

## ภาคผนวกที่ 4

### เอกสารการสอบเทียบความถูกต้องของ เครื่องมือตรวจวัดคุณภาพสิ่งแวดล้อม

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

**ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง  
และเครื่องมือตรวจวิเคราะห์คุณภาพสิ่งแวดล้อม**

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
<b>1. คุณภาพอากาศในบรรยากาศ</b>		
Total Suspended Particulate	High Volume Air Sampler No. B08, B18, B37	Digital Balance
Sulfur Dioxide	SO <sub>2</sub> Analyzer No. B05, B06, R07	SO <sub>2</sub> Analyzer No. B05, B06, R07
Nitrogen Dioxide	NO/NO <sub>x</sub> /NO <sub>2</sub> Analyzer No. B01, B19, B21	NO/NO <sub>x</sub> /NO <sub>2</sub> Analyzer No. B01, B19, B21
<b>2. คุณภาพอากาศจากปล่อง</b>		
Total Suspended Particulate	Console No. R01 Pitot Tube No. B58	Digital Balance
Sulfur Dioxide	Personal Pump SKC No. B90 Rotameter No. H-B08	-
Oxides of Nitrogen	Vacuum Gauge	Spectrophotometer
Sulfuric Acid	Console No. B01 Pitot Tube No. B035	-
<b>3. คุณภาพอากาศในสถานประกอบการ</b>		
Total Dust	Personal Pump SKC No. B36, B38, B40, R40, R44, R45 Rotameter No. H-B01, B03	Digital Balance
Sulfuric Acid	Personal Pump SKC No. B45, R41 Rotameter No. L-B01, B03	Ion Chromatography
<b>4. ระดับเสียงในสถานประกอบการ</b>		
L <sub>eq</sub> 8 hr	Acoustic Calibrator Sound Level Meter No. ACO-B18, B29, B41, R52	- -
<b>5. ความร้อนในสถานประกอบการ</b>		
WBGT	Digital Thermometer Heat Stress WBGT Meter No. B05, B07, B11	-
<b>6. คุณภาพน้ำ</b>		
pH	-	pH Meter
BOD <sub>5</sub>	-	BOD Analyzer
COD	-	COD Reactor
Grease & Oil	-	Digital Balance
Total Suspended Solids	-	Digital Balance
Total Dissolved Solids	-	Digital Balance
Zinc	-	ICP AAS
Nickel	-	ICP AAS
Cadmium	-	ICP AAS
Total Iron	-	ICP
Total Aluminum	-	ICP
TCB	-	Incubator Water Bath
Fluoride	-	Spectrophotometer

คุณภาพอากาศในบรรยากาศ



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

## 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 <sup>3</sup> /min)	R <sup>2</sup>
B01	B01	01/08/2025	$y = 1.099x - 3.517$	0.999
B02	B02	01/08/2025	$y = 1.142x - 3.995$	0.999
B03	B03	01/08/2025	$y = 1.127x - 5.756$	0.997
B04	B04	01/08/2025	$y = 1.137x - 4.695$	0.999
B05	B05	01/08/2025	$y = 1.128x - 5.472$	0.999
B06	B06	01/08/2025	$y = 1.177x - 5.925$	0.996
B07	B07	01/08/2025	$y = 1.147x - 5.407$	0.999
B08	B08	01/08/2025	$y = 1.152x - 6.011$	0.997
B09	B09	01/08/2025	$y = 1.132x - 4.325$	0.998
B10	B10	07/08/2025	$y = 1.123x - 5.255$	0.998
B11	B11	01/08/2025	$y = 1.131x - 3.867$	0.997
B12	B12	01/08/2025	$y = 1.128x - 2.501$	0.997
B13	B13	01/08/2025	$y = 1.162x - 4.037$	0.996
B14	B14	01/08/2025	$y = 1.144x - 4.295$	0.997
B15	B15	01/08/2025	$y = 1.101x - 3.061$	0.998
B16	B16	07/08/2025	$y = 1.039x - 1.195$	0.999
B17	B17	01/08/2025	$y = 1.056x + 0.573$	0.998
B18	B18	01/08/2025	$y = 1.176x - 6.349$	0.998
B19	B19	01/08/2025	$y = 1.150x - 4.805$	0.996
B20	B20	04/08/2025	$y = 1.043x + 2.427$	0.999
B21	B21	01/08/2025	$y = 1.064x + 0.460$	0.997
B22	B22	01/08/2025	$y = 1.146x - 4.084$	0.998
B23	B23	01/08/2025	$y = 1.118x - 2.441$	0.999
B24	B24	01/08/2025	$y = 1.085x - 1.292$	0.999
B25	B25	01/08/2025	$y = 1.074x + 0.323$	0.999
B26	B26	04/08/2025	$y = 1.098x - 3.782$	0.997
B27	B27	01/08/2025	$y = 1.173x - 7.561$	0.997
B28	B28	01/08/2025	$y = 1.128x - 5.410$	0.998
B29	B29	01/08/2025	$y = 1.134x - 3.750$	0.998
B30	B30	01/08/2025	$y = 1.050x + 1.266$	0.999
B31	B31	04/08/2025	$y = 1.166x - 5.291$	0.999
B32	B32	01/08/2025	$y = 1.159x - 4.739$	0.996
B33	B33	01/08/2025	$y = 1.173x - 5.447$	0.997
B34	B34	01/08/2025	$y = 1.148x - 4.099$	0.999

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)





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## High Volume Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard

Model : TE 5025A

S/N : 3440

### Calibration Data

High Volume Air Sampler Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (ft <sup>3</sup> /min)	R <sup>2</sup>
B35	B35	01/08/2025	$y = 1.126x - 2.314$	0.997
B36	B36	01/08/2025	$y = 1.158x - 3.625$	0.999
B37	B37	01/08/2025	$y = 1.071x - 0.714$	0.998
B38	B38	07/08/2025	$y = 1.138x - 6.470$	0.999
B39	B39	07/08/2025	$y = 1.074x - 2.233$	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	$y = 1.154x - 5.444$	0.998
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	$y = 1.097x + 0.437$	0.999
R06	R06	04/08/2025	$y = 1.138x - 2.560$	0.997
R07	R07	01/08/2025	$y = 1.046x - 0.699$	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	$y = 1.134x - 4.535$	0.996
R11	R11	01/08/2025	$y = 1.170x - 6.929$	0.998
R12	R12	01/08/2025	$y = 1.151x - 4.183$	0.999
R13	R13	01/08/2025	$y = 1.117x - 4.198$	0.999
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 :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)



