

ภาคผนวกที่ 4

เอกสารสอบเทียบความถูกต้องของเครื่องมือ

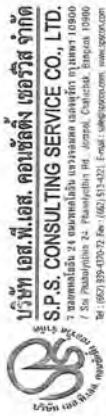
**ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง
และเครื่องมือตรวจวิเคราะห์คุณภาพสิ่งแวดล้อม**

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
1. คุณภาพอากาศในบรรยากาศ		
CO	Serial No. 704, 171-S, 926737615 Serial No. 171-S, 1352, 926737615	Serial No. 704, 171-S, 926737615 Serial No. 171-S, 1352, 926737615
SO ₂	Serial No. 76, 43C-69604-304, 1310957747 Serial No. 3415, 3430, 1310957747	Serial No. 76, 43C-69604-304, 1310957747 Serial No. 3415, 3430, 1310957747
NO ₂	Serial No. 769, 4410, CM13090047 Serial No. 2285, 4468, CM13090047	Serial No. 769, 4410, CM13090047 Serial No. 2285, 4468, CM13090047
TSP	High Volume Air Sampler Blower & Recorder No. R02, R03, R04 High Volume Air Sampler Blower & Recorder No. B04, R02, R09	Digital Balance
THC	Serial No. 6F3AC3V4, NM7K7YND Serial No. 6F3AC3V4, NM7K7YND	Serial No. 6F3AC3V4, NM7K7YND Serial No. 6F3AC3V4, NM7K7YND
PM ₁₀	High Volume PM ₁₀ Air Sampler Blower & Recorder No. R01, R03, R08 High Volume PM10 Air Sampler Blower & Recorder No. B10, R04, R07,	Digital Balance
2. คุณภาพอากาศจากปล่องระบาย		
TSP	Console No. R03, R04 Pitot Tube No. B45, B48	Digital Balance
NO _x	Vacuum Gauge	Spectrophotometer
SO ₂	Personal Pump SKC No. B09, B57 Rotameter No. H-R02, R04	-
CO	Personal Pump SKC No. B70, B78 Rotameter No. H-R02, R04	CO Analyzer No. B02
H ₂ S	Personal Pump SKC No. B08, B77 Rotameter No. H-R02, R04	-
NH ₃	Console No. R03, R04 Pitot Tube No. B45, B48	Ion Chromatography
3. คุณภาพน้ำทิ้ง		
Temperature	-	Thermometer
pH	-	pH Meter
Total Suspended Solids	-	Digital Balance
COD	-	COD Reactor
Grease & Oil	-	Digital Balance

**ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง
และเครื่องมือตรวจวิเคราะห์คุณภาพสิ่งแวดล้อม (ต่อ)**

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
4. ระดับเสียงภายนอกโครงการ L _{eq} 24 hr	Acoustic Calibrator Sound Level Meter No. ST-CIB08, ACO-C1-B04	-
5. ระดับเสียงภายในโรงงาน L _{eq} 8 hr	Acoustic Calibrator Sound Level Meter No. ACO-R51, R52	-
TWA	Acoustic Calibrator Sound Level Meter No. ACO-R50, R52	-
6. ระดับความร้อนในสภาวะประกอบการ WBGT	Heat Stress WBGT Meter	-

คุณภาพอากาศในบรรยากาศ



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
7 ซอย ปทุมวัน 24 ถนนปทุมวัน แขวงปทุมวัน เขตปทุมวัน 10000
Tel: (062) 559-020-75 Fax: (062) 511-421 Email: info@sps.com www.sps.com

Calibration Report									
Non-Dispersive Infrared CO Analyzer									
Date :	10 August 2025	Brand :	API	Model :	500E				
No.	CO-R01			Serial No.	704				
Calibrator (Dilution System)									
Brand :	Teledyne			Model :	700				
Last Cal. Date :	29 October 2024			Serial No. :	421				
Reference Standard Gas									
Standard Gas :	Carbon Monoxide (CO)			Cylinder No. :	0711839				
Certified Date :	14 March 2024			Expired Date :	14 March 2032	Cylinder Conc. :	4580	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	%Diff	Analyzer Response					
Zero	0	0.10	-	0					
CO Span	40.00	39.92	-0.200	40.00					
API Model 300E CO Analyzer Check List									
Parameter	Observed Value	Units	Normal Range						
Range	50	PPM	0-1000 ppm						
Stability	0.10	PPM	± 1 ppm With Zero Air						
CO Measure	4013.8	mV	2500-4800 mV						
CO Reference	3947.5	mV	2500-4800 mV						
Measure/Reference Ratio	1.179	-	1.1 ± 1.3 W/Zero Air						
Sample Pressure	28.4	in-Hg-A	-2" - Ambient Absolute Pressure						
Sample Flow	608	CC/Min	800 ± 10%						
Sample Temperature	48.4	°C	48 ± 4						
Bench Temperature	48.2	°C	48 ± 2						
Wheel Temperature	68.5	°C	68 ± 2						
Box Temperature	30.9	°C	Ambient Temp ± 7 ± 10						
Photo-Drive	3035.2	mV	250 mV to 4750 mV						
Slope	1.017	-	1.0 ± 0.3						
Offset	0.2	-	0 ± 0.3						

Calibrated by : Wong A. (Mr. Kasem Sinaphon)

Approved by : Juthana S. (Mr. Yuthana Thendarnit)



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Calibration Report									
Non-Dispersive Infrared CO Analyzer									
Date :	10 August 2025	Brand :	API	Model :	500E				
No.	CO-R02			Serial No.	171-S				
Calibrator (Dilution System)									
Brand :	Teledyne			Model :	700				
Last Cal. Date :	29 October 2024			Serial No. :	421				
Reference Standard Gas									
Standard Gas :	Carbon Monoxide (CO)			Cylinder No. :	0711839				
Certified Date :	14 March 2024			Expired Date :	14 March 2032	Cylinder Conc. :	4580	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	%Diff	Analyzer Response					
Zero	0	-0.10	-	0					
CO Span	40.00	40.05	0.125	40.00					
API Model 300E CO Analyzer Check List									
Parameter	Observed Value	Units	Normal Range						
Range	50	PPM	0-1000 ppm						
Stability	0.10	PPM	± 1 ppm With Zero Air						
CO Measure	4014.3	mV	2500-4800 mV						
CO Reference	3948.1	mV	2500-4800 mV						
Measure/Reference Ratio	1.179	-	1.1 ± 1.3 W/Zero Air						
Sample Pressure	28.5	in-Hg-A	-2" - Ambient Absolute Pressure						
Sample Flow	810	CC/Min	800 ± 10%						
Sample Temperature	48.5	°C	48 ± 4						
Bench Temperature	48.3	°C	48 ± 2						
Wheel Temperature	68.4	°C	68 ± 2						
Box Temperature	30.7	°C	Ambient Temp ± 7 ± 10						
Photo-Drive	3037.3	mV	250 mV to 4750 mV						
Slope	1.017	-	1.0 ± 0.3						
Offset	0.2	-	0 ± 0.3						

Calibrated by : Wong A. (Mr. Kasem Sinaphon)

Approved by : Juthana S. (Mr. Yuthana Thendarnit)



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Calibration Report									
Non-Dispersive Infrared CO Analyzer									
Date : 09 November 2023	Brand : API	Model : 300E							
No. CO-882		Serial No. 171/5							
Calibrator (Dilution System)									
Brand : API	Model : 700								
Last Cal. Date : 01 September 2023	Serial No. 911								
Reference Standard Gas									
Standard Gas : Carbon Monoxide (CO)	Cylinder No. : 0711839								
Certified Date : 14 March 2024	Expired Date : 14 March 2032	Cylinder Conc. : 4.350 ppm							
Calibrating Condition									
Pressure : 1011 mmbar	Temp. : 24.5 °C	% RH : 48							
Calibration Setting									
Span	Initial Reading (Before Adj.) PPM	Final Reading (After Adj.) PPM							
Set Point	Expected Concentration	Analyzer Response	%OF						
Zero	0	-0.10	0						
CO Span	40.00	40.05	0.125						
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	4016.2	mV	2500-4800 mV						
CO Reference	3943.6	mV	2500-4800 mV						
Measure/Reference Ratio	1.180		1.1-1.3 WZero Air						
Sample Pressure	26.5	in Hg-A	-2"± Ambient Absolute Pressure						
Sample Flow	808	CC/Min	800 ± 10%						
Sample Temperature	48.4	°C	48 ± 4						
Bench Temperature	48.2	°C	48 ± 2						
Wheel Temperature	68.3	°C	68 ± 2						
Box Temperature	30.8	°C	Ambient Temp ± 7, 10						
Photo-Drive	3655.7	mV	250 mV to 4750 mV						
Slope	1.017		1.0 ± 0.3						
Offset	0.3		0 ± 0.3						

Calibrated by : Wu A. (Ms Ksiam Siraporn)

Approved by : Yuthana S. (Ms Nubana Thanasarn)



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Calibration Report									
Non-Dispersive Infrared CO Analyzer									
Date : 09 November 2023	Brand : API	Model : 300E							
No. CO-803		Serial No. 1352							
Calibrator (Dilution System)									
Brand : API	Model : 700								
Last Cal. Date : 01 September 2023	Serial No. 911								
Reference Standard Gas									
Standard Gas : Carbon Monoxide (CO)	Cylinder No. : 0711839								
Certified Date : 14 March 2024	Expired Date : 14 March 2032	Cylinder Conc. : 4.350 ppm							
Calibrating Condition									
Pressure : 1011 mmbar	Temp. : 24.5 °C	% RH : 48							
Calibration Setting									
Span	Initial Reading (Before Adj.) PPM	Final Reading (After Adj.) PPM							
Set Point	Expected Concentration	Analyzer Response	%OF						
Zero	0	0.11	0						
CO Span	40.00	40.07	0.175						
API Model 300E CO Analyzer Check List									
Parameter	Observed Value	Units	Nominal Range						
Range	50	PPM	0-1000 ppm						
Stability	0.10	PPM	+1 ppm With Zero Air						
CO Measure	4015.6	mV	2500-4800 mV						
CO Reference	3947.3	mV	2500-4800 mV						
Measure/Reference Ratio	1.180		1.1-1.3 WZero Air						
Sample Pressure	26.6	in Hg-A	-2"± Ambient Absolute Pressure						
Sample Flow	807	CC/Min	800 ± 10%						
Sample Temperature	48.8	°C	48 ± 4						
Bench Temperature	48.2	°C	48 ± 2						
Wheel Temperature	68.4	°C	68 ± 2						
Box Temperature	30.9	°C	Ambient Temp ± 7, 10						
Photo-Drive	3648.3	mV	250 mV to 4750 mV						
Slope	1.017		1.0 ± 0.3						
Offset	0.2		0 ± 0.3						

Calibrated by : Wu A. (Ms Ksiam Siraporn)

Approved by : Yuthana S. (Ms Nubana Thanasarn)

