units (SI) , through Calibration Laboratory Co., Ltd. Certificate No. Q24120999, Due Date 26 November 2025.

4. The measurements are traceable to International System of Units (SI) , through Thailand Institute of Scientific and Technological Research (TISTR). Certificate No. PSL-T 1042/67, Due Date 16 October 2025.

5. The measurements are traceable to International System of Units (SI) , through National Institute of Metrology (Thailand). Certificate No. TT-0146-24, Due Date 28 October 2025.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor complies with the table which for a normal distribution corresponds to a coverage probability of approximately 95 %. It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

CALIBRATION LABORATORY CO., LTD.
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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 CALIBRATION AND DIMENSIONAL MEASUREMENT ACDM-2814

CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment ( ) adjustment

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

CALIBRATION DATA

1. pH METER RESULT @ 25 °C

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

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

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

2. TEMPERATURE RESULT

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

Technical Note. Type of sensor : Thermistor

Probe ∅ 3 mm

Materials : Metal Sheath.

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

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

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

End of Certificate

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-TISI 7025 CALIBRATION 0049

CERTIFICATE No : 25M2256
REFERENCE No : 76365-3

Certificate of Calibration

EQUIPMENT	:	DIGITAL BALANCE
MANUFACTURER	:	SARTORIUS
MODEL	:	BSA224S-CW
SERIAL No	:	36591843
ID No	:	BA09/61
CONDITION AS RECEIVED	:	USED ITEM
SUBMITTED BY	:	S.P.S. CONSULTING SERVICE CO., LTD. 7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD., JOMPOL, CHATUCHAK, BANGKOK 10900
CALIBRATED BY	:	ATSAWIN Y.
CALIBRATION DATE	:	07-Mar-25
APPROVED BY	:	[redacted]
ISSUED DATE	:	13-Mar-25
RECEIVED DATE	:	07-Mar-25

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

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 : 25M2256

Calibration Report

EQUIPMENT	:	DIGITAL BALANCE	**MODEL**	:	BSA224S-CW
MANUFACTURER	:	SARTORIUS	**S/N**	:	36591843
ID No	:	BA09/61	**RECEIVED DATE**	:	07-Mar-25
AIR PRESSURE	:	1009mbar ± 1mbar	**CALIBRATION DATE**	:	07-Mar-25
AMBIENT TEMPERATURE	:	24° C ± 1° C	**RELATIVE HUMIDITY**	:	52 %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	C02250116	28-Jan-27
2) STANDARD WEIGHT	E2	15843	C02250117	29-Jan-27

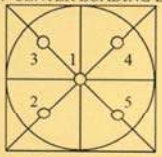
3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
   - NATIONAL INSTITUTE OF METROLOGY (THAILAND)

RESULT OF CALIBRATION : WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL
2. TARE FUNCTION : NORMAL
3. REPEATABILITY OF READING AT 200 g WAS 0.000071 g
4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (± g)
0.00	0.0000	0.0000	0.00012
0.10	0.1000	0.0000	0.00012
0.20	0.2000	0.0000	0.00012
0.50	0.5000	0.0000	0.00012
1.00	1.0000	0.0000	0.00012
2.00	2.0000	0.0000	0.00012
5.00	5.0000	0.0000	0.00012
10.00	10.0000	0.0000	0.00012
20.00	20.0001	-0.0001	0.00012
50.00	50.0000	0.0000	0.00014
100.00	100.0001	-0.0001	0.00019
200.00	200.0001	-0.0001	0.00032

5. OFF CENTER LOADING ERROR



POINT	READING (g)
1	100.0000
2	100.0000
3	100.0000
4	100.0000
5	100.0000
OFF-CENTER LOADING	0.0000

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

END OF CALIBRATION REPORT

[redacted]

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-W015C

Calibration Date :	18 Mar 25	Model	: YSI 5000
Submitted by :	S.P.S CONSULTING SERVICE CO.,LTD	S/N	: 15B100751
	7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol,	Probe	: YSI 5010
	Chatuchak, Bangkok, Thailand 10900	S/N	: 22D100097
		ID NO.	: -
Avg Room Temp :	20 °C	Air Temp ref	: S/N. F8065C26
Avg Water Temp :	20 °C	Barometric ref	: S/N. F8065C26
Air Pressure :	760.00 mmHg	Water Temp ref	: -
Salinity :	0 ppt	ID NO.	HS001
		Technician	: Kittipong M.

Calibration Details

Calibration Point	100% air sat. (@20 °C, DO = 9.09 mg/l)	(status)		(status)
Measurement 1 (mg/l)	9.08	(PASS)	-	-
Measurement 2 (mg/l)	9.08	(PASS)	-	-
Measurement 3 (mg/l)	9.08	(PASS)	-	-
Measurement 4 (mg/l)	9.07	(PASS)	-	-
Measurement 5 (mg/l)	9.07	(PASS)	-	-
Measurement 6 (mg/l)	9.07	(PASS)	-	-
Measurement 7 (mg/l)	9.07	(PASS)	-	-
Measurement 8 (mg/l)	9.07	(PASS)	-	-
Measurement 9 (mg/l)	9.07	(PASS)		-
Measurement 10 (mg/l)	9.07	(PASS)	-	-
Mean Measurement	9.07	mg/l	-	-
Inaccuracy	0.02	mg/l	-	-
Overall Status	(PASS)			

Manufacturer Specification

Accuracy = +/- 0.02 mg/l

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

[redacted]

(Kittipong Maekwong)

[redacted]

QUALITY CALIBRATION CO., LTD.