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CALIBRATION REPORT					
SO <sub>2</sub> FLUORESCENT ANALYZER					
DATE :	15 September 2025	BRAND :	API	MODEL :	100E
NO.	SO <sub>2</sub> -B05			SERIAL NO.	3270
Calibrator (Dilution System)					
Brand	: Teledyne			Model	: 700E
Last Cal. Date	: 28 October 2024			Serial No.	: 201-S
Reference Standard Gas					
Standard Gas	: Sulphur Dioxide (SO <sub>2</sub> )			Cylinder No.	: A00814SK
Certified Date	: 21 June 2021	Expired Date	: 21 June 2029	Cylinder Conc.	: 49.8 ppm
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.6	°C
			% RH	50	
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.10	-	0	-
SO <sub>2</sub> Span	400.0	399.6	-0.100	400.0	1.007
API Model 100E SO <sub>2</sub> Analyzer Check list					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	0-500		
SAMPLE PRESS	28.6	in-Hg	25-35		
SAMPLE FLOW	660	cc/min	650 ± 10%		
PMT	103.0	mV	-20-150 with Zero Air		
UV LAMP	3017.9	mV	1000-4900		
STR. LGT	61.9	PPB	<100		
DRK PMT	63.2	mV	-50 - 200		
DRK LMP	58.1	mV	-50 - 200		
HVPS	670	V	550-900 constant		
DCPS	2523	mV	2500 ± 200		
RCELL TEMP	50.0	°C	50 ± 1		
BOX TEMP	28.9	°C	5-40		
PMT TEMP	7.1	°C	7 ± 2.0		
SO <sub>2</sub> Span Conc	400	PPB	20-20,000		
SO <sub>2</sub> Slope	1.007	-	1.0 ± 0.3		
SO <sub>2</sub> Offset	21.6	mV	<250		
Stability at Zero	0.1	PPB	<0.2		
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)		

Calibrated by :

Adul Dangklom  
(Mr.Adul Dangklom)

Approved by :

Peera Detudom  
(Mr.Peera Detudom)



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CALIBRATION REPORT						
SO <sub>2</sub> FLUORESCENT ANALYZER						
DATE :	15 September 2025	BRAND :	API	MODEL :	100E	
NO.	SO <sub>2</sub> -B06	SERIAL NO.	3430			
Calibrator (Dilution System)						
Brand	: Teledyne			Model	: 700E	
Last Cal. Date	: 28 October 2024			Serial No.	: 201-S	
Reference Standard Gas						
Standard Gas	: Sulphur Dioxide (SO <sub>2</sub> )			Cylinder No.	: A00814SK	
Certified Date	: 21 June 2021	Expired Date	: 21 June 2029	Cylinder Conc.	: 49.8 ppm	
CALIBRATING CONDITION						
Pressure	1011	mmbar	Temp.	24.6	°C	
% RH						50
CALIBRATION SETTING						
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB		
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope	
Zero	0	0.11	-	0	-	
SO <sub>2</sub> Span	400.0	400.2	0.050	400.0	1.012	
API Model 100E SO <sub>2</sub> 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	657	cc/min	650 ± 10%			
PMT	103.5	mV	-20-150 with Zero Air			
UV LAMP	3045.1	mV	1000-4900			
STR. LGT	61.6	PPB	<100			
DRK PMT	63.1	mV	-50 - 200			
DRK LMP	58.0	mV	-50 - 200			
HVPS	674	V	550-900 constant			
DCPS	2520	mV	2500 ± 200			
RCELL TEMP	50.1	°C	50 ± 1			
BOX TEMP	29.0	°C	5-40			
PMT TEMP	7.3	°C	7 ± 2.0			
SO <sub>2</sub> Span Conc	400	PPB	20-20,000			
SO <sub>2</sub> Slope	1.012	-	1.0 ± 0.3			
SO <sub>2</sub> Offset	22.0	mV	<250			
Stability at Zero	0.1	PPB	<0.2			
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)			

Calibrated by : Adul Dangklom  
(Mr.Adul Dangklom)

Approved by : Peera Detudom  
(Mr.Peera Detudom)





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CALIBRATION REPORT					
SO <sub>2</sub> FLUORESCENT ANALYZER					
DATE :	15 September 2025	BRAND :	TELEDYNE	MODEL :	TML-60
NO.	SO <sub>2</sub> -R07	SERIAL NO.	TRS1068		
Calibrator (Dilution System)					
Brand : Teledyne			Model : 700E		
Last Cal. Date : 28 October 2024			Serial No. : 201-S		
Reference Standard Gas					
Standard Gas : Sulphur Dioxide (SO <sub>2</sub> )			Cylinder No. : A00814SK		
Certified Date : 21 June 2021		Expired Date : 21 June 2029		Cylinder Conc. : 49.8 ppm	
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.6	°C
% RH 50					
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
SO <sub>2</sub> Span	400.0	399.6	-0.100	400.0	1.005
API Model TML-60 SO <sub>2</sub> Analyzer Check list					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	0-500		
SAMPLE PRESS	28.4	in-Hg	25-35		
SAMPLE FLOW	655	cc/min	650 ± 10%		
PMT	103.4	mV	-20-150 with Zero Air		
UV LAMP	3042.5	mV	1000-4900		
STR. LGT	61.7	PPB	<100		
DRK PMT	63.2	mV	-50 - 200		
DRK LMP	58.0	mV	-50 - 200		
HVPS	669	V	550-900 constant		
DCPS	2519	mV	2500 ± 200		
RCELL TEMP	50.4	°C	50 ± 1		
BOX TEMP	29.2	°C	5-40		
PMT TEMP	7.1	°C	7 ± 2.0		
SO <sub>2</sub> Span Conc	400	PPB	20-20,000		
SO <sub>2</sub> Slope	1.005	-	1.0 ± 0.3		
SO <sub>2</sub> Offset	21.7	mV	<250		
Stability at Zero	0.1	PPB	<0.2		
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)		

Calibrated by :

Adul Dangklom  
(Mr.Adul Dangklom)

Approved by :

Peera Detudom  
(Mr.Peera Detudom)



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CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO <sub>2</sub> / NO <sub>x</sub> ANALYZER					
DATE :	15 September 2025	BRAND :	API	MODEL :	200A
NO.	NOX-B01	SERIAL NO.	2368		
Calibrator (Dilution System)					
Brand	: Teledyne			Model	: 700E
Last Cal. Date	: 28 October 2024			Serial No.	: 201-S
Reference Standard Gas					
Standard Gas	: Nitric Oxide (NO)			Cylinder No.	: A00726SV
Certified Date	: 05 January 2023	Expired Date	: 05 January 2026	Cylinder Conc.	: 48.8 ppm
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.6	°C
			% RH	50	
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.10	-	0	-
NO Span	400	399.8	-0.050	400.0	1.008
NO <sub>x</sub> Span	400	400.2	0.050	400.0	1.011
API Model 200A NO <sub>x</sub> Analyzer Check List					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	500 standard		
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air		
SAMPLE FLOW	510	cc/min	500 ± 50		
OZONE FLOW	79	cc/min	80 ± 15		
PMT	103.2	mV	-20 - 150		
AZERO	94.0	mV	-20 - 150		
HVPS	671	V	420 - 900 constant		
RCELL TEMP	50.2	°C	50 ± 1		
BOX TEMP	29.3	°C	8 - 48		
PMT TEMP	7.0	°C	7 ± 2		
MOLY TEMP	315.2	°C	315 ± 5		
RCELL PRESS	8.2	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.4	IN-Hg-A	25 - 30 constant		
NO Span Conc	400	PPB	20 - 20,000		
NO <sub>x</sub> Span Conc	400	PPB	20 - 20,000		
NO Slope	1.008	-	1.0 ± 0.3		
NO <sub>x</sub> Slope	1.011	-	1.0 ± 0.3		
NO Offset	1.5	mV	-20 to +150		
NO <sub>x</sub> Offset	0.9	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by :

Adul Dangklom  
(Mr.Adul Dangklom)

Approved by :

Peera Detudom  
(Mr.Peera Detudom)