CALIBRATION REPORT			
SO ₂ FLUORESCENT ANALYZER			
DATE : 10 August 2025	BRAND : AIA	MODEL : 110E	
NO. SO ₂ 809		SERIAL NO. 76	
Calibrator (Dilution System)			
Brand : Teledyne		Model : 700	
Last Cal. Date : 29 October 2024		Serial No. : 421	
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 : 49	
CALIBRATION SETTING			
Span	Initial Reading (Before Adj.) PPB	Final Reading (After Adj.) PPB	
Set Point	Expected Concentration	%DRF	
Zero	0	-0.10	
SO ₂ Span	400.0	0.025	
Nominal Range : 0-500			
SAMPLE PRESS. : 28.6 in-Hg			
SAMPLE FLOW : 655 cc/min			
PMT : 103.4 mV			
UV LAMP : 3038.1 mV			
STR LGT : 61.5 PPB			
DRK PMT : 62.9 mV			
DRK LMP : 57.6 mV			
HVP5 : 670 V			
DCPS : 2524 mV			
ACELL TEMP : 50.1 °C			
BOX TEMP : 29.0 °C			
PMT TEMP : 7.2 °C			
SO ₂ Span Conc : 400 PPB			
SO ₂ Slope : 1.010			
SO ₂ Offset : 21.7 mV			
Stability at Zero : 0.1 PPB			
Stability at Span : 0.2 PPB			

Calibrated by : Wu A Approved by : Yuthana J
(Mr. Kasem Sinaphon) (Ms. Yuthana Thanarat)

CALIBRATION REPORT			
SO ₂ FLUORESCENT ANALYZER			
DATE : 10 August 2025	BRAND : AIA	MODEL : 43C	
NO. SO ₂ 810		SERIAL NO. 43C-69605-864	
Calibrator (Dilution System)			
Brand : Teledyne		Model : 700	
Last Cal. Date : 29 October 2024		Serial No. : 421	
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	%DRF	
Zero	0	0.10	
SO ₂ Span	400.0	0.050	
Nominal Range : 0-500			
CHAMBER TEMP : 44.5 °C			
PRESSURE : 728.6 mm Hg			
FLOW : 1.0 LPM			

Calibrated by : Wu A Approved by : Yuthana J
(Mr. Kasem Sinaphon) (Ms. Yuthana Thanarat)

CALIBRATION REPORT									
SO ₂ FLUORESCENT ANALYZER									
DATE : 09 November 1968	BRAND : API	MODEL : 100E							
NO. SO ₂ -806	SERIAL NO. 3415								
Calibrator (Dilution System)									
Brand : API	Model : 700								
Last Cal. Date : 01 September 2025	Serial No. : 911								
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 : 40							
CALIBRATION SETTING									
Span	Initial Reading (Before Adj.) PPB		Final Reading (After Adj.) PPB						
Set Point	Expected Concentration	Analyzer Response	% Off	Analyzer Response					
Zero	0	0.10	-	0					
SO ₂ Span	400.0	400.4	0.100	400.0					
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	653	cc/min	650 ± 10%						
PMT	103.2	mV	-20-150 with Zero Air						
UV LAMP	3078.3	mV	1000-4900						
STR LGT	61.3	PPB	<100						
DRK PMT	62.9	mV	-50 - 200						
DRK LAMP	57.8	mV	-50 - 200						
HVPS	673	V	550-900 constant						
DCPS	2518	mV	2500 ± 200						
RECELL TEMP	50.1	°C	50 ± 1						
BOX TEMP	29.3	°C	5-40						
PMT TEMP	7.0	°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	21.9	mV	<250						
Stability at Zero	0.1	PPB	<0.2						
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)						

Calibrated by : Wu A.
(Mr. Kaseam Sinphong)

Approved by : Yuthana S.
(Mr. Yuthana Thanatrakul)

CALIBRATION REPORT									
SO ₂ FLUORESCENT ANALYZER									
DATE : 09 November 1968	BRAND : API	MODEL : 100E							
NO. SO ₂ -806	SERIAL NO. 3415								
Calibrator (Dilution System)									
Brand : API	Model : 700								
Last Cal. Date : 01 September 2025	Serial No. : 911								
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 : 40							
CALIBRATION SETTING									
Span	Initial Reading (Before Adj.) PPB		Final Reading (After Adj.) PPB						
Set Point	Expected Concentration	Analyzer Response	% Off	Analyzer Response					
Zero	0	0.10	-	0					
SO ₂ Span	400.0	400.2	0.050	400.0					
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	103.2	mV	-20-150 with Zero Air						
UV LAMP	2892.1	mV	1000-4900						
STR LGT	61.5	PPB	<100						
DRK PMT	62.8	mV	-50 - 200						
DRK LAMP	57.6	mV	-50 - 200						
HVPS	674	V	550-900 constant						
DCPS	2517	mV	2500 ± 200						
RECELL TEMP	50.1	°C	50 ± 1						
BOX TEMP	29.3	°C	5-40						
PMT TEMP	7.0	°C	7 ± 2.0						
SO ₂ Span Conc.	400	PPB	20-20,000						
SO ₂ Slope	1.008		1.0 ± 0.3						
SO ₂ Offset	21.9	mV	<250						
Stability at Zero	0.1	PPB	<0.2						
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)						

Calibrated by : Wu A.
(Mr. Kaseam Sinphong)

Approved by : Yuthana S.
(Mr. Yuthana Thanatrakul)

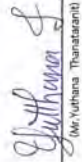
CALIBRATION REPORT									
CHEMILUMINESCENT NO ₂ / NO _x ANALYZER									
DATE : 10 August 2025	BRAND : API	MODEL : 200E							
NO. NOK-001	SERIAL NO. 769								
Calibrator (Dilution System)									
Brand : TeleDyne	Model : 700								
Last Cal. Date : 29 October 2024	Serial No. : 421								
Reference 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	% Diff	Analyzer Response	Slope					
Zero	0	-0.10	0	0					
NO Span	400	0.025	400.0	1.010					
NO ₂ Span	400	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	506	cc/min	500 ± 50						
OZONE FLOW	78	cc/min	80 ± 15						
PMT	103.4	mV	-20 - 150						
AZERO	94.1	mV	-20 - 150						
HVPS	671	V	420 - 900 constant						
RECELL TEMP	50.5	°C	50 ± 1						
BOX TEMP	29.8	°C	8 - 48						
PMT TEMP	7.2	°C	7 ± 2						
MOLY TEMP	315.2	°C	315 ± 5						
RECELL PRESS	8.8	IN-Hg-A	2 - 10 constant						
SAMPLE PRESS	28.6	IN-Hg-A	25 - 30 constant						
NO Span Conc	400	PPB	20 - 20,000						
NO ₂ Span Conc	400	PPB	20 - 20,000						
NO Slope	1.010	-	1.0 ± 0.3						
NO ₂ Slope	1.014	-	1.0 ± 0.3						
NO Offset	1.7	mV	-20 to +150						
NO ₂ Offset	1.0	mV	-20 to 150						
Stability at Zero	0.1	PPB	< 0.2						
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span g/m						

Calibrated by Wu A Approved by Yuthana J.
(Mr. Kasem Sinaphon) (Ms. Yuthana Thanasarnit)

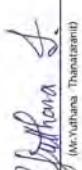
CALIBRATION REPORT									
CHEMILUMINESCENT NO ₂ / NO _x ANALYZER									
DATE : 10 August 2025	BRAND : API	MODEL : 200E							
NO. NOK-003	SERIAL NO. 0310								
Calibrator (Dilution System)									
Brand : TeleDyne	Model : 700								
Last Cal. Date : 29 October 2024	Serial No. : 421								
Reference 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	% Diff	Analyzer Response	Slope					
Zero	0	0.10	0	0					
NO Span	400	0.025	400.0	1.009					
NO ₂ Span	400	0.075	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	511	cc/min	500 ± 50						
OZONE FLOW	79	cc/min	80 ± 15						
PMT	103.3	mV	-20 - 150						
AZERO	94.1	mV	-20 - 150						
HVPS	670	V	420 - 900 constant						
RECELL TEMP	50.2	°C	50 ± 1						
BOX TEMP	29.1	°C	8 - 48						
PMT TEMP	7.3	°C	7 ± 2						
MOLY TEMP	315.2	°C	315 ± 5						
RECELL PRESS	8.3	IN-Hg-A	2 - 10 constant						
SAMPLE PRESS	28.4	IN-Hg-A	25 - 30 constant						
NO Span Conc	400	PPB	20 - 20,000						
NO ₂ Span Conc	400	PPB	20 - 20,000						
NO Slope	1.009	-	1.0 ± 0.3						
NO ₂ Slope	1.012	-	1.0 ± 0.3						
NO Offset	1.7	mV	-20 to +150						
NO ₂ Offset	1.0	mV	-20 to 150						
Stability at Zero	0.1	PPB	< 0.2						
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span g/m						

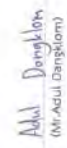
Calibrated by Wu A Approved by Yuthana J.
(Mr. Kasem Sinaphon) (Ms. Yuthana Thanasarnit)

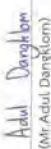
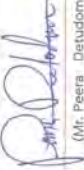
CALIBRATION REPORT									
CHEMILUMINESCENT NO ₂ / NO _x ANALYZER									
DATE :	09 November 2025	BRAND :	API	MODEL :	200E				
NO.	NOX-R02	SERIAL NO.	2385						
Calibrator (Dilution System)									
Brand :	API	Model :	700						
Last Cal. Date :	01 September 2025	Serial No. :	911						
Reference Standard Gas									
Standard Gas :	Nitric Oxide (NO)	Cylinder No. :	A007265V						
Certified Date :	05 January 2023	Expired Date :	05 January 2026	Cylinder Conc. :	46.8 ppm				
CALIBRATING CONDITION									
Pressure :	1011 mmbar	Temp. :	24.5 °C	% RH :	49				
CALIBRATION SETTING									
Span	Initial Reading (Before Adj.) PPB	%Diff	Analyzer Response	Slope	Final Reading (After Adj.) PPB				
Set Point	Expected Concentration	Analyzer Response	%Diff	Slope					
Zero	0	-0.10	-	0					
NO Span	410	399.9	-0.025	400.0	1.005				
NO _x Span	600	400.3	0.075	400.0	1.007				
API Model 200E NO _x Analyzer Check List									
Test Values	Observed Value	Units	Nominal Range						
RANGE	500	PPB	500 standard						
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air						
SAMPLE FLOW	509	cc/min	500 ± 50						
OZONE FLOW	78	cc/min	80 ± 15						
PM1	103.8	mV	-20 - 150						
AZERO	94.2	mV	-20 - 150						
PMPS	669	V	420 - 900 constant						
PCELL TEMP	50.0	°C	50 ± 1						
BOX TEMP	28.9	°C	8 - 48						
PM1 TEMP	7.0	°C	7 ± 2						
MOLY TEMP	315.3	°C	315 ± 5						
PCELL PRESS	83	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	1.005	-	1.0 ± 0.3						
NO _x Slope	1.007	-	1.0 ± 0.3						
NO Offset	0.9	mV	-20 to +150						
NO _x Offset	0.5	mV	-20 to 150						
Stability at Zero	0.1	PPB	< 0.2						
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas						

Calibrated by :  Approved by : 
(Mr. Aseem Singhani) (Mr. Yuthana Thantaratani)