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

CERTIFICATE No : 25T0521
REFERENCE No : 75853-2

Certificate of Calibration

EQUIPMENT	:	COD REACTOR
MANUFACTURER	:	HACH
MODEL	:	DRB 200
SERIAL No	:	15110C0498
ID No	:	CRB 06/59
CONDITION AS RECEIVED	:	USED ITEM
SUBMITTED BY	:	S.P.S. CONSULTING SERVICE CO., LTD. 7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD., JOMPOL, CHATUCHAK, BANGKOK 10900
CALIBRATED BY	:	CHAICHARN CH.
CALIBRATION DATE	:	03-Feb-25
APPROVED BY	:	[redacted]
ISSUED DATE	:	03-Feb-25
RECEIVED DATE	:	15-Jan-25

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

CERTIFICATE No : 25T0521 PAGE : 2 OF 2

Calibration Report

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

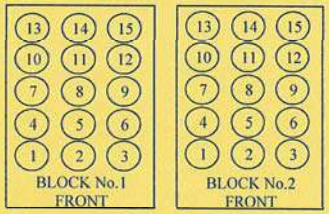
CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BY DIRECT MEASURMENT METHOD WITH CALIBRATED THERMOCOUPLE TYPE K UNDER NO LOAD CONDITION. THE THERMOCOUPLES WERE PLACED ON POINTS AND LOCATED AS THE PICTURE .
2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) DATA LOGGER WITH TC TYPE K	HYDRA 2635A	7301307	24T6467	26-Jun-25

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

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



Block No.		1	2
Calibration Point (°C)		150	150
Controller temperature (°C)		145	145
Indicating Temperature		145	145
Measured Temperature (° C) at Spread Locations	1	150.23	150.64
	2	149.73	149.78
	3	150.29	150.29
	4	150.04	150.49
	5	150.09	150.51
	6	150.74	150.67
	7	149.97	150.66
	8	150.76	150.57
	9	150.54	150.51
	10	149.44	149.94
	11	150.12	150.64
	12	149.93	150.33
	13	149.19	149.82
	14	148.96	149.70
	15	149.09	149.79
Uncertainty of Measurement(± °C)		0.88	0.88

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT EXCLUDED TEMPERATURE UNIFORMITY OF THE CHAMBER
NOTE 2 : LOCATION 10 WAS REFERENCE LOCATION.
NOTE 3 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.
THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY
COVERAGE FACTOR k =2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.
END OF CALIBRATION REPORT

Copy

WO-11540201/2025

PerkinElmer

MAINTENANCE AND TEST CERTIFICATE MODEL
OPTIMA 5300DV

Customer :	S.P.S.Consulting Service Co.,Ltd	Date Tested:	December 18, 2025
		Recommendation Recertification	
Address :	7 Soi Phaholyothin 24	Period	6 Months
	Paholyothin Road	Recertification Due:	June 28, 2026
	Jompol Chatuchak, Bangkok 1090	Date Last Certified:	July 1, 2025
User Name:	K.Phenpha Viphasthawat	Visit Number:	2of 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	November 30, 2026
Wavecal Solution	N058-2152	July 30, 2026
VIS Wavecal solution	N930-2946	August 30, 2026
Instrument Cal. STD4	N930-0221	November 30, 2026
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