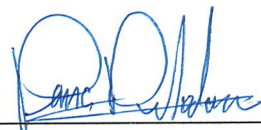
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7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900  
Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com., www.spscon.com

CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO <sub>2</sub> / NO <sub>x</sub> ANALYZER					
DATE :	15 September 2025	BRAND :	API	MODEL :	200E
NO.	NOX-B19	SERIAL NO.	353		
Calibrator (Dilution System)					
Brand : Teledyne			Model : 700E		
Last Cal. Date : 28 October 2024			Serial No. : 201-S		
Reference Standard Gas					
Standard Gas : Nitric Oxide (NO)			Cylinder No. : A00726SV		
Certified Date : 05 January 2023		Expired Date : 05 January 2026		Cylinder Conc. : 48.8 ppm	
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.6	°C
			% RH	50	
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.10	-	0	-
NO Span	400	399.7	-0.075	400.0	1.006
NO <sub>x</sub> Span	400	400.1	0.025	400.0	1.010
API Model 200E NO <sub>x</sub> Analyzer Check List					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	500 standard		
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air		
SAMPLE FLOW	506	cc/min	500 ± 50		
OZONE FLOW	78	cc/min	80 ± 15		
PMT	103.1	mV	-20 - 150		
AZERO	93.8	mV	-20 - 150		
HVPS	669	V	420 - 900 constant		
RCELL TEMP	50.3	°C	50 ± 1		
BOX TEMP	29.2	°C	8 - 48		
PMT TEMP	7.1	°C	7 ± 2		
MOLY TEMP	314.7	°C	315 ± 5		
RCELL PRESS	8.4	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.7	IN-Hg-A	25 - 30 constant		
NO Span Conc	400	PPB	20 - 20,000		
NO <sub>x</sub> Span Conc	400	PPB	20 - 20,000		
NO Slope	1.006	-	1.0 ± 0.3		
NO <sub>x</sub> Slope	1.010	-	1.0 ± 0.3		
NO Offset	1.2	mV	-20 to +150		
NO <sub>x</sub> Offset	0.8	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by :

Adul Dangklom  
(Mr.Adul Dangklom)

Approved by :

  
(Mr.Peera Detudom)





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CALIBRATION REPORT						
CHEMILUMINESCENT NO / NO <sub>2</sub> / NO <sub>x</sub> ANALYZER						
DATE :	15 September 2025	BRAND :	API	MODEL :	TML-41M	
NO.	NOX-B21	SERIAL NO.	N02374			
Calibrator (Dilution System)						
Brand	: Teledyne			Model	: 700E	
Last Cal. Date	: 28 October 2024			Serial No.	: 201-S	
Reference Standard Gas						
Standard Gas	: Nitric Oxide (NO)			Cylinder No.	: A00726SV	
Certified Date	: 05 January 2023	Expired Date	: 05 January 2026	Cylinder Conc.	: 48.8 ppm	
CALIBRATING CONDITION						
Pressure	1011	mmbar	Temp.	24.6	°C	
% RH						50
CALIBRATION SETTING						
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB		
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope	
Zero	0	0.10	-	0	-	
NO Span	400	399.9	-0.025	400.0	1.009	
NO <sub>x</sub> Span	400	400.2	0.050	400.0	1.012	
API Model TML-41M NO <sub>x</sub> Analyzer Check List						
Test Values	Observed Value	Units	Nominal Range			
RANGE	500	PPB	500 standard			
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air			
SAMPLE FLOW	505	cc/min	500 ± 50			
OZONE FLOW	78	cc/min	80 ± 15			
PMT	103.1	mV	-20 - 150			
AZERO	93.9	mV	-20 - 150			
HVPS	670	V	420 - 900 constant			
RCELL TEMP	50.4	°C	50 ± 1			
BOX TEMP	29.3	°C	8 - 48			
PMT TEMP	7.2	°C	7 ± 2			
MOLY TEMP	314.9	°C	315 ± 5			
RCELL PRESS	8.2	IN-Hg-A	2 - 10 constant			
SAMPLE PRESS	28.5	IN-Hg-A	25 - 30 constant			
NO Span Conc	400	PPB	20 - 20,000			
NO <sub>x</sub> Span Conc	400	PPB	20 - 20,000			
NO Slope	1.009	-	1.0 ± 0.3			
NO <sub>x</sub> Slope	1.012	-	1.0 ± 0.3			
NO Offset	1.4	mV	-20 to +150			
NO <sub>x</sub> Offset	0.9	mV	-20 to 150			
Stability at Zero	0.1	PPB	< 0.2			
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas			

Calibrated by : Adul Dangklom  
(Mr.Adul Dangklom)

Approved by : (Signature)  
(Mr.Peera Detudom)



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 :   
PONGSAK J.

ISSUED DATE : 13-Mar-25

RECEIVED DATE : 07-Mar-25

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







CERTIFICATE No : 25M2254

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : XS105DU  
MANUFACTURER : METTLER TOLEDO S/N : 1126422905  
ID No : BA05/50 RECEIVED DATE : 07-Mar-25  
AIR PRESSURE : 1009mbar  $\pm$  1mbar CALIBRATION DATE : 07-Mar-25  
AMBIENT TEMPERATURE : 24°C  $\pm$  1°C 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	QK-I-151	C02250116	28-Jan-27
2) STANDARD WEIGHT	E2	15843	C02250117	29-Jan-27

3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.

4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.

5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-

- NATIONAL INSTITUTE OF METROLOGY (THAILAND)

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

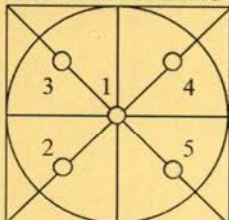
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 120 g WAS 0.000055 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY ( $\pm$ 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	0.000066
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	100.00001	-0.00001	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



คุณภาพอากาศจากปล่อง





บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

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

## Console Calibration Report

Calibration Method

Critical Orifices

### Calibration Data

Console Data		Calibration Data		
No.	Serial No.	Date	y	$\Delta H_{\text{g}}$ (mmH <sub>2</sub> 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	49.89
R05	1503015	02/09/2025	0.996	50.10

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

Accept Value of  $\Delta H_{\text{g}}$  (test) is  $46.7 \pm 6.4$  (mmH<sub>2</sub>O)

Calibrated by :

Adul Dangklom

(Mr. Adul Dangklom)

Approved by :

Peera Detudom

(Mr. Peera 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	Coefficient of Standard Pitot	Date	Avg. of Cp (test)	
				Side A	Side B
B03	S	0.99	04/08/2025	0.84	0.84
B04	S	0.99	01/08/2025	0.84	0.83
B05	S	0.99	01/08/2025	0.84	0.84
B07	S	0.99	04/08/2025	0.85	0.84
B08	S	0.99	01/08/2025	0.84	0.84
B09	S	0.99	04/08/2025	0.84	0.83
B11	S	0.99	05/08/2025	0.84	0.84
B16	S	0.99	04/08/2025	0.84	0.83
B18	S	0.99	01/08/2025	0.84	0.84
B19	S	0.99	01/08/2025	0.84	0.83
B21	S	0.99	04/08/2025	0.84	0.83
B24	S	0.99	01/08/2025	0.84	0.84
B27	S	0.99	04/08/2025	0.84	0.83
B30	S	0.99	01/08/2025	0.85	0.84
B31	S	0.99	01/08/2025	0.84	0.85
B33	S	0.99	01/08/2025	0.83	0.84
B35	S	0.99	01/08/2025	0.84	0.85