CALIBRATION REPORT									
CHEMILUMINESCENT NO ₂ / NO _x ANALYZER									
DATE :	09 November 2025	BRAND :	API	MODEL :	200E				
NO.	NOX-R07	SERIAL NO.	4468						
Calibrator (Dilution System)									
Brand :	API	Model :	700						
Last Cal. Date :	01 September 2025	Serial No. :	911						
Reference Standard Gas									
Standard Gas :	Nitric Oxide (NO)	Cylinder No. :	A007265V						
Certified Date :	05 January 2023	Expired Date :	05 January 2026	Cylinder Conc. :	46.8 ppm				
CALIBRATING CONDITION									
Pressure :	1011 mmbar	Temp. :	29.5 °C	% RH :	48				
CALIBRATION SETTING									
Span	Initial Reading (Before Adj.) PPB	%Diff	Analyzer Response	Slope	Final Reading (After Adj.) PPB				
Set Point	Expected Concentration	Analyzer Response	%Diff	Slope					
Zero	0	-0.10	-	0					
NO Span	400	400.1	0.025	400.0	1.004				
NO _x Span	400	400.3	0.075	400.0	1.007				
API Model 200E NO _x Analyzer Check List									
Test Values	Observed Value	Units	Nominal Range						
RANGE	500	PPB	500 standard						
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air						
SAMPLE FLOW	506	cc/min	500 ± 50						
OZONE FLOW	78	cc/min	80 ± 15						
PM1	103.2	mV	-20 - 150						
AZERO	94.3	mV	-20 - 150						
PMPS	672	V	420 - 900 constant						
PCELL TEMP	50.0	°C	50 ± 1						
BOX TEMP	28.4	°C	8 - 48						
PM1 TEMP	7.2	°C	7 ± 2						
MOLY TEMP	315.2	°C	315 ± 5						
PCELL PRESS	83	IN-Hg-A	2 - 10 constant						
SAMPLE PRESS	28.6	IN-Hg-A	25 - 30 constant						
NO Span Conc	400	PPB	20 - 20,000						
NO _x Span Conc	400	PPB	20 - 20,000						
NO Slope	1.004	-	1.0 ± 0.3						
NO _x Slope	1.007	-	1.0 ± 0.3						
NO Offset	1.0	mV	-20 to +150						
NO _x Offset	0.5	mV	-20 to 150						
Stability at Zero	0.1	PPB	< 0.2						
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas						

Calibrated by :  Approved by : 
(Mr. Aseem Singhani) (Mr. Yuthana Thantaratani)

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
B35	B35	01/08/2025	$y = 1.126x - 2.314$	0.997
B36	B36	01/08/2025	$y = 1.158x - 3.425$	0.999
B37	B37	01/08/2025	$y = 1.071x - 0.714$	0.998
B38	B38	01/08/2025	$y = 1.138x - 6.470$	0.999
B39	B39	01/08/2025	$y = 1.074x - 2.233$	0.999
B40	B40	01/08/2025	$y = 1.137x - 4.281$	0.998
B41	B41	01/08/2025	$y = 1.124x - 3.061$	0.999
B42	B42	01/08/2025	$y = 1.130x - 3.831$	0.998
B43	B43	04/08/2025	$y = 1.098x - 1.647$	0.999
B44	B44	07/08/2025	$y = 1.107x - 2.029$	0.997
R01	R01	01/08/2025	$y = 1.027x - 1.685$	0.998
R02	R02	01/08/2025	$y = 1.154x - 5.444$	0.996
R03	R03	01/08/2025	$y = 1.174x - 5.934$	0.999
R04	R04	04/08/2025	$y = 1.125x - 3.465$	0.997
R05	R05	01/08/2025	$y = 1.097x - 0.637$	0.999
R06	R06	04/08/2025	$y = 1.138x - 2.560$	0.997
R07	R07	01/08/2025	$y = 1.048x - 0.693$	0.999
R08	R08	01/08/2025	$y = 1.109x - 3.582$	0.997
R09	R09	01/08/2025	$y = 1.088x - 1.852$	0.999
R10	R10	01/08/2025	$y = 1.136x - 4.335$	0.996
R11	R11	01/08/2025	$y = 1.170x - 5.929$	0.998
R12	R12	01/08/2025	$y = 1.131x - 4.183$	0.999
R13	R13	01/08/2025	$y = 1.117x - 4.198$	0.996
R14	R14	01/08/2025	$y = 1.109x - 2.662$	0.998
R15	R15	01/08/2025	$y = 1.126x - 5.806$	0.996
R16	R16	01/08/2025	$y = 1.149x - 7.086$	0.996
R17	R17	01/08/2025	$y = 1.120x - 5.050$	0.997
R18	R18	04/08/2025	$y = 1.155x - 5.737$	0.997
R19	R19	04/08/2025	$y = 1.131x - 5.715$	0.997
R20	R20	01/08/2025	$y = 1.152x - 5.912$	0.996
Calibrated by :  (Mr. Abdul Darghom)		Approved by :  (Mr. Peera Detudom)		

High Volume Air Sampler Calibration Report				
Calibration Method : Multipoint Orifice Flow Transfer Standard			Model : TE 5025A	S/N : 3411
Calibration Data				
High Volume Air Sampler Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (ft ³ /min)	R ²
B01	B01	03/11/2025	$y = 1.118x - 3.833$	0.997
B02	B02	03/11/2025	$y = 1.120x - 3.384$	0.999
B03	B03	04/11/2025	$y = 1.069x - 0.968$	0.998
B04	B04	03/11/2025	$y = 1.096x - 2.076$	0.996
B05	B05	03/11/2025	$y = 1.101x - 2.990$	0.997
B06	B06	03/11/2025	$y = 1.124x - 3.707$	0.999
B07	B07	03/11/2025	$y = 1.133x - 2.855$	0.999
B08	B08	04/11/2025	$y = 1.108x - 1.898$	0.996
B09	B09	03/11/2025	$y = 1.110x - 2.993$	0.998
B10	B10	03/11/2025	$y = 1.116x - 3.121$	0.999
B11	B11	03/11/2025	$y = 1.119x - 2.105$	0.996
B12	B12	03/11/2025	$y = 1.126x - 1.525$	0.997
B13	B13	05/11/2025	$y = 1.093x - 0.946$	0.998
B14	B14	05/11/2025	$y = 1.149x - 3.087$	0.999
B15	B15	05/11/2025	$y = 1.137x - 3.875$	0.999
B16	B16	03/11/2025	$y = 1.079x - 2.409$	0.998
B17	B17	03/11/2025	$y = 1.177x - 4.168$	0.997
B18	B18	03/11/2025	$y = 1.138x - 2.900$	0.999
B19	B19	03/11/2025	$y = 1.109x - 1.623$	0.996
B20	B20	03/11/2025	$y = 1.123x - 0.045$	0.999
B21	B21	04/11/2025	$y = 1.082x - 0.484$	0.996
B22	B22	04/11/2025	$y = 1.110x - 1.594$	0.996
B23	B23	04/11/2025	$y = 1.135x - 2.878$	0.999
B24	B24	04/11/2025	$y = 1.141x - 3.242$	0.998
B25	B25	03/11/2025	$y = 1.011x - 3.037$	0.997
B26	B26	03/11/2025	$y = 1.104x - 2.679$	0.998
B27	B27	03/11/2025	$y = 1.148x - 3.947$	0.999
B28	B28	03/11/2025	$y = 1.120x - 3.393$	0.998
B29	B29	05/11/2025	$y = 1.142x - 3.319$	0.997
B30	B30	05/11/2025	$y = 1.139x - 1.015$	0.996
B31	B31	05/11/2025	$y = 1.152x - 2.962$	0.997
B32	B32	05/11/2025	$y = 1.140x - 3.712$	0.999
B33	B33	05/11/2025	$y = 1.125x - 0.806$	0.996
B34	B34	04/11/2025	$y = 1.150x - 3.245$	0.996
Calibrated by :  (Mr. Abdul Darghom)		Approved by :  (Mr. Peera Detudom)		

Date : 09 November 2025		Brand : HCS8BA	Model : APHA-370
No : 802		Serial No : 85343146	
Calibrator (Dilution System)			
Brand : Tenosyne	Model : 700		
Last Cal. Date : 05 August 2024			
Reference Standard Gas			
Standard Gas : Methane (CH ₄)	Cylinder No. : D612165		
Certified Date : 28 February 2023	Expired Date : 25 February 2031	Cylinder Conc. : 453 ppm	
Calibrating Condition			
Pressure : 1011 mmbar	Temp. : 24.6 °C	% RH : 50	
Start Time : 9:00 AM			
Pre-Calibration Checks			
Change Particulate Filter : YES	Station Temp : 25.0 °C		
Leak Test : YES			
Calibration Setting			
Span Set Point : Zero	Expected Concentration (PPM) : 0	Initial Reading (Before Adj) : 0.11	Final Reading (After Adj) : 0
Span : Span	10	10.05	10
Span Instrument Gain : 0.995			
Calibration Setting (Final)			
Finish Time : 10:00 AM			
Test Values			
Signal (CH ₄)	Observed Value : 911.3	Units : mV	Nominal Range : 800-1,550
Signal (THC)	916.4	mV	800-1,550
Detector	78.1	µPa	Pressure Air/1013x100-20 : 4 µPa
Purifier	19.2	µPa	8 : 25
MMC	258.5	°C	250 ± 10
BYPATH	0.9	L / min	0.9 ± 0.3
OVER FLOW	0.8	L / min	0.8

Calibrated by : Wij A. (Mr Kasem Sinphong)

Approved by : Yuthana S. (Mr Yuthana Thanaratant)

DATE : 10 August 2025		BRAND : HCS8BA	MODEL : APHA-370
NO : THC-802		SERIAL NO : 85343146	
Calibrator (Dilution System)			
Brand : Tenosyne	Model : 700		
Last Cal. Date : 29 October 2024			
Reference Standard Gas			
Standard Gas : Methane (CH ₄)	Cylinder No. : D612165		
Certified Date : 25 February 2023	Expired Date : 25 February 2031	Cylinder Conc. : 453 ppm	
Calibrating Condition			
Pressure : 1011 mmbar	Temp. : 24.6 °C	% RH : 50	
Start Time : 2:00 PM			
Pre-Calibration Checks			
Change Particulate Filter : YES	Station Temp : 25.0 °C		
Leak Test : YES			
Calibration Setting			
Span Set Point : Zero	Expected Concentration (PPM) : 0	Initial Reading (Before Adj) : 0.10	Final Reading (After Adj) : 0
Span : Span	10	10.05	10
Span Instrument Gain : 0.997			
Calibration Setting (Final)			
Finish Time : 3:00 PM			
Test Values			
Signal (CH ₄)	Observed Value : 911.3	Units : mV	Nominal Range : 800-1,550
Signal (THC)	917.1	mV	800-1,550
DETECTOR	78.0	µPa	Pressure Air/1013x100-20 : 4 µPa
PURIFIER	19.2	µPa	8 : 25
MMC	258.5	°C	250 ± 10
BYPATH	0.9	L / min	0.9 ± 0.3
OVER FLOW	0.8	L / min	0.8

Calibrated by : Wij A. (Mr Kasem Sinphong)

Approved by : Yuthana S. (Mr Yuthana Thanaratant)

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	
R01		01/08/2025	$y = 1.104x - 5.304$	0.998	
R02		01/08/2025	$y = 1.064x - 2.083$	0.998	
R03		01/08/2025	$y = 1.108x - 4.353$	0.999	
R04		01/08/2025	$y = 1.101x - 5.179$	0.998	
R05		01/08/2025	$y = 1.111x - 5.074$	0.996	
R06		01/08/2025	$y = 1.127x - 3.017$	0.998	
R07		04/08/2025	$y = 1.037x - 1.156$	0.998	
R08		01/08/2025	$y = 1.042x - 0.842$	0.998	
R09		01/08/2025	$y = 1.063x - 2.007$	0.997	
R10		01/08/2025	$y = 1.041x - 0.474$	0.997	
R11		01/08/2025	$y = 1.085x - 1.804$	0.997	
R12		01/08/2025	$y = 1.062x - 1.085$	0.997	
R13		01/08/2025	$y = 1.075x - 2.468$	0.999	
R14		01/08/2025	$y = 1.017x - 0.519$	0.999	
R15		01/08/2025	$y = 1.138x - 6.436$	0.998	
R16		04/08/2025	$y = 1.051x - 0.608$	0.999	
R17		04/08/2025	$y = 1.116x - 4.329$	0.998	
R18		01/08/2025	$y = 1.096x - 5.425$	0.998	
R19		01/08/2025	$y = 1.113x - 2.375$	0.997	
R20		01/08/2025	$y = 1.105x - 4.058$	0.998	