PerkinElmer

MAINTENANCE AND TEST CERTIFICATE MODEL

OPTIMA 5300DV

SERIAL NUMBER 077C7042401 **DATE TESTED** December 18, 2025

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

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

WO-11540201/2025

PerkinElmer

MAINTENANCE AND TEST CERTIFICATE MODEL

OPTIMA 5300DV

SERIAL NUMBER : 077C7042401 **DATE TESTED :** December 18, 2025

PARAMETER			SPECIFICATION		FINAL VALUE	
Spectral Resolution : UV	**As**	**193.696 nm**	≤ 0.007		0.00530	
	Ni	**231.604 nm**	≤ 0.008		0.00708	
	Ni	**341.476 nm**	≤ 0.012		0.00776	
Spectral Resolution : VIS	**La**	**408.672 nm**	≤ 0.020		0.01614	
	Ba	**455.403 nm**	≤ 0.025		0.02377	
Precision						
	As	**193.656 nm**	% RSD	< 1.0	0.67	%
	Zn	**213.856 nm**	% RSD	< 1.0	0.62	%
	Mn	**257.610 nm**	% RSD	< 1.0	0.88	%
	La	**379.478 nm**	% RSD	< 1.0	0.63	%
	Ba	**455.403 nm**	% RSD	< 1.0	0.65	%
	Ba	**493.408 nm**	% RSD	< 1.0	0.45	%
Detection Limits : Axial	**Tl**	**190.080 nm**	3(sd)		3.21	ppb
	As	**193.696 nm**	3(sd)		6.06	ppb
	Pb	**220.353 nm**	3(sd)		0.92	ppb
Detection Limits : Radial	**As**	**193.696 nm**	3(sd)		17.35	ppb
	Zn	**213.856 nm**	3(sd)		1.79	ppb
	Mn	**257.610 nm**	3(sd)		0.18	ppb
	La	**379.478 nm**	3(sd)		0.76	ppb
	Ba	**455.403 nm**	3(sd)		0.11	ppb
	Ba	**493.408 nm**	3(sd)		0.56	ppb
BEC : Axial (IB X 500)/(IS-IB)	**Cd**	**226.502 nm**	≤ 150 ppb		40.52	
BEC : Radial (IB X 1000)/(IS-IB)	**Mn**	**257.610 nm**	≤ 45 ppb		42.33	

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

WO-11540201/2025

PerkinElmer

MAINTENANCE AND TEST CERTIFICATE MODEL

OPTIMA 5300DV

SERIAL NUMBER 077C7042401 **DATE TESTED** December 18, 2025

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

Aut

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

SITHIPORN associates

ilac-MRA

NSC-TISI-TIS 17025
CALIBRATION 0394

Cert. No. : SP25026
Pages : 1 of 4

Calibration Certificate

Equipment :	UV-VIS SPECTROPHOTOMETER
Manufacturer :	PERKINELMER
Model :	LAMBDA 25
Serial No.:	501S14123010
ID No.:	SP03/58
Calibration Mode :	WAVELENGTH ACCURACY PHOTOMETRIC ACCURACY STRAY LIGHT
Condition As Found :	GOOD
Customer :	S.P.S CONSULTING SERVICE CO., LTD. 7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN ROAD, CHOMPHON SUB-DISTRICT, CHATUCHAK DISTRICT, BANGKOK PROVINCE 10900 THAILAND.
Location :	ORGANIC LABORATORY IV
Ambient Temperature :	(22.9 ± 5) °C
Relative Humidity :	(53.7 ± 25) %
Received Date :	22 AUGUST 2025
Calibration Date :	22 AUGUST 2025
Date of Issue :	25 AUGUST 2025

Calibrated by :

Approved by :

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

Cert. No. : SP25026
Job No. : VC68SP0019
Pages : 2 of 4

Calibration Method :

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

Condition of this result of calibration :

1. Certified reference materials

Material	Ref. type	Cell serial No.	Cert. No.	Due Date
Holmium liquid	RM-HL	29706	126461	24/10/2026
Didymium liquid	RM-DL	28912	126462	24/10/2026
Neutral density filter	RM-1N2N3N	13877	126457	24/10/2026
Potassium dichromate solutions	RM-0204060810	14204	126497	25/10/2026
Potassium Iodide solution	-	KI-0701-001	CI-0185-24	14/05/2026

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

Result of calibration : Wavelength Accuracy

(Without adjustment)

Material	Certified Values of Reference Material (nm)	UUC* Reading (nm)	Error (nm)	Uncertainty ± (nm)	*k* Factor
RM-HL	278.13	278.21	0.08	0.16	2.00
	361.25	361.39	0.14	0.16	2.00
	467.82	467.71	-0.11	0.16	2.00
	536.56	536.50	-0.06	0.16	2.00
	640.50	640.36	-0.14	0.16	2.00
RM-DL	740.09	739.85	-0.24	0.16	2.00
	864.94	865.12	0.18	0.16	2.00

UUC* = Unit Under Calibration

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CALIBRATION LABORATORY

Cert. No. : SP25026
Job No. : VC68SP0019
Pages : 3 of 4

Result of calibration : Photometric Accuracy

Material	Wavelength (nm)	Filter S/N	Nominal Absorbance (A)	Certified Absorbance (A)	UUC* Reading Absorbance (A)	Error (A)	Uncertainty ± (A)	*k* Factor
Neutral Density glass filter	440.0	29381	0.5	0.5443	0.5413	-0.0030	0.0043	2.00
		29914	0.7	0.7484	0.7455	-0.0029	0.0054	2.00
		29360	1.0	1.0527	1.0535	0.0008	0.0032	2.00
	465.0	29381	0.5	0.4948	0.4922	-0.0026	0.0041	2.00
		29914	0.7	0.6906	0.6877	-0.0029	0.0050	2.00
		29360	1.0	0.9695	0.9709	0.0014	0.0031	2.00
	546.1	29381	0.5	0.5090	0.5068	-0.0022	0.0036	2.00
		29914	0.7	0.6985	0.6960	-0.0025	0.0041	2.00
		29360	1.0	0.9814	0.9825	0.0011	0.0031	2.00
	590.0	29381	0.5	0.5375	0.5353	-0.0022	0.0034	2.00
		29914	0.7	0.7256	0.7231	-0.0025	0.0037	2.00
		29360	1.0	1.0213	1.0219	0.0006	0.0032	2.00
	635.0	29381	0.5	0.5223	0.5202	-0.0021	0.0033	2.00
		29914	0.7	0.6927	0.6901	-0.0026	0.0036	2.00
		29360	1.0	0.9744	0.9750	0.0006	0.0032	2.00

UUC* = Unit Under Calibration

Michou B.