Remark : Accept value of Cp (test) is  $0.84 \pm 0.01$

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera 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	Coefficient of Standard Pitot	Date	Avg. of Cp (test)	
				Side A	Side B
B36	S	0.99	01/08/2025	0.84	0.84
B37	S	0.99	01/08/2025	0.84	0.85
B38	S	0.99	01/08/2025	0.84	0.83
B39	S	0.99	01/08/2025	0.84	0.84
B40	S	0.99	04/08/2025	0.85	0.84
B41	S	0.99	01/08/2025	0.84	0.84
B44	S	0.99	05/08/2025	0.83	0.84
B45	S	0.99	01/08/2025	0.84	0.85
B46	S	0.99	01/08/2025	0.85	0.84
B47	S	0.99	01/08/2025	0.85	0.84
B48	S	0.99	01/08/2025	0.84	0.84
B49	S	0.99	04/08/2025	0.85	0.84
B54	S	0.99	01/08/2025	0.84	0.84
B56	S	0.99	04/08/2025	0.84	0.84
B57	S	0.99	04/08/2025	0.85	0.84
B58	S	0.99	04/08/2025	0.84	0.84

Remark : Accept value of Cp (test) is  $0.84 \pm 0.01$

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)



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Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Environmental Conditions

Temperature 25 ± 3 °C  
Pressure 1010 ± 15 mmbar

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (ml/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R <sup>2</sup>
B80	SKC	224-PCXR3	504569	01/07/2025	1,000	1,500	2,000	1,005	1,501	2,007	1.014x - 22.484	0.999
B81	SKC	224-PCXR3	503480	02/07/2025	1,000	1,500	2,000	997	1,494	1,995	1.005x - 14.583	1.000
B82	SKC	224-PCXR3	505673	04/07/2025	1,000	1,500	2,000	998	1,497	2,001	1.004 - 6.075	1.000
B83	SKC	224-PCXR3	510785	04/07/2025	1,000	1,500	2,000	1,009	1,501	1,998	1.003x - 7.370	0.999
B84	SKC	224-PCXR3	508333	02/07/2025	1,000	1,500	2,000	997	1,502	1,997	1.000x - 1.894	1.000
B85	SKC	224-PCXR3	505757	02/07/2025	1,000	1,500	2,000	1,002	1,503	2,004	1.004x - 7.222	1.000
B86	SKC	224-PCXR3	512625	01/07/2025	1,000	1,500	2,000	999	1,493	1,997	0.996x + 1.139	1.000
B87	SKC	224-PCXR3	504324	01/07/2025	1,000	1,500	2,000	1,001	1,498	2,002	1.001x + 0.607	1.000
B88	SKC	224-PCXR3	508307	02/07/2025	1,000	1,500	2,000	999	1,497	1,995	0.995x + 5.331	1.000
B89	SKC	224-PCXR3	509860	02/07/2025	1,000	1,500	2,000	1,003	1,494	1,998	1.007x - 15.027	0.999
B90	SKC	224-PCXR3	508366	04/07/2025	1,000	1,500	2,000	997	1,510	1,992	0.998x + 0.332	1.000
B91	SKC	224-PCXR3	510919	03/07/2025	1,000	1,500	2,000	1,005	1,503	1,999	0.990x + 13.532	1.000
B92	SKC	224-PCXR3	510987	03/07/2025	1,000	1,500	2,000	1,004	1,506	2,002	0.999x + 3.737	1.000
B93	SKC	224-PCXR3	509845	03/07/2025	1,000	1,500	2,000	997	1,501	2,004	1.008x - 12.857	1.000

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Mr. Peera Detudom





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### Rotameter Calibration Report (For Personal Pump High Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

#### Calibration Data

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

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

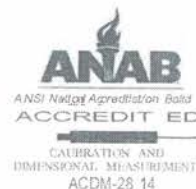
Approved by :

Peera Detudom  
(Mr. Peera Detudom)



# CALIBRATION LABORATORY Co.,LTD.

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



## CERTIFICATE OF CALIBRATION FOR

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

CUSTOMER S.P.S. CONSULTING SERVICE CO., LTD.  
7 SOI 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 Yotsoontorn  
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. Q24076549

F3-011-05/12-23

page 1 of 3





# CALIBRATION LABORATORY Co., LTD.

211Q-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230  
Tel. 02-578-Q353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



CALIBRATION AND  
DIMENSIONAL MEASUREMENT  
ACDM-2814

## REPORT OF CALIBRATION

### FOR

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

---

#### ENVIRONMENT CONDITIONS

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

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

#### REFERENCE STANDARD USED :

Document Process Calibrator, Fluke Model 74 1B *S/N.* 8295020 with Pressure Module Model 700PD5 *S/N.* 89404505.

#### TRACEABILITY :

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

#### 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. Q24076549

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

### **CALIBRATION DATA**

#### **CORRECTION OF PRESSURE**

DUC Test point ( inHg )	STD Reading ( kPa )		Conversion to inHg		Correction ( inHg)	
	Up	Down	Up	Down	Up	Down
0	0.00	0.00	0.0	0.0	0.0	0.0
-5	-17.61	-17.95	-5.2	-5.3	+0.2	+0.3
-10	-34.54	-34.54	-10.2	-10.2	+0.2	+0.2
-15	-51.13	-51.47	-15.1	-15.2	+0.1	+0.2
-20	-67.72	-68.06	-20.0	-20.1	+0.0	+0.1
-25	-84.31	-84.31	-24.9	-24.9	+0.1	+0.1
-30	-101.24	-101.24	-29.9	-29.9	+0.1	+0.1

Uncertainty of measurement  $\pm 0.2$  inHg

Transmitting fluid : Air.

Technical Note. Conversion factor 1 kPa ; 0.2953003 inHg

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

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

**### End of Certificate ###**

Certificate No. Q24076549

F3-011-05/ 12-23



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** : PONGSAK J.

**ISSUED DATE** : 13-Mar-25

**RECEIVED DATE** : 07-Mar-25

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







CERTIFICATE No : 25M2254

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : XS105DU  
MANUFACTURER : METTLER TOLEDO S/N : 1126422905  
ID No : BA05/50 RECEIVED DATE : 07-Mar-25  
AIR PRESSURE : 1009mbar  $\pm$  1mbar CALIBRATION DATE : 07-Mar-25  
AMBIENT TEMPERATURE : 24°C  $\pm$  1°C 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	QK-I-151	C02250116	28-Jan-27
2) STANDARD WEIGHT	E2	15843	C02250117	29-Jan-27

3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.

4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.