Calibrated by : Adul Dangklom
(Mr. Adul Dangklom)

Approved by : Peera Detudom
(Mr. Peera Detudom)

High Volume PM-10 Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard				Model : TE 5025A	S/N : 3611
Calibration Data					
High Volume PM-10 Data		Calibration Data			
Recorder No.	Blower No.	Date	Actual Flowrate (ft ³ /min)	R ²	
R01		03/11/2025	$y = 1.055x - 0.809$	0.998	
R02		03/11/2025	$y = 1.132x - 3.919$	0.998	
R03		03/11/2025	$y = 1.113x - 2.991$	0.996	
R04		03/11/2025	$y = 1.126x - 3.936$	0.996	
R05		04/11/2025	$y = 1.103x - 2.878$	0.996	
R06		04/11/2025	$y = 1.107x - 1.644$	0.996	
R07		04/11/2025	$y = 1.085x - 0.697$	0.998	
R08		03/11/2025	$y = 1.071x - 0.571$	0.998	
R09		03/11/2025	$y = 1.118x - 2.909$	0.999	
R10		03/11/2025	$y = 1.089x - 1.636$	0.996	
R11		03/11/2025	$y = 1.045x - 1.442$	0.999	
R12		03/11/2025	$y = 1.058x - 0.370$	0.998	
R13		03/11/2025	$y = 1.100x - 2.187$	0.998	
R14		03/11/2025	$y = 1.099x - 1.650$	0.999	
R15		03/11/2025	$y = 1.128x - 4.768$	0.997	
R16		05/11/2025	$y = 1.093x - 2.124$	0.997	
R17		05/11/2025	$y = 1.101x - 2.286$	0.997	
R18		05/11/2025	$y = 1.118x - 5.339$	0.999	
R19		03/11/2025	$y = 1.054x - 1.212$	0.996	
R20		03/11/2025	$y = 1.068x - 1.764$	0.997	

Calibrated by : Adul Dangklom
(Mr. Adul Dangklom)

Approved by : Peera Detudom
(Mr. Peera Detudom)



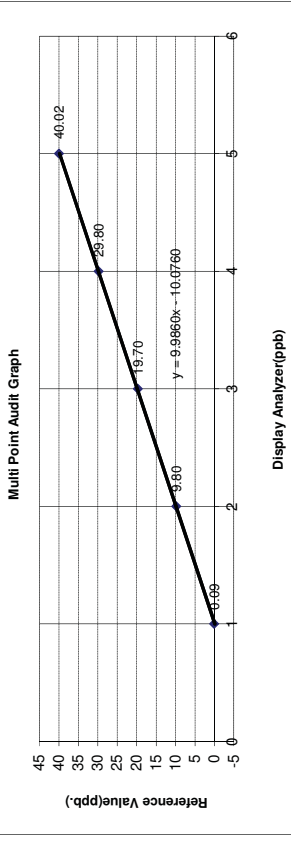
บริษัท คิว-ชี โซลูชั่นส์ จำกัด
Q-SHE SOLUTIONS CO., LTD.
7/409 ซอยวิภาวดีรังสิต 36 ถนนวิภาวดีรังสิต แขวงจตุจักร กรุงเทพฯ 10900
โทรศัพท์ : (662) 939-5711 (12 Lines) โทรสาร : (662) 939-4207-8
Website http://www.qshe.co.th E-mail-address: info@qshe.co.th

รายงานการสอบเทียบก๊าซแบบหลายจุด
MULTI-POINT GAS TEST REPORT

Date :	11 August 2025	Temperature(°C) :	26	Pressure(mBar) :	-
Equipment :	Gas Analyzer (CO	Model S/N :	48i, 0926737615		
Manufacturer :	Thermic	Location :	Micro3		

Standard Gas Concentration:		Dilutor Details	
Sulfur Dioxide (SO ₂)	44.44 ppm.	Manufacture	Thermic
Nitric Oxide (NO)	45.84 ppm.	Mode	146i
Carbon Monoxide (CO)	4513 ppm.	Serial Number	1201351404
Methane (CH ₄)	506.7 ppm.	Zero Air	
Cylinder NO	CC507818	Manufacture	Thermic
Expiration Dat	August 13, 2025	Model / Serial Number	111-B2R

Multi Point Gas Test Data						Result Test Report		
Reference Value (ppb.)		Analyzer Displa		Difference		Percent Error		Percent
Level 1	Zero	#1	#2	AVG.		Abs.(STD±15%)		Inter.
Level 2	20%	10	9.80	-	0.09	-	-	
Level 3	40%	20	18.70	-	9.80	-2.00	2.00	
Level 4	60%	30	29.80	-	19.70	-1.50	1.50	
Level 5	80%	40	40.02	-	40.02	-0.67	0.67	
						Average Difference (%)	0.05	<±0.5%
						Slope	0.9986	<±0.5%
						Correlation Coefficient	1.05	<±0.5%
						Intercept	-0.0900	-0.0054
								-0.1400
								-2.2222
								0.9999



Calibrate by : ชีโรส นุโพธิ์
Date : 11 August 2025

Q-SHE SOLUTIONS CO., LTD.

Job Number :	J092500024-003	Customer Name :	IRPC
Equipment :	Micro Mobile AQMs	Contact Name :	Khun Wirasak Khumsuk
Model :	Micro Mobile AQMs	Telephone Number :	081-803-0475
Serial Number :	Micro Mobile3	E-mail address/Fax. :	wirasak.k@irpc.co.th
Working Date :	12 November 2025	Working Hour :	4 Hours

Service Report

Working Scope:

รถเคลื่อนที่ AQMs micro#3 จอดตรวจอากาศ อยู่ที่ อนามัยหนองจอก จึงได้เข้าทำการตรวจเช็ค

Physical Checking:

- ตรวจเช็ค Data logger พบว่าทำงานได้ปกติ
- ตรวจเช็ค Diagnostic of all analyzers อยู่ในเกณฑ์ปกติ
- ตรวจเช็ค Reading of all analyzers และ Met sensor พบว่าปกติ
- ตรวจเช็ค เครื่องวัดฝุ่น PM-10 พบว่าทำงานได้ปกติ
- ตรวจเช็ค เครื่อง THC analyzer พบว่าทำงานได้ปกติ
- ตรวจเช็ค การทำงานของระบบไฟฟ้า และ UPS พบว่าทำงานได้ปกติ
- ทำความสะอาดภายในสถานี และ บริเวณรอบสถานี

Correction working:

Replace silica gel for dryer NOx Analyzer.	Drain water for pump of Zero Air.
Replace sample filter 47 mm.	

Part Replacement:

- Sample filter 47 mm. 3 ea. (Part Support by IRPC)
- Silica gel. 1/2 Bottle. (Part Support by IRPC)

Addition Recommended:

— End —

Serviced by :	ชินรอส นุโพธิ์	Serviced Date :	12 November 2025
Approved by:	(ช.นุโพธิ์)	Approved Date :	12 November 2025



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โทรศัพท์ : (662) 939-5711 (12 Lines) โทรสาร : (662) 939-4207-8
Website http://www.qshe.co.th E-mail-address: info@qshe.co.th

General Checking			
Equipment :	Micro Mobile AQMS	Model :	-
Serial Number :	-	Manufacturer :	-

Item	Description	Set-Point Value	Status & Value	Remark
	On Mobile			
1	Air conditioner operation	OK	OK	
2	Mobile temperature	25-27 °C	25-27 °C	
3	Lighting system	OK	OK	
4	Lamp in sampling box	OK	OK	
5	Sampling probe	Clean	Clean	
6	Blower	OK	OK	
7	Drain liquid in tank	Drain	Drain	
8	Compressor tank set pressure	80 psi	80 psi	
9	Zero air compressor operation	OK	OK	
10	Silica gel for dry air of NO _x analyzer	OK	OK	
11	UPS 6 KVA	Bypass	Bypass	
12	Data logger	OK	OK	
13	Ventilation fan	OK	OK	
14	Power cable	OK	OK	
15	Hydrogen Gas	>500 psi	600/50 psi	
16	Standard gas#1 (NO,SO ₂ ,HC,CO)	>500 psi	300/22 psi	

Note :



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SO ₂ Analyzer			
Equipment :	Sulfur Dioxide analyzer.	Model :	43i
Serial Number :	1310957747	Manufacturer :	Thermo

Parameter	Diagnostic test value		Unit	Nominal range
	Before	After		
Sample reading	7.6	7.1	ppb	
Range	500	500	ppb	50 to 1000 ppb
Averaging Time	30	30	Sec	10 to 300 Sec
Calibration Factors				
SO ₂ BKG. ppb	110.0	109.7	ppb	0 to 60
SO ₂ COEF	0.977	0.977	-	1.0 ± 0.3
Instrument Controls				
Temp Compensation	On	On	On/Off	On
Pressure Compensation	On	On	On/Off	On
Flash Lamp	On	On	On/Off	On
Communication setting				
Baud Rate	9600	9600	bps	9600 to 115000
Instrument ID	43	43	-	0 to 99
Screen Contrast	50	50	%	0 to 100
Service Mode	Off	Off	On/Off	Up to used
Diagnostics				
Voltages				
Motherboard voltages:				
3.3 Supply	3.3	3.3	Vdc	3.3 +/- 1 Vdc
5.0 Supply	5.0	5.0	Vdc	5.0 +/- 1 Vdc
15.0 Supply	15.1	15.1	Vdc	15.0 +/- 1 Vdc
24.0 Supply	23.7	23.7	Vdc	24.0 +/- 1 Vdc
-3.3 Supply	-3.1	-3.1	Vdc	- 3.3 +/- 1 Vdc
Interface board voltages:				
PMT Supply	-685.2	-685.2		
Flash Supply	842	845		
3.3 Supply	3.2	3.2	Vdc	3.3 +/- 1 Vd
5.0 Supply	5.0	5.0	Vdc	5.0 +/- 1 Vdc
15.0 Supply	14.7	14.7	Vdc	15.0 +/- 1 Vdc
-15.0 Supply	-15.0	-15.0	Vdc	-15.0 +/- 1 Vdc
24.0 Supply	23.2	23.2	Vdc	24.0 +/- 1 Vdc
Temperatures				
Internal	31.8	32.0	°C	15°C to 45°C
Chamber	44.9	45.0	°C	45°C ± 2°C
Pressure	0.0	0.0	mmHg	750 ± 100 mmHg
Flow	0.513	0.513	L/min	0.5 to 100 L/min
Lamp intensity	88	89	%	40 - 100 %
Note : หน้าจอไม่ติด				



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Website http://www.qshe.co.th E-mail-address: info@qshe.co.th