SITHIPORN associates

SITHIPORN ASSOCIATES
CALIBRATION LABORATORY

Cert. No. : SP25026
Job No. : VC68SP0019

Result of calibration : Photometric Accuracy

(Without adjustment)

Material	Wavelength (nm)	Solution (mg/l)	Certified Absorbance (A)	UUC* Reading Absorbance (A)	Error (A)	Uncertainty ± (A)	*k* Factor
Potassium dichromate solutions	235.0	20	0.2415	0.2443	0.0028	0.0101	2.00
		40	0.4866	0.4871	0.0005	0.0115	2.00
		60	0.7415	0.7295	-0.0120	0.0067	2.00
		80	0.9854	0.9844	-0.0010	0.0071	2.00
		100	1.2444	1.2425	-0.0019	0.0073	2.00

UUC* = Unit Under Calibration

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

Resolution of Wavelength Mode 0.1 nm
Resolution of Photometric Mode 0.001 A
Parameter Setting
Measurement Mode Wavelength, Absorbance
Wavelength Scan 190 nm - 1100 nm
Scanning Speed 7.5 nm/min
Band width(Wavelength) 1.0
Band width(Vis) 1.0
Band width(Uv) 1.0

Stray Light** UUC* Reading at 220.0 nm	
Transimission T(%)	**Absorbance(A)**
0.020	3.7032

**Specific Acceptance :
Transmission ≤ 1.0 T(%), Absorbance ≥ 2.0 A
**Stray light not TISI Accredited

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

End of Calibration Certificate

คุณภาพอากาศในสถานประกอบการ

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Personal Pump Calibration Report

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

Environmental Conditions

Temperature	.	25	± 3	°c
Pressure	.	1010	± 15	mmbar

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

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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

Rotameter Data			Calibration Data							
No.	Brand	Model	Date	Flow Rate (ml/min)					Value From Calibration Curve	
				Flow Rate (Reading)			Actual (Q std.)				
				1	2	3	1	2	3	y	R^2
H-B01	Dwyer	VFB-65	02/07/2025	500	1,000	2,000	498.8	1001.4	2005.7	0.996x + 4.876	1.000
H-B02	Dwyer	VFB-65	02/07/2025	500	1,000	2,000	501.6	1001.3	1997.6	0.997x + 5.643	1.000
H-B03	Dwyer	VFB-65	03/07/2025	500	1,000	2,000	499.3	1001.9	1990.3	0.998x + 3.307	0.999
H-B04	Dwyer	VFB-65	04/07/2025	500	1,000	2,000	501.3	997.3	2005.9	1.000x + 1.052	1.000
H-B05	Dwyer	VFB-65	02/07/2025	500	1,000	2,000	501.6	998.8	2005.5	1.003x - 1.210	1.000
H-B06	Dwyer	VFB-65	03/07/2025	500	1,000	2,000	500.9	1001.3	1990.6	0.997x + 5.814	0.999
H-B07	Dwyer	VFB-65	04/07/2025	500	1,000	2,000	501.9	1001.7	2009.2	0.999x - 1.217	1.000
H-B08	Dwyer	VFB-65	04/07/2025	500	1,000	2,000	499.0	998.4	2006.7	1.002x - 9.084	0.999
H-B09	Dwyer	VFB-65	02/07/2025	500	1,000	2,000	498.8	1000.5	1998.8	1.001x - 1.402	1.000
H-B10	Dwyer	VFB-65	02/07/2025	500	1,000	2,000	500.2	1000.6	2001.7	0.999x + 3.178	1.000

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Rotameter Calibration Report (For Personal Pump Low Flow Adjust)

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

Rotameter Data			Calibration Data							
No.	Brand	Model	Date	Flow Rate (ml/min)						Value From Calibration Curve	
				Flow Rate (Reading)			Actual (Q std.)				
				1	2	3	1	2	3	y	R^2
L-801	Dwyer	VFA-21	02/07/2025	50	100	200	50.3	100.2	201.1	1.001x + 0.271	1.000
L-802	Dwyer	VFA-21	02/07/2025	50	100	200	50.5	100.3	202.2	0.996x + 1.427	1.000
L-803	Dwyer	VFA-21	03/07/2025	50	100	200	50.2	101.5	199.1	1.000x + 0.166	1.000
L-804	Dwyer	VFA-21	04/07/2025	50	100	200	50.9	99.3	201.4	0.997x + 1.377	0.999
L-805	Dwyer	VFA-21	02/07/2025	50	100	200	50.1	101.7	199.9	0.996x + 1.540	1.000
L-806	Dwyer	VFA-21	03/07/2025	50	100	200	50.8	99.0	201.6	0.999x + 0.969	0.999
L-807	Dwyer	VFA-21	04/07/2025	50	100	200	49.9	101.2	200.6	1.002x + 0.347	1.000
L-808	Dwyer	VFA-21	04/07/2025	50	100	200	50.5	99.7	199.8	1.001x - 0.048	1.000
L-809	Dwyer	VFA-21	02/07/2025	50	100	200	50.7	99.9	199.3	0.997x + 1.056	0.999
L-810	Dwyer	VFA-21	02/07/2025	50	100	200	49.8	99.2	199.6	0.999x - 0.559	1.000