5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-

- NATIONAL INSTITUTE OF METROLOGY (THAILAND)

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

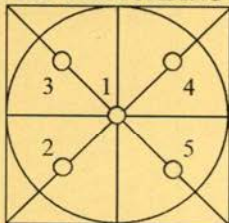
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 120 g WAS 0.000055 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY ( $\pm$ 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	0.000066
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





**SITHIPORN ASSOCIATES CO., LTD.**  
**CALIBRATION LABORATORY**

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

SITHIPORN  
associates



Cert. No. : SP25026

Pages : 1 of 4

## Calibration Certificate

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

**Cert. No. : SP25026**

**Job No. : VC68SP0019**

**Pages : 2 of 4**

**Calibration Method :**

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

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

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

**Condition of this result of calibration :**

1. Certified reference materials

<u>Material</u>	<u>Ref. type</u>	<u>Cell serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
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)

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

UUC\* = Unit Under Calibration

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

**Result of calibration : Photometric Accuracy**

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

UUC\* = Unit Under Calibration

Cert. No. : SP25026

Job No. : VC68SP0019

Pages : 4 of 4

**Result of calibration : Photometric Accuracy**

(Without adjustment)

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

UUC\* = Unit Under Calibration

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

Resolution of Wavelength Mode 0.1 nm

Resolution of Photometric Mode 0.001 A

**Parameter Setting**

Measurement Mode Wavelength, Absorbance

Wavelength Scan 190 nm - 1100 nm

Scanning Speed 7.5 nm/min

Band width(Wavelength) 1.0

Band width(Vis) 1.0

Band width(Uv) 1.0

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

\*\*Specific Acceptance :

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

\*\*Stray light not TISI Accredited

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

**End of Calibration Certificate**



คุณภาพอากาศในสถานประกอบการ



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

S.P.S. CONSULTING SERVICE CO., LTD.

7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900

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

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

### Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

#### Environmental Conditions

Temperature  
Pressure

25

1010

± 3

± 15

°C

mmbar

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (mL/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R <sup>2</sup>
B01	SKC	224-PCXR4	262101	01/07/2025	1,000	1,500	2,000	997	1,501	2,003	1.003x - 4.236	1.000
B02	SKC	224-PCXR4	626166	02/07/2025	1,000	1,500	2,000	1,005	1,506	2,007	1.001x + 1.555	1.000
B03	SKC	224-PCXR4	612968	04/07/2025	1,000	1,500	2,000	1,004	1,499	2,002	1.004x - 11.638	0.999
B04	SKC	224-PCXR4	602804	01/07/2025	1,000	1,500	2,000	999	1,502	1,998	1.002x - 3.373	1.000
B05	SKC	224-PCXR4	612693	03/07/2025	1,000	1,500	2,000	1,002	1,504	2,008	1.008x - 9.160	1.000
B06	SKC	224-PCXR4	262188	01/07/2025	1,000	1,500	2,000	1,001	1,505	2,003	1.001x - 3.965	1.000
B07	SKC	224-PCXR4	626262	02/07/2025	1,000	1,500	2,000	999	1,494	2,000	0.997x + 3.261	1.000
B08	SKC	224-PCXR4	626100	04/07/2025	1,000	1,500	2,000	1,003	1,502	2,004	1.009x - 15.922	0.999
B09	SKC	224-PCXR4	626479	01/07/2025	1,000	1,500	2,000	997	1,499	2,005	1.005x - 9.935	1.000
B10	SKC	224-PCXR4	091950	01/07/2025	1,000	1,500	2,000	995	1,507	2,001	1.008x - 15.634	1.000
B11	SKC	224-PCXR8	564315	04/07/2025	1,000	1,500	2,000	997	1,495	2,002	1.004x - 7.274	1.000
B12	SKC	224-PCXR4	034656	01/07/2025	1,000	1,500	2,000	1,001	1,507	2,005	1.007x - 13.608	0.999
B13	SKC	224-PCXR4	602073	01/07/2025	1,000	1,500	2,000	1,002	1,504	2,007	1.006x - 6.161	1.000
B14	SKC	224-PCXR4	626313	04/07/2025	1,000	1,500	2,000	999	1,503	2,004	1.001x - 3.361	1.000
B15	SKC	224-PCXR4	626474	04/07/2025	1,000	1,500	2,000	1,005	1,506	2,005	1.008x - 12.821	0.999
B16	SKC	224-PCXR4	626477	04/07/2025	1,000	1,500	2,000	997	1,509	1,995	0.999x - 0.595	1.000
B17	SKC	224-PCXR4	626860	02/07/2025	1,000	1,500	2,000	999	1,497	1,996	1.000x - 1.613	1.000
B18	SKC	224-PCXR4	691484	04/07/2025	1,000	1,500	2,000	1,003	1,499	1,995	1.003x - 9.955	0.999
B19	SKC	224-PCXR4	691599	01/07/2025	1,000	1,500	2,000	996	1,508	1,994	1.001x - 1.127	1.000
B20	SKC	224-PCXR4	691587	02/07/2025	1,000	1,500	2,000	997	1,505	1,997	1.004x - 9.596	1.000
B21	SKC	224-PCXR4	691531	03/07/2025	1,000	1,500	2,000	998	1,504	1,999	1.002x - 3.125	1.000
B22	SKC	224-PCXR4	691654	04/07/2025	1,000	1,500	2,000	1,002	1,505	1,992	1.003x - 9.240	0.999
B23	SKC	224-PCXR4	798393	01/07/2025	1,000	1,500	2,000	992	1,498	1,993	0.999x - 3.941	1.000
B24	SKC	224-PCXR4	626363	02/07/2025	1,000	1,500	2,000	1,004	1,506	1,994	1.003x - 9.084	0.999
B25	SKC	224-PCXR4	798489	03/07/2025	1,000	1,500	2,000	1,005	1,497	2,004	0.998x + 5.100	1.000
B26	SKC	224-PCXR4	798479	03/07/2025	1,000	1,500	2,000	1,004	1,504	1,998	0.997x + 5.575	1.000
B27	SKC	224-PCXR4	691673	04/07/2025	1,000	1,500	2,000	997	1,508	1,991	1.002x - 8.556	0.999
B28	SKC	224-PCXR4	691570	03/07/2025	1,000	1,500	2,000	1,005	1,504	2,001	1.000x + 2.897	1.000
B29	SKC	224-PCXR4	626472	02/07/2025	1,000	1,500	2,000	1,003	1,502	2,004	1.001x - 1.675	1.000
B30	SKC	224-PCXR4	691489	03/07/2025	1,000	1,500	2,000	1,004	1,510	2,007	1.010x - 13.764	0.999
B31	SKC	224-PCXR4	691509	02/07/2025	1,000	1,500	2,000	996	1,499	1,991	0.997x + 0.891	1.000
B32	SKC	224-PCXR4	091567	03/07/2025	1,000	1,500	2,000	998	1,497	1,996	0.996x + 3.273	1.000
B33	SKC	224-PCXR4	091756	02/07/2025	1,000	1,500	2,000	1,004	1,505	1,992	1.000x - 4.228	0.999
B34	SKC	224-PCXR4	612962	04/07/2025	1,000	1,500	2,000	1,005	1,508	2,011	1.007x - 5.447	1.000
B35	SKC	224-PCXR4	602682	02/07/2025	1,000	1,500	2,000	1,004	1,506	1,991	0.997x + 1.603	0.999
B36	SKC	224-PCXR4	626164	01/07/2025	1,000	1,500	2,000	999	1,498	2,002	1.004x - 8.113	1.000
B37	SKC	224-PCXR4	626256	02/07/2025	1,000	1,500	2,000	995	1,508	2,001	1.005x - 10.431	1.000
B38	SKC	224-PCXR4	626167	02/07/2025	1,000	1,500	2,000	1,000	1,497	1,993	0.999x - 0.639	1.000
B39	SKC	224-PCXR4	034637	04/07/2025	1,000	1,500	2,000	1,005	1,503	1,991	1.002x - 7.186	0.999
B40	SKC	224-PCXR4	798349	03/07/2025	1,000	1,500	2,000	995	1,494	1,990	1.000x - 7.405	1.000

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

S.P.S. CONSULTING SERVICE CO., LTD.