NO-NO ₂ -NO _x Analyzer					
Equipment :	NO-NO ₂ -NO _x analyzer.		Model :	42i	
Serial Number :	CM13090047		Manufacturer :	Thermo	
Diagnostic test value					
Parameter	Observed value		Unit	Nominal range	
	Before	After			
Sample reading					
NO reading	7.5	5.8	ppb		
NO _x reading	9.5	7.9	ppb		
Range	500	500	ppb	50 to 1000 ppb	
Averaging Time	60	60	Sec	10 to 300 Sec	
Calibration Factors					
NO BKG. ppb	49.8	49.8	ppb	0 to 60	
NO _x BKG. ppb	44.8	44.8	ppb	0 to 60	
NO COEF.	0.948	0.948	-	1.0 ± 0.3	
NO _x COEF.	1.000	1.000	-	1.0 ± 0.3	
NO ₂ COEF.	1.000	1.000	-	1.0 ± 0.3	
Instrument Controls					
Ozonator	On	On	On/Off		
PMT Supply	On	On	On/Off		
Auto/Manual Mode	NO/NO _x	NO/NO _x	NO/NO _x , NO, NO _x		
Baud Rate	9600	9600	bps	1200 to 9600	
Temp Compensation	On	On	-	On/Off	
Pressure Compensation	On	On	-	On/Off	
Screen Contrast	55	55	%	0 to 100	
Service Mode	Off	Off	-	On/Off, Up to used	
Diagnostics					
Voltages					
Motherboard voltages:					
3.3 Supply	3.3	3.3	Vdc	3.3 ± 1 Vdc	
5.0 Supply	5.0	5.0	Vdc	5.0 ± 1 Vdc	
15.0 Supply	14.9	14.9	Vdc	15.0 ± 1 Vdc	
24.0 Supply	24.1	24.1	Vdc	24.0 ± 1 Vdc	
-3.3 Supply	-3.2	-3.2	Vdc	-3.3 ± 1 Vdc	
Interface board voltages:					
PMT Supply	-906.5	-906.5	Vdc	-400 to -1200 Vdc	
3.3 Supply	3.3	3.3	Vdc	3.3 ± 1 Vdc	
5.0 Supply	5.0	5.0	Vdc	5.0 ± 1 Vdc	
15.0 Supply	14.9	14.9	Vdc	15.0 ± 1 Vdc	
P15.0 Supply	15.2	15.2	Vdc	15.0 ± 1 Vdc	
24.0 Supply	23.3	23.3	Vdc	24.0 ± 1 Vdc	
-15.0 Supply	-15.2	-15.2	Vdc	-15.0 ± 1 Vdc	
Temperatures					
Internal	27.8	28.0	°C	15 °C to 45 °C	
Chamber	49.6	49.7	°C	50 °C ± 2 °C	
Cooler	-2.7	-2.7	°C	(-3) °C ± 2 °C	
Converter	323.4	325.1	°C	325 °C ± 5 °C	
Converter Set	325.0	325.0	°C	325 °C	
Pressure	315.8	318.8	mmHg	250 ± 100 mmHg	
Flow	0.548	0.548	L/min	0.5 to 1.00 L/min	
Note :					



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 Website http://www.qshe.co.th E-mail-address: info@qshe.co.th

THC Analyzer					
Equipment :	Total hydrocarbon analyzer.		Model :	APHA-370	
Serial Number :	-		Manufacturer :	Horiba	
Diagnostic test value					
Parameter	Observed value		Unit	Nominal range	
	Before	After			
Data logger reading					
CH4 reading	1.642	1.722	ppm	0-25 ppm	
NMHC reading	0.291	0.229	ppm	0-25 ppm	
THC reading	1.933	1.951	ppm	0-25 ppm	
Analyzer reading					
CH4 reading	1.642	1.722	ppm	0-25 ppm	
NMHC reading	0.291	0.229	ppm	0-25 ppm	
THC reading	1.933	1.951	ppm	0-25 ppm	
Calibration Factors					
CH4					
Zero calibration coefficient	60	60	-	-3500 to 3500	
Span calibration coefficient	1.0000	1.0000	-	0.50000 to 2.00000	
THC					
Zero calibration coefficient	62	62	-	-3500 to 3500	
Span calibration coefficient	1.0000	1.0000	-	0.50000 to 2.00000	
Analog Input					
Detector temp	39.8	39.9	°C	Ambient Temp +(-5 – 15 °C)	
Detector pressure	57.7	57.9	kPa	80 kPa ± 4 kPa	
Ambient	10.6	10.6	kPa	Current Atmospheric pressure	
Purifier temp	418.4	418.4	°C	390-430 °C	
Purifier pressure	21.3	21.4	kPa	8 kPa -25 kPa	
NMC cutter temp	154.7	154.9	°C	230-260 °C	
DC24V	23.9	23.9	V.	24V ± 0.5 V	
DC5V	4.9	4.9	V.	5V ± 0.5 V	
Note :					



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F-G010 REV 03



QUALITY CALIBRATION CO.,LTD.

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

www.qcalibration.com

CERTIFICATE No : 25M2254

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE
MANUFACTURER : METTLER TOLEDO
ID No : BA05/50
AIR PRESSURE : 1009mmbar ± 1mmbar
AMBIENT TEMPERATURE : 24°C ± 1°C
MODEL : XS105DU
S/N : 1126422905
RECEIVED DATE : 07-Mar-25
CALIBRATION DATE : 07-Mar-25
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 LINEARITY TEST. OFF-CENTER LOADING WAS MEASURED BY USING STANDARD WEIGHTS PLACED ON THE PAN AND MOVED TO VARIOUS POSITIONS ON THE PAN.

2. REFERENCE STANDARD INSTRUMENTS :-

1) STANDARD WEIGHT SET E2
2) STANDARD WEIGHT E2
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	50.00000	0.00000	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



F-G010 REV 03

คุณภาพอากาศจากปล่อง

Console Calibration Report

Calibration Method		Critical Orifices		
Calibration Data				
Console Data		Calibration Data		
No.	Serial No.	Date	y	ΔH_p (mmH ₂ O)
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	49.59
R05	1503015	02/09/2025	0.996	50.10

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

Accept Value of ΔH_p (test) is 46.7 ± 6.4 (mmH₂O)

Calibrated by : <u>Adul Dangklom</u> (Mr. Adul Dangklom)	Approved by : <u>Peeru Detudom</u> (Mr. Peeru Detudom)
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Pitot Tube Calibration Report

Calibration Method		Standard Pitot Tube			
Calibration Data					
Pitot Tube Data			Calibration Data		
No.	Type of Pitot	Coefficiency of Standard Pitot	Date	Avg. of Cp (test)	
				Side A	Side B
B36	S	0.99	03/11/2025	0.85	0.84
B37	S	0.99	03/11/2025	0.84	0.84
B38	S	0.99	03/11/2025	0.84	0.84
B39	S	0.99	06/11/2025	0.84	0.85
B40	S	0.99	06/11/2025	0.84	0.84
B41	S	0.99	04/11/2025	0.85	0.84
B44	S	0.99	03/11/2025	0.84	0.84
B45	S	0.99	03/11/2025	0.84	0.84
B46	S	0.99	03/11/2025	0.85	0.84
B47	S	0.99	04/11/2025	0.84	0.83
B48	S	0.99	04/11/2025	0.85	0.84
B49	S	0.99	04/11/2025	0.84	0.84
B54	S	0.99	05/11/2025	0.85	0.84
B56	S	0.99	05/11/2025	0.84	0.85
B57	S	0.99	05/11/2025	0.84	0.84
B58	S	0.99	04/11/2025	0.84	0.85

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

Calibrated by : <u>Adul Dangklom</u> (Mr. Adul Dangklom)	Approved by : <u>Peeru Detudom</u> (Mr. Peeru Detudom)
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CALIBRATION LABORATORY Co., LTD.

210-11/14,55 Soi Prasert Manukul 29 Yaek 4, Prasert Manukul Rd. Ladphrao, Bangkok 10230
Tel: 02-576-0353-4 Fax: 02-576-2872 www.lab-laboratory.com Email: info@lab-laboratory.com



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE	VACUUM GAUGE
MANUFACTURER	HI-LIGHT
MODEL/TYPE	N/A
SERIAL NO.	N/A [64-220088-1]
CLID. NO.	212301422
JOB CONTROL NO.	240720076546

CUSTOMER S.P.S. CONSULTING SERVICE CO., LTD.
7501 PHAHOLYOTHIN 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 Calibration Laboratory Co., Ltd.

Calibrated By :

Sittipong Pimdee
Calibration Engineer

Approved By :

Mongkol Yotsuontorn
Authorized Signatory
24 July 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. Q24076546

F3-011-05/12-23

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210-11/14,55 Soi Prasert Manukul 29 Yaek 4, Prasert Manukul Rd. Ladphrao, Bangkok 10230
Tel: 02-576-0353-4 Fax: 02-576-2872 www.lab-laboratory.com Email: info@lab-laboratory.com



REPORT OF CALIBRATION

FOR

NOMENCLATURE	VACUUM GAUGE
MANUFACTURER	HI-LIGHT
MODEL/TYPE	N/A
SERIAL NO.	N/A [64-220088-1]
DATE OF CALIBRATION	23 July 2025
DUE DATE OF CALIBRATION	23 July 2026

ENVIRONMENT CONDITIONS

Temperature : $(23 \pm 2)^{\circ}\text{C}$

Relative Humidity $(55 \pm 10)\% \text{RH}$

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 Calibration and Pressure Module which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

Document: Process Calibration, Fluke Model 74 (B SN: 8295020 with Pressure Module Model 700PD5 S/N: 89404505)

TRACEABILITY :

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

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%.

Certificate No. Q24076546

F3-011-05/12-23

page 2 of 3

CONDITION OF CALIBRATION ITEM :RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS: (X) without adjustment () adjustment

The DJC 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 mean value were reported in the table below.

CALIBRATION DATA

CORRECTION OF PRESSURE

DUC Test point (ind/g)	STD Reading (kPa)		Conversion to ind/g		Correction (ind/g)	
	Up	Down	Up	Down	Up	Down
0	0.00	0.00	0.0	0.0	0.0	0.0
-5	-15.07	-15.10	-4.5	-4.5	-0.5	+0.5
-10	-32.50	-32.84	-9.6	-9.7	+0.4	+0.3
-15	-49.44	-49.77	-14.6	-14.7	+0.4	+0.3
-20	-66.70	-66.70	-19.7	-19.7	+0.3	+0.3
-25	-83.63	-83.97	-24.7	-24.8	+0.3	+0.2
-30	-100.39	-100.39	-29.6	-29.6	+0.4	+0.4

Uncertainty of measurement ± 0.2 in Fig.

Transmitting fluid: Air.