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Personal Pump Calibration Report

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

Environmental Conditions

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

Personal Pump Data				Calibration Data									
No.	Brand	Model	Serial No.	Date	Flow Rate (ml/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R^2
B41	SKC	224-PCXR4	612669	01/10/2025	1,000	1,500	2,000	1,010	1,508	2,009	1.000x + 2.612	0.999
B42	SKC	224-PCXR4	626041	02/10/2025	1,000	1,500	2,000	1,004	1,494	1,994	0.997x + 1.344	1.000
B43	SKC	224-PCXR4	034636	01/10/2025	1,000	1,500	2,000	998	1,505	2,002	1.001x - 5.177	1.000
B44	SKC	224-PCXR8	529341	01/10/2025	1,000	1,500	2,000	999	1,496	1,998	0.996x + 0.909	1.000
B45	SKC	224-PCXR8	529594	01/10/2025	1,000	1,500	2,000	996	1,510	1,992	1.005x - 11.543	1.000
B46	SKC	224-PCXR8	566743	01/10/2025	1,000	1,500	2,000	1,003	1,488	1,997	0.994x + 3.717	1.000
B47	SKC	224-PCXR8	566747	01/10/2025	1,000	1,500	2,000	1,004	1,500	1,993	0.996x + 2.230	1.000
B48	SKC	224-PCXR8	566753	01/10/2025	1,000	1,500	2,000	1,002	1,501	1,991	1.000x - 4.116	0.999
B49	SKC	224-PCXR8	566780	01/10/2025	1,000	1,500	2,000	995	1,502	1,990	0.997x - 1.978	1.000
B50	SKC	224-PCXR8	500400	02/10/2025	1,000	1,500	2,000	997	1,503	2,001	1.004x - 10.178	1.000
B51	SKC	224-PCXR8	500363	01/10/2025	1,000	1,500	2,000	1,001	1,502	1,993	0.995x + 2.848	1.000
B52	SKC	224-PCXR8	093186	03/10/2025	1,000	1,500	2,000	996	1,510	1,999	1.005x - 12.252	0.999
B53	SKC	224-PCXR8	707670	03/10/2025	1,000	1,500	2,000	1,002	1,496	2,004	1.003x - 8.791	1.000
B54	SKC	224-PCXR3	509821	03/10/2025	1,000	1,500	2,000	999	1,501	1,995	0.999x - 2.090	1.000
B55	SKC	224-PCXR3	510710	02/10/2025	1,000	1,500	2,000	1,002	1,503	2,006	1.007x - 13.250	0.999
B56	SKC	224-PCXR3	511450	01/10/2025	1,000	1,500	2,000	995	1,505	1,997	1.002x - 7.594	1.000
B57	SKC	224-PCXR3	510798	02/10/2025	1,000	1,500	2,000	998	1,500	1,994	0.999x - 7.163	0.999
B58	SKC	224-PCXR3	509852	03/10/2025	1,000	1,500	2,000	1,002	1,494	1,996	0.993x + 6.485	1.000
B59	SKC	224-PCXR3	509862	01/10/2025	1,000	1,500	2,000	1,006	1,505	1,998	0.996x + 5.117	1.000
B60	SKC	224-PCXR3	512655	02/10/2025	1,000	1,500	2,000	1,004	1,501	2,003	1.010x - 14.223	0.999
B61	SKC	224-PCXR3	503915	03/10/2025	1,000	1,500	2,000	993	1,495	1,994	0.999x - 4.942	1.000
B62	SKC	224-PCXR3	505975	03/10/2025	1,000	1,500	2,000	995	1,500	2,005	1.009x - 16.396	1.000
B63	SKC	224-PCXR3	511432	03/10/2025	1,000	1,500	2,000	996	1,497	1,991	0.998x - 3.171	1.000
B64	SKC	224-PCXR3	508302	03/10/2025	1,000	1,500	2,000	1,008	1,506	1,998	0.992x + 8.667	0.999
B65	SKC	224-PCXR3	508310	03/10/2025	1,000	1,500	2,000	1,006	1,492	2,003	1.000x - 9.355	1.000
B66	SKC	224-PCXR3	509861	03/10/2025	1,000	1,500	2,000	994	1,496	1,998	0.997x - 0.275	1.000
B67	SKC	224-PCXR3	506295	01/10/2025	1,000	1,500	2,000	997	1,505	2,001	1.004x - 10.258	1.000
B68	SKC	224-PCXR3	505872	03/10/2025	1,000	1,500	2,000	998	1,512	1,992	0.999x - 3.554	0.999
B69	SKC	224-PCXR3	508375	01/10/2025	1,000	1,500	2,000	997	1,489	1,996	0.997x - 2.309	1.000
B70	SKC	224-PCXR3	510623	03/10/2025	1,000	1,500	2,000	1,001	1,496	1,991	0.992x + 7.131	1.000
B71	SKC	224-PCXR3	508367	03/10/2025	1,000	1,500	2,000	999	1,498	1,995	0.994x + 6.433	1.000
B72	SKC	224-PCXR3	505977	03/10/2025	1,000	1,500	2,000	996	1,507	1,999	1.003x - 7.490	1.000
B73	SKC	224-PCXR3	512606	03/10/2025	1,000	1,500	2,000	1,004	1,503	2,003	1.001x - 5.285	0.999
B74	SKC	224-PCXR3	505993	01/10/2025	1,000	1,500	2,000	1,006	1,501	1,997	0.993x + 8.232	1.000
B75	SKC	224-PCXR3	509820	02/10/2025	1,000	1,500	2,000	1,005	1,494	1,995	0.997x - 2.979	0.999
B76	SKC	224-PCXR3	509811	02/10/2025	1,000	1,500	2,000	996	1,503	1,999	1.005x - 10.613	1.000
B77	SKC	224-PCXR3	508301	01/10/2025	1,000	1,500	2,000	1,003	1,490	1,998	0.994x + 4.694	1.000
B78	SKC	224-PCXR3	510677	01/10/2025	1,000	1,500	2,000	1,004	1,492	1,997	0.995x + 4.036	1.000
B79	SKC	224-PCXR3	510920	01/10/2025	1,000	1,500	2,000	1,008	1,504	2,006	1.006x - 9.588	0.999