7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900

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

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

Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

Environmental Conditions

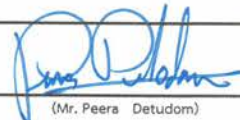
Temperature : 25  $\pm$  3  $^{\circ}$ C  
Pressure : 1010  $\pm$  15 mmbar

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (ml/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R <sup>2</sup>
R40	SKC	224-PCXR4	612753	02/07/2025	1,000	1,500	2,000	1,003	1,503	1,994	1.004x - 11.618	0.999
R41	SKC	224-PCXR4	626140	02/07/2025	1,000	1,500	2,000	995	1,495	1,993	1.008x - 22.708	0.999
R42	SKC	224-PCXR4	626463	02/07/2025	1,000	1,500	2,000	1,001	1,497	1,991	0.994x + 7.539	1.000
R43	SKC	224-PCXR4	626129	01/07/2025	1,000	1,500	2,000	1,007	1,507	2,001	1.005x - 8.869	0.999
R44	SKC	224-PCXR4	602753	01/07/2025	1,000	1,500	2,000	1,002	1,499	1,997	0.999x - 0.384	1.000
R45	SKC	224-PCXR4	626137	02/07/2025	1,000	1,500	2,000	995	1,508	2,007	1.008x - 11.542	1.000

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

  
(Mr. Peera Detudom)



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

### Rotameter Calibration Report (For Personal Pump High Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

#### Calibration Data

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

Calibrated by :

Adul Dangklom  
 (Mr.Adul Dangklom)

Approved by :

Peera Detudom  
 (Mr. Peera Detudom)



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

Rotameter Calibration Report (For Personal Pump Low Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Rotameter Data				Calibration Data							
No.	Brand	Model	Date	Flow Rate (mL/min)						Value From Calibration Curve	
				Flow Rate (Reading)			Actual (Q std.)				
				1	2	3	1	2	3	y	R <sup>2</sup>
L-B01	Dwyer	VFA-21	02/07/2025	50	100	200	50.3	100.2	201.1	1.001x + 0.271	1.000
L-B02	Dwyer	VFA-21	02/07/2025	50	100	200	50.5	100.3	202.2	0.996x + 1.427	1.000
L-B03	Dwyer	VFA-21	03/07/2025	50	100	200	50.2	101.5	199.1	1.000x + 0.166	1.000
L-B04	Dwyer	VFA-21	04/07/2025	50	100	200	50.9	99.3	201.4	0.997x + 1.377	0.999
L-B05	Dwyer	VFA-21	02/07/2025	50	100	200	50.1	101.7	199.9	0.994x + 1.540	1.000
L-B06	Dwyer	VFA-21	03/07/2025	50	100	200	50.8	99.0	201.4	0.999x + 0.969	0.999
L-B07	Dwyer	VFA-21	04/07/2025	50	100	200	49.9	101.2	200.6	1.002x + 0.347	1.000
L-B08	Dwyer	VFA-21	04/07/2025	50	100	200	50.5	99.7	199.8	1.001x - 0.048	1.000
L-B09	Dwyer	VFA-21	02/07/2025	50	100	200	50.7	99.9	199.3	0.997x + 1.056	0.999
L-B10	Dwyer	VFA-21	02/07/2025	50	100	200	49.8	99.2	199.6	0.999x - 0.559	1.000

Calibrated by :

Adul Dangklom  
(Mr.Adul Dangklom)

Approved by :

Mr. Peera Detudom  
(Mr. Peera Detudom)





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 :   
PONGSAK J.

ISSUED DATE : 13-Mar-25

RECEIVED DATE : 07-Mar-25

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







CERTIFICATE No : 25M2254

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : XS105DU  
MANUFACTURER : METTLER TOLEDO S/N : 1126422905  
ID No : BA05/50 RECEIVED DATE : 07-Mar-25  
AIR PRESSURE : 1009mbar  $\pm$  1mbar CALIBRATION DATE : 07-Mar-25  
AMBIENT TEMPERATURE : 24°C  $\pm$  1°C 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	QK-I-151	C02250116	28-Jan-27
2) STANDARD WEIGHT	E2	15843	C02250117	29-Jan-27

3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.

4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.

5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-

- NATIONAL INSTITUTE OF METROLOGY (THAILAND)

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

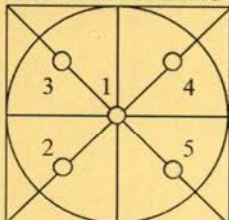
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 120 g WAS 0.000055 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY ( $\pm$ 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	0.000066
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







## 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.**



บริษัท อาร์เคมีกา แล็บ จำกัด  
ARCHEMICA LAB CO.,LTD.

Operator Signature : Teerapat B

Date : Jun 6, 2025

(Mr. Teerapat Boonla)

Application Chemist



ระดับเสียงในสถานประกอบการ



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

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

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

- Standards used :
1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
  2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.
  3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.
  4. Digital Multimeter Agilent 34401A S/N MY44005560.
  5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.
  6. Audio Analyzer 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  
W

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

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

FM.BL.MTC.002 Rev.5

#### Head Office

35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,  
Changwat Pathumthani 12120, Thailand  
Tel. (66) 0 2577 9036  
Fax. (66) 0 2577 9009

#### Office/Laboratory

668 Mu 2 Tambon Bangpoomai, Amphoe Muang Samutprakan,  
Changwat Samutprakan 10280, Thailand  
Tel. (66) 0 2323 1672-80 ext. 115, 116  
(66) 08 3219 9440  
E-mail : mtc@tistr.or.th Website : www.tistr.or.th

#### Office

196 Phahonyothin Road, Ladyao, Chatuchak,  
Bangkok 10900, Thailand  
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217  
(66) 08 1889 6827

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 20 $\mu$ Pa at 1000 Hz

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

1. Sound Pressure Level

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

2. Frequency

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

3. Total Distortion

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

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. Prawate Kluaypa)  
Director

Date of Calibration : 21 Feb. 2025

Date of Issue : 24 Feb. 2025

Electrical and Electronic Standards Laboratory  
Industrial Metrology and Testing Service Centre

Ref : 2011268021900739001

End of Certificate

2 / 2

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

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FM.BL.MTC.002 Rev.5

Head Office

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Tel. (66) 0 2577 9036  
Fax. (66) 0 2577 9009

Office/Laboratory

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Changwat Samutprakan 10280, Thailand  
Tel. (66) 0 2323 1672-80 ext. 115, 116  
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E-mail : mtc@tistr.or.th Website : www.tistr.or.th

Office

196 Phahonyothin Road, Ladyao, Chatuchak,  
Bangkok 10900, Thailand  
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217  
(66) 08 1889 6827





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

Noise B\_326/25

## Sound Level Meter Calibration Report

### Acoustic Calibrator Data

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

### Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-B18	ACO	6236	00172048	12 July 2025	93.7	93.9
ACO-B29	ACO	6236	00182011	12 July 2025	93.7	93.9
ACO-B41	ACO	6236	00192032	12 July 2025	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.81 ± 0.10 dB	

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)



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

Noise B\_447/25

## Sound Level Meter Calibration Report

### Acoustic Calibrator Data

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

### Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-B29	ACO	6236	00182011	10 September 2025	93.8	93.9
ACO-B41	ACO	6236	00192032	10 September 2025	93.7	93.9
ACO-R52	ACO	6236	00192064	10 September 2025	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.81 ± 0.10 dB	

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Pang Detudom  
(Mr. Peera Detudom)

ระดับความร้อนในสถานประกอบการ





ID LINE : IEC17025



## Certificate of Calibration

Certificate Number : SPR24100363-5

Page : 1 of 3

Customer : S.P.S. CONSULTING SERVICE CO., LTD.