Technical Note: Conversion factor (kPa): 0.2953003 inH₂O

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

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

End of Certificate

Certificate No. Q24076546

F3-011-05/12-23

THEY SAY

Personal Pump Calibration Report

Calibration Method: Dry Cal Primary Flowmeter	Model: Defender 510-H	S/N: 135164
Environmental Conditions Temperature: $\pm 25^{\circ}\text{C}$ Pressure: ± 15 mmbar		

Personal Pump Data				Calibration Data										
No.	Brand	Model	Serial No.	Date	Flow Rate (m/min)					Value From Calibration Curve				
					Setting			Actual (Q act)		y				
					1	2	3	1	2	3	y	r ²		
B01	SAC	224-PC-06A	282101	03/12/2023	1.000	1.500	2.000	998	1.490	1.997	1.006 ± 0.131	1.000		
B02	SAC	224-PC-06B	456166	03/10/2023	1.000	1.500	2.000	1.007	1.500	2.008	0.996 ± 0.2337	1.000		
B03	SAC	224-PC-06E	412968	03/10/2023	1.000	1.500	2.000	1.003	1.503	2.001	0.9979 ± 0.010	0.999		
B04	SAC	224-PC-06C	630360	02/10/2023	1.000	1.500	2.000	999	1.494	1.999	1.0074 ± 0.0025	1.000		
B05	SAC	224-PC-06A	412493	02/10/2023	1.000	1.500	2.000	999	1.495	2.001	0.9999 ± 0.243	1.000		
B06	SAC	224-PC-06A	282183	07/10/2023	1.000	1.500	2.000	997	1.510	2.000	0.9996 ± 0.094	0.999		
B07	SAC	204-PC-06A	408365	01/10/2023	1.000	1.500	2.000	1.002	1.492	2.007	1.0025 ± 0.178	1.000		
B08	SAC	224-PC-06B	456100	02/10/2023	1.000	1.500	2.000	1.003	1.500	2.005	1.0044 ± 0.723	1.000		
B09	SAC	224-PC-06A	626719	07/10/2023	1.000	1.500	2.000	1.001	1.501	1.986	0.9996 ± 0.330	0.999		
B10L	SAC	204-PC-06A	491356	02/10/2023	1.000	1.500	2.000	997	1.504	2.000	1.0036 ± 0.022	1.000		
B11	SAC	224-PC-06B	494415	05/10/2023	1.000	1.500	2.000	1.001	1.503	1.993	0.9984 ± 0.249	1.000		
B12	SAC	224-PC-06A	034455	05/12/2023	1.000	1.500	2.000	997	1.506	2.003	1.0035 ± 0.023	0.999		
B13	SAC	224-PC-06B	602713	03/10/2023	1.000	1.500	2.000	1.003	1.497	2.004	1.0025 ± 0.013	1.000		
B14	SAC	204-PC-06B	602612	03/10/2023	1.000	1.500	2.000	998	1.501	1.992	1.0021 ± 11.702	0.999		
B15	SAC	224-PC-06B	626572	03/10/2023	1.000	1.500	2.000	1.001	1.500	2.004	1.0005 ± 11.664	1.000		
B16	SAC	204-PC-06A	626677	03/10/2023	1.000	1.500	2.000	994	1.498	1.982	1.0075 ± 14.529	0.999		
B17	SAC	204-PC-06A	456066	02/10/2023	1.000	1.500	2.000	1.001	1.503	1.998	0.9976 ± 0.041	1.000		
B18	SAC	224-PC-06A	414145	01/10/2023	1.000	1.500	2.000	997	1.514	1.994	0.9966 ± 0.340	1.000		
B19	SAC	224-PC-06A	441539	01/10/2023	1.000	1.500	2.000	998	1.497	2.003	0.9986 ± 0.330	1.000		
B20	SAC	224-PC-06A	641547	01/10/2023	1.000	1.500	2.000	1.001	1.501	1.999	0.9954 ± 0.330	0.999		
B21	SAC	224-PC-06A	619131	03/10/2023	1.000	1.500	2.000	999	1.502	2.001	1.0005 ± 7.151	1.000		
B22	SAC	224-PC-06A	491454	03/10/2023	1.000	1.500	2.000	1.001	1.500	1.998	0.9976 ± 0.041	1.000		
B23	SAC	224-PC-06A	786351	03/10/2023	1.000	1.500	2.000	997	1.507	1.999	1.0071 ± 17.505	0.999		
B24	SAC	224-PC-06A	626583	03/10/2023	1.000	1.500	2.000	994	1.498	1.995	1.0005 ± 1.941	1.000		
B25	SAC	224-PC-06B	786409	01/10/2023	1.000	1.500	2.000	1.007	2.001	2.001	0.9971 ± 1.103	1.000		
B26	SAC	224-PC-06B	786419	01/10/2023	1.000	1.500	2.000	1.002	1.509	1.995	1.0005 ± 3.081	0.999		
B27	SAC	224-PC-06B	691673	01/10/2023	1.000	1.500	2.000	991	1.510	2.000	1.0026 ± 9.616	1.000		
B28	SAC	204-PC-06B	491371	07/10/2023	1.000	1.500	2.000	1.011	1.508	2.009	0.9984 ± 3.729	0.999		
B29	SAC	224-PC-06B	626471	01/10/2023	1.000	1.500	2.000	1.002	1.503	1.998	1.0026 ± 0.066	1.000		
B30	SAC	224-PC-06A	491491	01/10/2023	1.000	1.500	2.000	997	1.506	2.000	1.0004 ± 0.397	1.000		
B31	SAC	204-PC-06A	491339	02/10/2023	1.000	1.500	2.000	999	1.497	1.992	0.9986 ± 0.293	1.000		
B32	SAC	224-PC-06A	071647	02/10/2023	1.000	1.500	2.000	1.002	1.500	2.003	1.0084 ± 0.3718	0.999		
B33	SAC	224-PC-06B	091756	09/10/2023	1.000	1.500	2.000	1.001	1.997	2.026	1.0026 ± 4.559	1.000		
B34	SAC	204-PC-06A	412862	02/10/2023	1.000	1.500	2.000	996	1.512	1.996	1.0014 ± 3.807	0.999		
B35	SAC	224-PC-06B	626602	07/10/2023	1.000	1.500	2.000	1.008	1.491	1.999	0.9954 ± 0.362	1.000		
B36	SAC	224-PC-06A	626144	01/10/2023	1.000	1.500	2.000	997	1.502	1.992	0.9999 ± 0.215	1.000		
B37	SAC	204-PC-06A	626266	01/10/2023	1.000	1.500	2.000	1.003	1.490	1.997	0.9984 ± 0.393	1.000		
B38	SAC	224-PC-06A	626147	10/10/2023	1.000	1.500	2.000	998	1.513	1.993	1.0000 ± 3.271	0.999		
B39	SAC	224-PC-06A	034637	03/10/2023	1.000	1.500	2.000	1.007	1.504	2.000	0.9964 ± 0.240	1.000		
B40	SAC	224-PC-06B	786406	03/10/2023	1.000	1.500	2.000	1.000	1.500	2.001	1.0000 ± 0.345	1.000		

Calibrated by:

Adul Dangkom
(Mr. Adul Dangkom)

Approved by:

(Use Pagea Defectum)

Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter Model : Defender 510-H S/N : 136833

Environmental Conditions
 Temperature : 25 °C
 Pressure : 1010 mmbar

Personal Pump Data				Calibration Data				Value From Calibration Curve						
No.	Brand	Model	Serial No.	Date	Flow Rate (m³/min)				Actual (Q std.)					
					Setting									
					1	2	3	1	2	3	4	Y	R²	
B01	SVC	224-PCV18	612669	01/10/2025	1.000	1.500	2.000	2.500	1.013	1.520	2.027	2.534	1.008 ± 0.12	0.999
B02	SVC	224-PCV18	612670	02/10/2025	1.000	1.500	2.000	2.500	1.014	1.521	2.028	2.535	0.999 ± 0.134	1.000
B03	SVC	224-PCV18	612671	03/10/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	1.000 ± 0.117	1.000
B04	SVC	224-PCV18	612672	04/10/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.130	1.000
B05	SVC	224-PCV18	612673	05/10/2025	1.000	1.500	2.000	2.500	998	1.519	2.026	2.534	1.005 ± 0.134	1.000
B06	SVC	224-PCV18	612674	06/10/2025	1.000	1.500	2.000	2.500	998	1.519	2.026	2.534	0.999 ± 0.130	1.000
B07	SVC	224-PCV18	612675	07/10/2025	1.000	1.500	2.000	2.500	997	1.520	2.027	2.535	0.999 ± 0.118	0.999
B08	SVC	224-PCV18	612676	08/10/2025	1.000	1.500	2.000	2.500	997	1.520	2.027	2.535	1.000 ± 0.118	1.000
B09	SVC	224-PCV18	612677	09/10/2025	1.000	1.500	2.000	2.500	996	1.520	2.026	2.534	0.999 ± 0.130	1.000
B10	SVC	224-PCV18	612678	10/10/2025	1.000	1.500	2.000	2.500	996	1.520	2.026	2.534	1.000 ± 0.125	0.999
B11	SVC	224-PCV18	612679	11/10/2025	1.000	1.500	2.000	2.500	995	1.520	2.026	2.534	0.999 ± 0.130	0.999
B12	SVC	224-PCV18	612680	12/10/2025	1.000	1.500	2.000	2.500	995	1.520	2.026	2.534	1.000 ± 0.130	1.000
B13	SVC	224-PCV18	612681	13/10/2025	1.000	1.500	2.000	2.500	998	1.520	2.027	2.535	0.999 ± 0.143	0.999
B14	SVC	224-PCV18	612682	14/10/2025	1.000	1.500	2.000	2.500	1.021	1.521	2.028	2.536	0.999 ± 0.143	1.000
B15	SVC	224-PCV18	612683	15/10/2025	1.000	1.500	2.000	2.500	1.018	1.520	2.027	2.535	1.000 ± 0.123	0.999
B16	SVC	224-PCV18	612684	16/10/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B17	SVC	224-PCV18	612685	17/10/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	1.000 ± 0.142	1.000
B18	SVC	224-PCV18	612686	18/10/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B19	SVC	224-PCV18	612687	19/10/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	1.000 ± 0.142	1.000
B20	SVC	224-PCV18	612688	20/10/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B21	SVC	224-PCV18	612689	21/10/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B22	SVC	224-PCV18	612690	22/10/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B23	SVC	224-PCV18	612691	23/10/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B24	SVC	224-PCV18	612692	24/10/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B25	SVC	224-PCV18	612693	25/10/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B26	SVC	224-PCV18	612694	26/10/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B27	SVC	224-PCV18	612695	27/10/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B28	SVC	224-PCV18	612696	28/10/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B29	SVC	224-PCV18	612697	29/10/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B30	SVC	224-PCV18	612698	30/10/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B31	SVC	224-PCV18	612699	31/10/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B32	SVC	224-PCV18	612700	01/11/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B33	SVC	224-PCV18	612701	02/11/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B34	SVC	224-PCV18	612702	03/11/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B35	SVC	224-PCV18	612703	04/11/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B36	SVC	224-PCV18	612704	05/11/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B37	SVC	224-PCV18	612705	06/11/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B38	SVC	224-PCV18	612706	07/11/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B39	SVC	224-PCV18	612707	08/11/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B40	SVC	224-PCV18	612708	09/11/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B41	SVC	224-PCV18	612709	10/11/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B42	SVC	224-PCV18	612710	11/11/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B43	SVC	224-PCV18	612711	12/11/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B44	SVC	224-PCV18	612712	13/11/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B45	SVC	224-PCV18	612713	14/11/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B46	SVC	224-PCV18	612714	15/11/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B47	SVC	224-PCV18	612715	16/11/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B48	SVC	224-PCV18	612716	17/11/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B49	SVC	224-PCV18	612717	18/11/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B50	SVC	224-PCV18	612718	19/11/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B51	SVC	224-PCV18	612719	20/11/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B52	SVC	224-PCV18	612720	21/11/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B53	SVC	224-PCV18	612721	22/11/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B54	SVC	224-PCV18	612722	23/11/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B55	SVC	224-PCV18	612723	24/11/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B56	SVC	224-PCV18	612724	25/11/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B57	SVC	224-PCV18	612725	26/11/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B58	SVC	224-PCV18	612726	27/11/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B59	SVC	224-PCV18	612727	28/11/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B60	SVC	224-PCV18	612728	29/11/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B61	SVC	224-PCV18	612729	30/11/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B62	SVC	224-PCV18	612730	01/12/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B63	SVC	224-PCV18	612731	02/12/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B64	SVC	224-PCV18	612732	03/12/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B65	SVC	224-PCV18	612733	04/12/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B66	SVC	224-PCV18	612734	05/12/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B67	SVC	224-PCV18	612735	06/12/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B68	SVC	224-PCV18	612736	07/12/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B69	SVC	224-PCV18	612737	08/12/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B70	SVC	224-PCV18	612738	09/12/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B71	SVC	224-PCV18	612739	10/12/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B72	SVC	224-PCV18	612740	11/12/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535	0.999 ± 0.142	1.000
B73	SVC	224-PCV18	612741	12/12/2025	1.000	1.500	2.000	2.500	999	1.520	2.027	2.535</		



CERTIFICATE No : 25M2254
REFERENCE No : 76365-1

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE
MANUFACTURER : METTLER TOLEDO
MODEL : XS105DU
SERIAL No : 1126422905
ID No : BA05/50

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

CALIBRATED BY : ATSAWIN Y.
CALIBRATION DATE : 07-Mar-25

APPROVED BY :
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.