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

Rotameter Calibration Report (For Personal Pump High Flow Adjust)

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

Rotameter Data			Calibration Data							
No.	Brand	Model	Date	Flow Rate (ml/min)						Value From Calibration Curve	
				Flow Rate (Reading)			Actual (Q std.)				
				1	2	3	1	2	3	y	R^2
H-B01	Dwyer	VFB-65	01/10/2025	500	1,000	2,000	502.3	998.1	1996.9	0.999x + 2.995	1.000
H-B02	Dwyer	VFB-65	01/10/2025	500	1,000	2,000	501.2	998.9	1998.1	0.998x + 4.159	1.000
H-B03	Dwyer	VFB-65	01/10/2025	500	1,000	2,000	500.4	999.5	2000.3	1.000x - 1.574	0.999
H-B04	Dwyer	VFB-65	01/10/2025	500	1,000	2,000	499.5	1000.6	1999.5	0.999x + 0.880	1.000
H-B05	Dwyer	VFB-65	01/10/2025	500	1,000	2,000	499.1	1001.3	2001.6	1.001x - 7.095	0.999
H-B06	Dwyer	VFB-65	01/10/2025	500	1,000	2,000	499.4	999.8	1994.1	1.000x + 2.760	1.000
H-B07	Dwyer	VFB-65	02/10/2025	500	1,000	2,000	501.0	999.4	2000.7	0.997x + 1.623	1.000
H-B08	Dwyer	VFB-65	01/10/2025	500	1,000	2,000	499.9	1001.7	2002.8	0.998x - 1.887	1.000
H-B09	Dwyer	VFB-65	02/10/2025	500	1,000	2,000	499.3	999.2	1996.6	0.999x + 1.428	0.999
H-B10	Dwyer	VFB-65	03/10/2025	500	1,000	2,000	498.7	1001.1	1997.8	0.996x + 6.669	1.000

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

Rotameter Calibration Report (For Personal Pump Low Flow Adjust)

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

Rotameter Data			Calibration Data							
No.	Brand	Model	Date	Flow Rate (ml/min)						Value From Calibration Curve	
				Flow Rate (Reading)			Actual (Q std.)				
				1	2	3	1	2	3	y	R^2
L-B01	Dwyer	VFA-21	01/10/2025	50	100	200	50.7	99.8	199.6	1.000x + 0.067	1.000
L-B02	Dwyer	VFA-21	01/10/2025	50	100	200	50.2	99.4	198.7	1.001x - 1.181	0.999
L-B03	Dwyer	VFA-21	01/10/2025	50	100	200	50.8	99.2	201.5	1.002x + 0.053	1.000
L-B04	Dwyer	VFA-21	01/10/2025	50	100	200	49.7	101.6	200.8	1.001x + 0.344	1.000
L-B05	Dwyer	VFA-21	01/10/2025	50	100	200	50.5	100.4	201.6	0.998x + 0.225	0.999
L-B06	Dwyer	VFA-21	01/10/2025	50	100	200	50.1	100.5	201.8	1.003x - 0.103	1.000
L-B07	Dwyer	VFA-21	02/10/2025	50	100	200	50.6	100.8	201.3	0.998x + 0.877	1.000
L-B08	Dwyer	VFA-21	01/10/2025	50	100	200	49.8	101.3	198.9	1.000x - 0.165	1.000
L-B09	Dwyer	VFA-21	02/10/2025	50	100	200	50.1	99.6	200.7	1.002x - 0.766	0.999
L-B10	Dwyer	VFA-21	03/10/2025	50	100	200	50.2	100.2	201.2	1.000x - 0.164	1.000