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

Equipment Name : Area Heat Stress Monitor

Manufacturer : Quest Technologies

Model : QUESTemp 34

Serial Number : TEH060047

ID. Number : B05

### Environmental Conditions

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

Received Date : 21 Oct 2024

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

Calibration Date : 21 Oct 2024

Location of Calibration : In-Lab

Recommend Due Date : 21 Oct 2025

Calibration Procedure : SP-CPT-04-13

Date of Issue : 22 Oct 2024

### Method of Calibration

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

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

Calibrated by : Mr.Surasak Ritthikaew

Calibration Officer

Approved by :

( Mr.Prayoon Topart )

Authorized Signatory



ID LINE : IEC17025



## Calibration Report

Certificate Number : SPR24100363-5

Page : 2 of 3

### Reference Standards

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

### Traceability

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

Quality Reborn Co., Ltd





ID LINE : IEC17025



## Result of Calibration

Certificate Number : SPR24100363-5

Page : 3 of 3

Temperature Accuracy in the Measurement. (WET)

Unit : °C

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

Temperature Accuracy in the Measurement. (DRY)

Unit : °C

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

Temperature Accuracy in the Measurement. (GLOBE)

Unit : °C

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

### Note :

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

### Measurement Uncertainty

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

- End of Certificate -





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

Heat B\_327\_1

Heat Stress WBGT Meter Verification Report			
Verification Data			
Heat Stress WBGT Meter No.	: B05	Verification Date	: 12 July 2025
Brand	: Quest Technologies	Ambient Temp.	: 24.5 °C
Model	: QUESTemp34	Barometric Pressure	: 1011 mmbar
Serial No.	: TEH060047	Relative Humidity	: 49 %
Verification Module (Electronic Sensor Check) :			
Verification Module No. : 21 WB = 12.5 °C, DB = 47.1 °C, G = 69.3 °C			
Result of Verification : Without Adjustment			
Wet Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
12.5	12.3	0.2	± 0.5
Dry Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
47.1	47.2	-0.1	± 0.5
Globe Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
69.3	69.2	0.1	± 0.5
UUC* = UNIT UNDER CALIBRATION			

Verified by :

Adul Dangklom  
(Mr.Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

S.P.S. CONSULTING SERVICE CO., LTD.

7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900

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

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

Heat B\_448\_1

Heat Stress WBGT Meter Verification Report			
Verification Data			
Heat Stress WBGT Meter No.	: B05	Verification Date	: 10 September 2025
Brand	: Quest Technologies	Ambient Temp.	: 24.5 °C
Model	: QUESTemp34	Barometric Pressure	: 1011 mmbar
Serial No.	: TEH060047	Relative Humidity	: 49 %
Verification Module (Electronic Sensor Check) :			
Verification Module No. : 21 WB = 12.5 °C, DB = 47.1 °C, G = 69.3 °C			
Result of Verification : Without Adjustment			
Wet Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
12.5	12.6	-0.1	± 0.5
Dry Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
47.1	46.9	0.2	± 0.5
Globe Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
69.3	69.2	0.1	± 0.5
UUC* = UNIT UNDER CALIBRATION			

Verified by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)



ID LINE : IEC17025



## Certificate of Calibration

Certificate Number : SPR25030358-1

Page : 1 of 3

Customer : S.P.S. CONSULTING SERVICE CO., LTD.

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

Equipment Name : Area Heat Stress Monitor

Manufacturer : Quest Technologies

Model : QUESTemp 34

Serial Number : TEG040059

ID. Number : B07

### Environmental Conditions

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

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

Location of Calibration : In-Lab

Calibration Procedure : SP-CPT-04-13

Received Date : 19 Mar 2025

Calibration Date : 22 Mar 2025

Recommend Due Date : 22 Mar 2026

Date of Issue : 23 Mar 2025

### Method of Calibration

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

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

Calibrated by : Mr. Navaporn Uengseng

Calibration Officer

Approved by :

( Mr. Pootthipong A. )

Authorized Signatory





## Calibration Report

Certificate Number : SPR25030358-1

Page : 2 of 3

### Reference Standards

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

### Traceability

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

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

NA - NA Caltechnologies Co., Ltd.



## Result of Calibration

Certificate Number : SPR25030358-1

Page : 3 of 3

Temperature Accuracy in the Measurement. (WET)

Unit : °C

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

Temperature Accuracy in the Measurement. (DRY)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty ( ± )
30.0	30.015	29.8	-0.215	0.20
35.0	35.012	34.8	-0.212	0.20
40.0	40.016	39.8	-0.216	0.20

Temperature Accuracy in the Measurement. (GLOBE)

Unit : °C

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

### Note:

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

### Measurement Uncertainty

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

- End of Certificate -



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

Heat B\_327\_2

Heat Stress WBGT Meter Verification Report			
Verification Data			
Heat Stress WBGT Meter No.	: B07	Verification Date	: 12 July 2025
Brand	: Quest Technologies	Ambient Temp.	: 24.5 °C
Model	: QUESTemp34	Barometric Pressure	: 1011 mmbar
Serial No.	: TEG040059	Relative Humidity	: 49 %
Verification Module (Electronic Sensor Check) :			
Verification Module No. : 21 WB = 12.5 °C, DB = 47.1 °C, G = 69.3 °C			
Result of Verification : Without Adjustment			
Wet Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
12.5	12.6	-0.1	± 0.5
Dry Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
47.1	47.0	0.1	± 0.5
Globe Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
69.3	69.3	0.0	± 0.5
UUC* = UNIT UNDER CALIBRATION			

Verified by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)





บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

S.P.S. CONSULTING SERVICE CO., LTD.

7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900

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

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

Heat B\_448\_2

Heat Stress WBGT Meter Verification Report			
Verification Data			
Heat Stress WBGT Meter No.	: B07	Verification Date	: 10 September 2025
Brand	: Quest Technologies	Ambient Temp.	: 24.5 °C
Model	: QUESTemp34	Barometric Pressure	: 1011 mmbar
Serial No.	: TEG040059	Relative Humidity	: 49 %
Verification Module (Electronic Sensor Check) :			
Verification Module No. : 21 WB = 12.5 °C, DB = 47.1 °C, G = 69.3 °C			
Result of Verification : Without Adjustment			
Wet Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
12.5	12.6	-0.1	± 0.5
Dry Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
47.1	47.0	0.1	± 0.5
Globe Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
69.3	69.3	0.0	± 0.5
UUC* = UNIT UNDER CALIBRATION			

Verified by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)



ID LINE : IEC17025



## Certificate of Calibration

Certificate Number : SPR24100363-3

Page : 1 of 3

Customer : S.P.S. CONSULTING SERVICE CO., LTD.