F-G010 REV 03



CERTIFICATE No : 25M2254

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE
MANUFACTURER : METTLER TOLEDO
MODEL : XS105DU
ID No : BA05/50
SERIAL No : 1126422905
RECEIVED DATE : 07-Mar-25
CALIBRATION DATE : 07-Mar-25
RELATIVE HUMIDITY : 54 %RH $\pm$ 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

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

2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT : MODEL : SERIAL No : CERTIFICATE No : DUE DATE :
1) STANDARD WEIGHT SET E2 C02250116 28-Jan-27
2) STANDARD WEIGHT E2 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 CERTIFICATE EXCLUDES 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

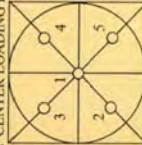
2. TARE FUNCTION : NORMAL

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 ($\pm$ 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	0.000067
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	50.00000	0.00000	0.00013
100.00	100.00011	-0.00011	0.00019
120.00	120.00002	-0.00002	0.00022

5. OFF-CENTER LOADING ERROR



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

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

END OF CALIBRATION REPORT



F-G010 REV 03

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 : *Wichok B.*
(Wichok Ekpongpradit)

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.

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
RM-DL	640.50	640.36	-0.14	0.16	2.00
	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	Certified Absorbance (A)	UUC* Reading Absorbance (A)	Error (A)	Uncertainty ± (A)	k Factor
	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

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 501814123010

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	
Transmission T(%)	Absorbance(A)
0.020	3.7032

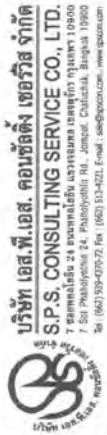
**Specific Acceptance :

Transmission ≤ 1.0 T(%), Absorbance ≥ 2.0 A

**Stray light not TISI Accredited

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

End of Calibration Certificate



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
7 Soi Phaisong 24, Phaisong 24, Jomtien, Pattaya 1, Chonburi 20150
Tel: (662) 559-4757 Fax: (662) 513-4221 E-mail: sales@sps.co.th www.sps.co.th

Calibration Report			
Non-Dispersive Infrared CO Analyzer			
Date : 05 November 2025	Brand : JPH	Model : 300E	
No. CO-302		Serial No. 985	
Calibrator (Dilution System)			
Brand : JPH	Model : 720		
Last Cal. Date : 01 September 2025	Serial No. : 911		
Reference Standard Gas			
Standard Gas : Carbon Monoxide (CO)	Cylinder No. : 0711839		
Certified Date : 18 March 2025	Expiry Date : 14 March 2035	Cylinder Conc. : 4,580 ppm	
Calibrating Condition			
Pressure : 1011 mmHg	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	% OF
Zero	0	0.10	0
CO Span	40.00	39.99	-0.100
API Model 200E CO Analyzer Check List			
Parameter	Observed Value	Units	Nominal Range
Range	30	PPM	0-1000 ppm
Stability	0.10	PPM	< 1 ppm With Zero Air
CO Measure	4016.7	ppm	2500-4800 ppm
CO Reference	3045.1	ppm	2500-4800 ppm
Measure/Reference Ratio	1.180	-	1.0-1.3 W/Zero Air
Sample Pressure	29.8	mmHgA	~2"± Ambient Absolute Pressure
Sample Flow	81.1	CC/Min	800 ± 10%
Sample Temperature	48.3	°C	48 ± 4
Bench Temperature	48.1	°C	48 ± 2
Wheel Temperature	48.4	°C	48 ± 2
Bar Temperature	30.7	°C	Ambient Temp. ± 7 ± 1.0
Photo-Drive	2086.2	mm	250 mm to 4750 mm
Scope	3.017	-	1.0 ± 0.3
Other	0.2	-	0 ± 0.3

Calibrated By : Abul Daulat
(/s/ Abul Daulat)

Approved by : [Signature]
(/s/ Peera Deabunli)



Certificate of Calibration

Aquion : Anion (ID#894)

This certificate is to verify that instrument below are calibrated
by Archemica Lab Co.,Ltd.

AQUION S/N : 190840059
AS-DV S/N : 190915235

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



ARCHEMICA LAB
บริษัท อีอาร์เคมีคัล แล็บ จำกัด
ARCHEMICA LAB CO.,LTD.

Operator Signature : [Signature] Date : Jun 6, 2025

(Mr. Teerapat Boonla)
Application Chemist

คุณภาพน้ำ

Certificate of Calibration

Certificate No. : 68-400046-2

Page : 1 of 2

Submitted by :

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

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

Equipment :

Liquid in Glass Thermometer

Manufacturer : SK

Model : N/A

Range : 0 °C to 100 °C

Resolution : 1 °C

Serial No. : N/A

Immersion : Total

ID No. : TM21/59

Environment :

Ambient Temperature : (23 ± 2) °C

Relative Humidity : (50 ± 15) %

Line Voltage : (220 ± 22) VAC

Date of Received : 21 January 2025

Date of Calibration : 24 January 2025

Date of Issue : 24 January 2025

Calibrated by : Chotrip Samchusri

Calibration Method : This instrument was calibrated by In-house method comparison technique CAL-M4001 based on ASTM E77-07 by compared with PRT in the liquid bath at the constant controlled temperature.

The temperature scale used was based on ITS-90

Reference Standard Instruments :

This certification is traceable to the International System of Units

1. Platinum Resistance Thermometer (PRT)

ID No. Cert. No. Due Date

400001 TT-0023-24 16 Feb 2026

Traceability
National Institute of Metrology Thailand (NIMT)

2. Standard Digital Thermometer

ID No. Cert. No. Due Date

400003 23E1866 01 Jun 2025

Traceability
National Institute of Metrology Thailand (NIMT)

400004 23E1866 01 Jun 2025

Traceability
National Institute of Metrology Thailand (NIMT)

Approved by :

(Permpon Charpu)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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



Certificate of Calibration

Certificate No. : 68-400046-2

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

Ice point check : UUC* reading 0 °C Standard reading 0.4429 °C

Standard Reading (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (± °C)
20.4801	20	0.5	0.31

Remark

UUC : Unit Under Calibration

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

This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95%

- 0.03 -

3





CALIBRATION LABORATORY CO., LTD.

210-11, 4, 55 Soi Prasert Manulit 29 Yaek 4, Prasert Manulit Rd., Ladprao, Bangkok 10230
Tel. 02-578-0353-4 Fax. 02-578-2672 www.cal-lab.co.th Email: sale@cal-lab.co.th



CLC
ACCREDITED
ISO/IEC 17025

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 PHAHOL YOTHIN 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 : Sukgasm Sechanart
Wenick Inchaistri
Calibration Engineer



Approved By : Mongkol Yoisoonorn
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
F3-011-05/12-23

page 1 of 4



phc calibration



CALIBRATION LABORATORY CO., LTD.

210-11, 4, 55 Soi Prasert Manulit 29 Yaek 4, Prasert Manulit Rd., Ladprao, Bangkok 10230
Tel. 02-578-0353-4 Fax. 02-578-2672 www.cal-lab.co.th Email: sale@cal-lab.co.th



CLC
ACCREDITED
ISO/IEC 17025

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 : $(25 \pm 2.5) ^\circ\text{C}$ Relative Humidity : $(50 \pm 15) \% \text{ RH}$

PROCEDURE USED :

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

This instrument was calibrated under procedure No. CLC-CPTH-04 [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-222 ULT SN. 17115653.
4. Precision Thermometer, ASL Model F250 SN. 1334023800.
5. IPRT, Wika Model CTF5000-250-D S/N. PO00043543-1-10-1.

Certificate No. Q25070523
F3-011-05/12-23

page 2 of 4



phc calibration



CERTIFICATE No : 25M2256
REFERENCE No : 76365-3

PAGE : 1 OF 2

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 :
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.



F-G010 REV 03



CERTIFICATE No : 25M2256

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE
MANUFACTURER : SARTORIUS
ID No : BA09/61
AIR PRESSURE : 1009mbar $\pm$ 1mbar
AMBIENT TEMPERATURE : 24°C $\pm$ 1°C
MODEL : BSA224S-CW
S/N : 36591843
RECEIVED DATE : 07-Mar-25
CALIBRATION DATE : 07-Mar-25
RELATIVE HUMIDITY : 52 %RH $\pm$ 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

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

2. REFERENCE STANDARD INSTRUMENTS :-

- 1) STANDARD WEIGHT SET
E2
2) STANDARD WEIGHT
E2
3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.
4. THIS CERTIFICATE EXCLUDES 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



F-G010 REV 03



QUALITY CALIBRATION CO., LTD.

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

CERTIFICATE No : 25T0521
REFERENCE No : 75853-2

PAGE : 1 OF 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 : 
PONGSAK J.

ISSUED DATE : 03-Feb-25

RECEIVED DATE : 15-Jan-25

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



F-G010 REV : 03



QUALITY CALIBRATION CO., LTD.

235 Petchkasem 63/2 Road, Laksong, 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
ID NUMBER : CRB 06/59
RECEIVED DATE : 15-Jan-25
AMBIENT TEMPERATURE : 23° C ± 1° C

MODEL : DRB 200
SERIAL NUMBER : 15110C0498
CALIBRATION DATE : 03-Feb-25
RELATIVE HUMIDITY : 53 %RH ± 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BY DIRECT MEASUREMENT 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 :-

- 1) DATA LOGGER WITH TC TYPE K HYDRA 2635A
2) THERMOCOUPLE TYPE K 24T6467
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					BLOCK No.2				
FRONT					FRONT				
13	14	15	13	14	15	13	14	15	13
10	11	12	10	11	12	10	11	12	10
7	8	9	7	8	9	7	8	9	7
4	5	6	4	5	6	4	5	6	4
1	2	3	1	2	3	1	2	3	1

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
	2	149.78
	3	150.29
	4	150.04
	5	150.09
	6	150.74
	7	149.97
	8	150.76
	9	150.54
	10	149.44
	11	150.12
	12	149.93
	13	149.19
	14	148.96
	15	149.09
Uncertainty of Measurement (± °C)		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 MULTIPLIED BY A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



F-G010 REV : 03

ระดับเสียงภายนอกโครงการ



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

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 Brüel&Kjær 2636 S/N 1537484.
3. Programmable Attenuator Taniagawa 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.