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-TISI 2025 CALIBRATION 0349

CERTIFICATE No : 25M2254
REFERENCE No : 76365-1

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	:	07-Mar-25
APPROVED BY	:	[redacted] PONGSAK J.
ISSUED DATE	:	13-Mar-25
RECEIVED DATE	:	07-Mar-25

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

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

Calibration Report

EQUIPMENT	:	DIGITAL BALANCE	**MODEL**	:	XS105DU
MANUFACTURER	:	METTLER TOLEDO	**S/N**	:	1126422905
ID No	:	BA05/50	**RECEIVED DATE**	:	07-Mar-25
AIR PRESSURE	:	1009mbar ± 1mbar	**CALIBRATION DATE**	:	07-Mar-25
AMBIENT TEMPERATURE	:	24° C ± 1° C	**RELATIVE HUMIDITY**	:	54 %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	C02250116	28-Jan-27
2) STANDARD WEIGHT	E2	15843	C02250117	29-Jan-27

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

RESULT OF CALIBRATION : WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL
2. TARE FUNCTION : NORMAL
3. REPEATABILITY OF READING AT 120 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	0.01999	0.00001	0.000065
0.10	0.10001	-0.00001	0.000066
0.20	0.20001	-0.00001	0.000066
0.50	0.50002	-0.00002	0.000065
1.00	1.00003	-0.00003	0.000066
2.00	2.00001	-0.00001	0.000067
5.00	5.00002	-0.00002	0.000068
10.00	10.00000	0.00000	0.000070
20.00	20.00004	-0.00004	0.000078
50.00	50.0000	0.0000	0.00013
100.00	100.0001	-0.0001	0.00019
120.00	120.0002	-0.0002	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

[redacted]

ระดับความร้อนในสถานประกอบการ

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบเครื่องมือวัด.com

Certificate of Calibration

Certificate Number : SPR25100063-10 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 32		
Serial Number	:	TPA100010		
ID. Number	:	B12		
Environmental Conditions				
Ambient Temperature	:	23 °C ± 2 °C	Received Date	: 06 Oct 2025
Relative Humidity	:	50 % ± 15 %	Calibration Date	: 29 Oct 2025
Location of Calibration	:	In-Lab	Recommend Due Date	: 29 Oct 2026
Calibration Procedure	:	SP-CPT-04-13	Date of Issue	: 30 Oct 2025

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 : [redacted]

Approved by [redacted]

SPM A Trescal SP Metrology System (Thailand) Co., Ltd.

Authorized Signatory

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบเครื่องมือวัด.com

Calibration Report

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
THERMO-HYGROMETER	5020A	A47046	TMU2500342	29 Jan 2026
Temp & Humidity Test Chamber	TEMI1500-01/SD/N/N/	S7110ZL742 1014	SPR25040010-13	20 Apr 2026

Traceability

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

NA - NA Caltechnologies Co., Ltd.

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

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบเครื่องมือวัด.com

Result of Calibration

Certificate Number : SPR25100063-10

Temperature Accuracy in the Measurement. (WET)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.019	30.1	0.081	0.20
35.0	35.013	35.1	0.087	0.20
40.0	40.009	40.0	-0.009	0.21

Temperature Accuracy in the Measurement. (DRY)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.022	30.1	0.078	0.20
35.0	35.016	35.1	0.084	0.20
40.0	40.010	40.0	-0.010	0.21

Temperature Accuracy in the Measurement. (GLOVE)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.024	30.1	0.076	0.20
35.0	35.019	35.1	0.081	0.20
40.0	40.011	40.1	0.089	0.21

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 B_595_1

Heat Stress WBGT Meter Verification Report					
Verification Data					
Heat Stress WBGT Meter No.	: B12	Verification Date	: 13 December 2025		
Brand	: Quest Technologies	Ambient Temp.	: 24.5	°C	
Model	: QUESTemp°32	Barometric Pressure	: 1011	mmbar	
Serial No.	: TPA100010	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

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบเครื่องมือวัด.com

Certificate of Calibration

Certificate Number : SPR25100063-7 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	:	TEF050029		
ID. Number	:	B17		

Environmental Conditions

Ambient Temperature	:	23 °C ± 2 °C	Received Date	:	06 Oct 2025
Relative Humidity	:	50 % ± 15 %	Calibration Date	:	21 Oct 2025
Location of Calibration	:	In-Lab	Recommend Due Date	:	21 Oct 2026
Calibration Procedure	:	SP-CPT-04-13	Date of Issue	:	22 Oct 2025

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 b [redacted] Approve [redacted]

SPM A Trescal SP Metrology System (Thailand) Co., Ltd.

Authorized Signatory

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบเครื่องมือวัด.com

Calibration Report

Certificate Number : SPR25100063-7 Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
THERMO-HYGROMETER	5020A	A47046	TMU2500342	29 Jan 2026
Temp & Humidity Test Chamber	TEMI1500-01/SD/N/N/	S7110ZL742 1014	SPR25040010-13	20 Apr 2026

Traceability

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

NA - NA Caltechnologies Co., Ltd.