Head Office
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Fax. (66) 0 2577 9009
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Changwat Samutprakan 10280, Thailand
Tel. (66) 0 2323 1672-80 ext. 115, 116
(66) 08 3219 9440
E-mail : mtcal@tistr.or.th Website : www.tistr.or.th

FM.BLMTC.002 Rev-5



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 Brüel&Kjær 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 Brüel&Kjær 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 Brüel&Kjær 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 :

(Mr. Weerachai Deechaiyae)

Approved by :

(Mr. Prayoon Khuyapa)
Director

Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Date of Calibration : 21 Feb. 2025

Date of Issue : 24 Feb. 2025

Ref : 2011268021900739001

End of Certificate

2 / 2

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(66) 08 3219 9440
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FM.BLMTC.002 Rev-5



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 Brüel&Kjær 2636 S/N 1537484.
3. Programmable Attenuator Taniigawa 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

1 / 2

The results relate only to the items tested/calibrated or value assigned.
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FM.LMTC.002 Rev.5



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
1/2 inch Brüel&Kjær 4180	93.98	-0.02	± 0.10	IEC 60942:2003 Class 1 ±0.40 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit
1/2 inch Brüel&Kjær 4180	1000.1	0.1	± 1.5	IEC 60942:2003 Class 1 ±1.0%

3. Total Distortion

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit
1/2 inch Brüel&Kjær 4180	0.65	± 0.50	IEC 60942:2003 Class 1 ±3.0%

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :

(Mr. Weerachai Deechaiyave)

Approved by :

(Mr. Naratit Kiatyapa)

Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Date of Calibration : 21 Feb. 2025

Date of Issue : 24 Feb. 2025

End of Certificate

Ref : 2011268021900739002

2 / 2

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FM.LMTC.002 Rev.5

Noise R_630/25

Sound Level Meter Calibration Report

Acoustic Calibrator Data			
Brand	ACD	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
Sound Level Meter Data			
SLM No.	Brand	Model	Serial No.
ACC-C1-800	ACD	6238	00223041
Date			
09 November 2025			
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)			
93.81 ± 0.10 dB			

Calibrated By : Adul Donklong
(Mr. Adul Donklong)

Approved by :

(Mr. Peera Detudom)

Noise R_630-1/25

Sound Level Meter Calibration Report

Acoustic Calibrator Data			
Brand	CIRREUS	Number	ACC-CR01/63
Model	CRS15	Serial No.	92002
Calibration Range	94 dB, 1000 Hz	Last Calibration	21 February 2025
		Due Date	21 February 2026
Sound Level Meter Data			
SLM No.	Brand	Model	Serial No.
3T-C608	SCARLETT	ST-120	10351469
Date			
09 November 2025			
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)			
93.98 ± 0.10 dB			

Calibrated By :

Adul Donklong
(Mr. Adul Donklong)

Approved by :

(Mr. Peera Detudom)

ระดับเสียงภายในโครงการ



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

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 Brüel&Kjær 2636 S/N 1537484.
3. Programmable Attenuator Taniagawa 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. 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 Brüel&Kjær 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 Brüel&Kjær 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 Brüel&Kjær 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 :

(Mr. Weerachai Deechaiyae)

Approved by :

(Mr. Prayoon Khuyapa)
Director

Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Date of Calibration : 21 Feb. 2025

Date of Issue : 24 Feb. 2025

Ref : 2011268021900739001

End of Certificate

2 / 2

The results relate only to the items tested/calibrated or value assigned.
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FM.BLMTC.002 Rev-5

Noise R_443/25

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]
ACO-R30	ACO	6236	00192662	13 July 2025	Before Adjustment 93.9
ACO-R31	ACO	6236	00192663	13 July 2025	After Adjustment 93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.81 ± 0.10 dB

Calibrated by : Abul Dangklom
(Mr. Abul Dangklom)

Approved by :

(Signature)
(Mr. Peera Dejudom)

Noise R_444/25

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]
ACO-R53	ACO	6236	00192664	13 July 2025	Before Adjustment 93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					After Adjustment 93.9
					93.81 ± 0.10 dB

Calibrated by :

Abul Dangklom
(Mr. Abul Dangklom)

Approved by :

(Signature)
(Mr. Peera Dejudom)

Noise R_656/25

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	
SUM No.	Brand	Model	Serial No.
ACO-RS1	ACO	6236	00192063
ACO-RS2	ACO	6236	00192064
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)		93.81 ± 0.10 dB	

Calibrated by : Adul Dangklum
(Mr. Adul Dangklum)

Approved by : Peeru Detudom
(Mr. Peeru Detudom)

Noise R_657/25

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	
SUM No.	Brand	Model	Serial No.
ACO-RS1	ACO	6236	00192062
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)		93.81 ± 0.10 dB	

Calibrated by : Adul Dangklum
(Mr. Adul Dangklum)

Approved by : Peeru Detudom
(Mr. Peeru Detudom)

ระดับความร้อนในสถานประกอบการ



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รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Heat	Heat Stress	Heat Stress Monitor	RYG_FS0223	7-Jan-25	7-Jan-26	12
Heat	Heat Stress	Heat Stress Monitor	RYG_FS0224	27-Jan-25	26-Jan-26	12

CERTIFICATE OF CALIBRATION

Certificate No. : CD1-005-68

MEASUREMENT ITEM
: Heat Stress Monitor
MANUFACTURER
: Delta OHM
MODEL/TYPE
: HD32.2
SERIAL NUMBER
: 15006718
ID NUMBER
: RYG-F50223
CONDITION AS-RECEIVED
: Used item
CUSTOMER
: ALS laboratory group (thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khuang Suan Luang, Khet Suan Luang,
Bangkok 10250 Thailand.

RECEIVED DATE
: 27 Dec 2024
MEASUREMENT DATE
: 07 Jan 2025
ISSUE DATE
: 08 Jan 2025

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follows:
Temperature : 23.0 ± 3.0 °C
Relative Humidity : 55.0 ± 15.0 %RH

NOTED: The certificate is valid only to the item calibrated on date and place of calibration.

TABULATION OF RESULTS:

The table on next page give the measured values.

REVIEW BY: Supt.S.
APPROVED BY: [Signature]
NEXT CAL DATE: 07/01/26

Calibrated by:
☒ Mr. Siroon Thachalad
☐ Mrs. Jiraporn Jiraporn
☒ Ms. Jiraporn Jiraporn

Approved signatory:

[Signature]
Mr. Panya Booncharoen
Calibration Department Manager

Page 1 of 2 Pages

Calibration procedure:
The temperature calibration was done by In-House calibration method as VIM:1, 001 according to comparison method with standard digital temperature probe. The temperature scale use was based on ITS-90.

Traceability:
The measurement results are traceable to the International System of units (SI) through National Institute of Metrology (NIM) Certificate number: 11-024724. Certificate number: 0113-24

Reference Used During Calibration:
1. Standard Temperature Probe Model: STS-100 A500, Serial No.: 667682-09, Due date: 26 Mar 2025
2. Digital Temperature Indicator Model: DTI-1000-A MK II, Serial No.: 671407-00591, Due date: 21 Oct 2025

Uncertainty of Measurement:
The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty has been determined in accordance with the GUM Evaluation of measurement data - Guide to the expression of uncertainty in measurement.

Continuation of Certificate of Calibration Number CD1-005-68

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 °C to 40 °C

Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3201-2, S/N: 18009588. Dimension: Diameter 3.3 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
80	20.068	20.1	0.0	0.099
80	25.061	25.1	0.0	0.099
80	30.053	30.1	0.0	0.099
80	35.043	35.1	0.1	0.099
80	40.035	40.0	-0.0	0.099

Table 2: This equipment was connected with Globe thermometer probe Model: TP3276-2, S/N: 20019638. Dimension: Diameter 3.3 mm, Length 205 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.068	20.2	0.1	0.099
110	25.061	25.2	0.1	0.099
110	30.053	30.2	0.1	0.099
110	35.043	35.2	0.2	0.099
110	40.035	40.2	0.2	0.099

Table 3: This equipment was connected with temperature probe Model: TP3207-2, S/N: 15015496. Dimension: Diameter 14 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.068	20.3	0.2	0.099
75	25.061	25.2	0.1	0.099
75	30.053	30.1	0.0	0.099
75	35.043	35.0	0.0	0.099
75	40.035	39.9	-0.1	0.099

UUC*: Unit Under Calibration

End of Certificate of Calibration

CERTIFICATE OF CALIBRATION

Certificate No. : CDT-034.68

MEASUREMENT ITEM
MANUFACTURER
MODEL/TYPE
SERIAL NUMBER
ID NUMBER
CONDITION AS RECEIVED
CUSTOMER

: Heat Stress Monitor
: Delta OHM
: HD32.2
: 15006720
: RYG_F50224
: Used item
: ALS laboratory group (thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd.,
Khwang Suan Luang, Khet Suan Luang,
Bangkok 10250 Thailand.

RECEIVED DATE
MEASUREMENT DATE
ISSUE DATE

: 17 Jan 2025
: 27 Jan 2025
: 29 Jan 2025

ENVIRONMENTAL CONDITIONS:
Ambient condition in the laboratory are as follow:
Temperature
Relative Humidity

: 23.0 ± 3.0 °C
: 55.0 ± 15.0 %RH

NOTED: The certificate is valid only to the item calibrated on date and place of calibration.

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:
Mr. Sanguit Thachalad
Mr. Jitthiporn Lertsomphol
Mr. Mueangrumpal Phonmank



Approved signature:
Mr. Pannya Booncharoen
Calibration Department Manager

NEXT CAL DATE: 28/01/2026

REVIEW BY: Spt.S
APPROVED BY: Spt.S
NEXT CAL DATE: 28/01/2026

Page 1 of 2 Pages

Calibration procedure:
The temperature calibration was done by In-House calibration method, as WtCI 001 according to comparison method with standard digital temperature indicator and standard temperature probe. The temperature scale use was based on ITS-90.

Traceability:
The measurement results are traceable to the International system of units (SI) through National Institute of Metrology Thailand (NIMT) Certificate number: TT-0047-24, Certificate number: ER-0113-24

Reference Used During Calibration:
1. Standard Temperature Probe
Model: STS-100 A500, Serial No.: 667682-09,
Due date: 26 Mar 2025
2. Digital Temperature Indicator
Model: DTI-1000-A MK II, Serial No.: 671407-00591 Due date: 21 Oct 2025

Uncertainty of Measurement:
The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty has been determined in accordance with the GUM "Evaluation of measurement data - Guide to the expression of uncertainty in measurement"

Continuation of Certificate of Calibration Number CDT-034.68

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 °C to 40 °C

Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2, S/N: 15015854.
Dimension: Diameter 3.3 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
80	20.067	19.7	-0.4	0.099
80	25.060	24.7	-0.4	0.099
80	30.051	29.7	-0.4	0.099
80	35.041	34.7	-0.3	0.099
80	40.028	39.6	-0.4	0.099

Table 2: This equipment was connected with Globe thermometer probe Model: TP3276.2, S/N: 20008279.
Dimension: Diameter 3.3 mm, Length 205 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.068	20.1	0.0	0.099
110	25.060	25.1	0.0	0.099
110	30.051	30.1	0.0	0.099
110	35.040	35.1	0.1	0.099
110	40.028	40.2	0.1	0.16

Table 3: This equipment was connected with temperature probe Model: TP3207.2, S/N: 15015498.
Dimension: Diameter 14 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.068	20.3	0.2	0.099
75	25.060	25.2	0.1	0.099
75	30.051	30.1	0.0	0.099
75	35.040	35.1	0.1	0.099
75	40.028	40.0	0.0	0.099

UUC: Unit Under Calibration

Remark: The reported uncertainty of measurement is 0.16, based on standard uncertainty multiplied by a coverage factor k=2.21 providing a level of confidence of approximately 95%.

End of Certificate of Calibration