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

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
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Result of Calibration

Certificate Number : SPR25100063-7

Temperature Accuracy in the Measurement. (WET)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.007	29.9	-0.107	0.20
35.0	35.009	34.9	-0.109	0.20
40.0	40.005	39.9	-0.105	0.21

Temperature Accuracy in the Measurement. (DRY)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.007	30.2	0.193	0.20
35.0	35.009	35.2	0.191	0.20
40.0	40.005	40.2	0.195	0.21

Temperature Accuracy in the Measurement. (GLOVE)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.007	30.0	-0.007	0.20
35.0	35.009	34.9	-0.109	0.20
40.0	40.005	39.9	-0.105	0.21

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 B_595_2

Heat Stress WBGT Meter Verification Report

Verification Data

Heat Stress WBGT Meter No.	:	B17	Verification Date	:	13 December 2025
Brand	:	Quest Technologies	Ambient Temp.	:	24.5 °C
Model	:	QUESTemp°34	Barometric Pressure	:	1011 mmbar
Serial No.	:	TEF050029	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	69.1	0.2	± 0.5

UUC* = UNIT UNDER CALIBRATION

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company

Certificate of Calibration

Certificate Number : SPR25110089-4

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 : TPH050047

ID. Number : B31

Environmental Conditions

Ambient Temperature	: 23 °C ± 2 °C	Received Date	: 07 Nov 2025
Relative Humidity	: 50 % ± 15 %	Calibration Date	: 01 Dec 2025
Location of Calibration	: In-Lab	Recommend Due Date	: 01 Dec 2026
Calibration Procedure	: SP-CPT-04-13	Date of Issue	: 02 Dec 2025

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 [redacted]

Approved by [redacted]

SPM
A Trescal
SP Metrology System (Thailand) Co., Ltd.

Authorized Signatory

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบเครื่องมือวัด.com

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company

Calibration Report

Certificate Number : SPR25110089-4

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
THERMO-HYGROMETER	5020A	A47046	TMU2500342	29 Jan 2026
Temp & Humidity Test Chamber	TEMI1500-01/SD/N/N/	S7110ZL742 1014	SPR25040010-13	20 Apr 2026

Traceability

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

NA - NA Caltechnologies Co., Ltd.

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

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Result of Calibration

Certificate Number : SPR25110089-4 Page : 3 of 3

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

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.006	29.5	-0.506	0.20
35.0	35.009	34.6	-0.409	0.20
40.0	40.008	39.5	-0.508	0.21

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

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.006	29.5	-0.506	0.20
35.0	35.009	34.6	-0.409	0.20
40.0	40.008	39.6	-0.408	0.21

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

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.006	29.6	-0.406	0.20
35.0	35.009	34.7	-0.309	0.20
40.0	40.008	39.7	-0.308	0.21

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 B_406_1

Heat Stress WBGT Meter Verification Report

Verification Data

Heat Stress WBGT Meter No.	:	B31	Verification Date	:	16 August 2025
Brand	:	Quest Technologies	Ambient Temp.	:	24.5 °C
Model	:	QUESTemp°32	Barometric Pressure	:	1011 mmbar
Serial No.	:	TPH050047	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	69.2	0.1	± 0.5

UUC* = UNIT UNDER CALIBRATION

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ID LINE : IEC17025

Certificate of Calibration

Certificate Number : SPR25030358-2 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 32		
Serial Number	:	TPH050015		
ID. Number	:	B32		
Environmental Conditions				
Ambient Temperature	:	23 °C ± 2 °C	Received Date	: 19 Mar 2025
Relative Humidity	:	50 % ± 15 %	Calibration Date	: 22 Mar 2025
Location of Calibration	:	In-Lab	Recommend Due Date	: 22 Mar 2026
Calibration Procedure	:	SP-CPT-04-13	Date of Issue	: 23 Mar 2025

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 [redacted]

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ID LINE : IEC17025

Calibration Report

Certificate Number : SPR25030358-2 Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Humidity Chamber	TH-80S	N/A	SPR25010173-14	30 Jan 2026
THERMO-HYGROMETER	5020A	A47046	TMU2500342	29 Jan 2026

Traceability

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

SP-FM-04-15 rev.0

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ID LINE : IEC17025

Result of Calibration

Certificate Number : SPR25030358-2

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

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.015	29.9	-0.115	0.20
35.0	35.012	34.9	-0.112	0.20
40.0	40.016	39.9	-0.116	0.20

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

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.015	30.0	-0.015	0.20
35.0	35.012	35.0	-0.012	0.20
40.0	40.016	40.0	-0.016	0.20

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

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.015	30.2	0.185	0.20
35.0	35.012	35.2	0.188	0.20
40.0	40.016	40.2	0.184	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 -

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Heat B_406_2

Heat Stress WBGT Meter Verification Report					
Verification Data					
Heat Stress WBGT Meter No.	: B32	Verification Date	: 16 August 2025		
Brand	: Quest Technologies	Ambient Temp.	: 24.5	°C	
Model	: QUESTemp°32	Barometric Pressure	: 1011	mmbar	
Serial No.	: TPH050015	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					