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

Equipment Name : Area Heat Stress Monitor

Manufacturer : Quest Technologies

Model : QUESTemp 34

Serial Number : TEL080034

ID. Number : B11

### Environmental Conditions

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

Received Date : 21 Oct 2024

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

Calibration Date : 21 Oct 2024

Location of Calibration : In-Lab

Recommend Due Date : 21 Oct 2025

Calibration Procedure : SP-CPT-04-13

Date of Issue : 22 Oct 2024

### Method of Calibration

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

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

Calibrated by : Mr.Chatchai Kittisopha

Calibration Officer

Approved by :

( Mr. Prayoon Topart )

Authorized Signatory





ID LINE : IEC17025



## Calibration Report

Certificate Number : SPR24100363-3

Page : 2 of 3

### Reference Standards

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

### Traceability

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

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

Quality Reborn Co., Ltd





ID LINE : IEC17025



## Result of Calibration

Certificate Number : SPR24100363-3

Page : 3 of 3

Temperature Accuracy in the Measurement. (WET)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty ( ± )
30.0	30.021	30.3	0.279	0.20
35.0	35.018	35.3	0.282	0.20
40.0	40.019	40.3	0.281	0.20

Temperature Accuracy in the Measurement. (DRY)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty ( ± )
30.0	30.021	30.2	0.179	0.20
35.0	35.018	35.2	0.182	0.20
40.0	40.019	40.2	0.181	0.20

Temperature Accuracy in the Measurement. (GLOBE)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty ( ± )
30.0	30.021	30.2	0.179	0.20
35.0	35.018	35.2	0.182	0.20
40.0	40.019	40.2	0.181	0.20

### Note :

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

### Measurement Uncertainty

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

- End of Certificate -



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

Heat B\_327\_3

Heat Stress WBGT Meter Verification Report			
Verification Data			
Heat Stress WBGT Meter No.	: B11	Verification Date	: 12 July 2025
Brand	: Quest Technologies	Ambient Temp.	: 24.5 °C
Model	: QUESTemp34	Barometric Pressure	: 1011 mmbar
Serial No.	: TEL080034	Relative Humidity	: 49 %
Verification Module (Electronic Sensor Check) :			
Verification Module No. : 21 WB = 12.5 °C, DB = 47.1 °C, G = 69.3 °C			
Result of Verification : Without Adjustment			
Wet Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
12.5	12.5	0.0	± 0.5
Dry Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
47.1	46.9	0.2	± 0.5
Globe Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
69.3	69.2	0.1	± 0.5
UUC* = UNIT UNDER CALIBRATION			

Verified by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)



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

Heat B\_448\_3

Heat Stress WBGT Meter Verification Report			
Verification Data			
Heat Stress WBGT Meter No.	: B11	Verification Date	: 10 September 2025
Brand	: Quest Technologies	Ambient Temp.	: 24.5 °C
Model	: QUESTemp34	Barometric Pressure	: 1011 mmbar
Serial No.	: TEL080034	Relative Humidity	: 49 %
Verification Module (Electronic Sensor Check) :			
Verification Module No. : 21 WB = 12.5 °C, DB = 47.1 °C, G = 69.3 °C			
Result of Verification : Without Adjustment			
Wet Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
12.5	12.4	0.1	± 0.5
Dry Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
47.1	47.2	-0.1	± 0.5
Globe Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
69.3	69.5	-0.2	± 0.5
UUC* = UNIT UNDER CALIBRATION			

Verified by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)



คุณภาพน้ำ

## CERTIFICATE OF CALIBRATION FOR

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

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

DATE OF RECEIVED : 17 June 2025

DATE OF ISSUED : 20 June 2025

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

Calibrated By : Sukgasem Seehanart  
Wenick Inchaisri  
Calibration Engineer



Approved By : Mongkol Yotsoontorn  
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





**CLC**  
Accredited  
ISO/IEC 17025

# CALIBRATION LABORATORY Co., LTD.

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



## REPORT OF CALIBRATION

### FOR

**NOMENCLATURE** : **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-22/2 ULT S/N. 17115653.
4. Precision Thermometer, ASL Model F250 S/N. 1334023800.
5. IPRT, Wika Model CTP5000-250-D S/N. PO00043543-1-10-1.

Certificate No. **Q25070523**

**F3-011-05/12-23**

page 2 of 4



@clccalibration





# CALIBRATION LABORATORY Co., LTD.

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



## TRACEABILITY :

1. The measurements are traceable to International System of Units (SI) , through National Institute of Metrology (Thailand).  
Lot Number. 080124 , 120124. Due Date 23 January 2026.
2. The measurements are traceable to International System of Units (SI) , through Control Company.  
Certificate No. 4281-14495731 , Due Date 27 September 2025.
3. The measurements are traceable to International System of Units (SI) , through Calibration Laboratory Co., Ltd.  
Certificate No. Q24120999, Due Date 26 November 2025.
4. The measurements are traceable to International System of Units (SI) , through Thailand Institute of Scientific and Technological Research (TISTR). Certificate No. PSL-T 1042/67, Due Date 16 October 2025.
5. The measurements are traceable to International System of Units (SI) , through National Institute of Metrology (Thailand).  
Certificate No. TT-0146-24, Due Date 28 October 2025.

## UNCERTAINTY :

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

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

Certificate No. Q25070523

F3-011-05/12-23

page 3 of 4



@clccalibration



**CLC**  
Accredited  
ISO/IEC 17025

# CALIBRATION LABORATORY Co., LTD.

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



**CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION**

**MEASUREMENT RESULTS : ( X ) without adjustment ( ) adjustment**

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

## CALIBRATION DATA

### 1. pH METER RESULT @ 25 °C

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

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

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

### 2. TEMPERATURE RESULT

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

Technical Note. Type of sensor : Thermistor

Probe  $\varnothing$  3 mm

Materials : Metal Sheath.

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

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

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

**### End of Certificate ###**

Certificate No. Q25070523

F3-011-05/12-23

page 4 of 4



@clccalibration

CERT.No.: HS-W015C

Calibration Date : 18 Mar 25  
Submitted by : S.P.S CONSULTING SERVICE CO.,LTD  
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol,  
Chatuchak, Bangkok, Thailand 10900

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

Model : YSI 5000  
S/N : 15B100751  
Probe : YSI 5010  
S/N : 22D100097  
ID NO. : -  
Air Temp ref : S/N. F8065C26  
Barometric ref : S/N. F8065C26  
Water Temp ref : -  
ID NO. HS001  
Technician : Kittipong M.

#### Calibration Details

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

Mean Measurement	9.07	mg/l	-	-
Inaccuracy	0.02	mg/l	-	-

Overall Status (PASS)

#### Manufacturer Specification

Accuracy = +/- 0.02 mg/l

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



Technician Signature  
(Kittipong Maekwong)



Laboratory Manager  
(Natenapha Pisatkunchon)





# QUALITY CALIBRATION CO., LTD.

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

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

www.qcalibration.com

CERTIFICATE No : 25T0521

REFERENCE No : 75853-2

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







# QUALITY CALIBRATION CO., LTD.

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

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

CERTIFICATE No : 25T0521

PAGE : 2 OF 2

## Calibration Report

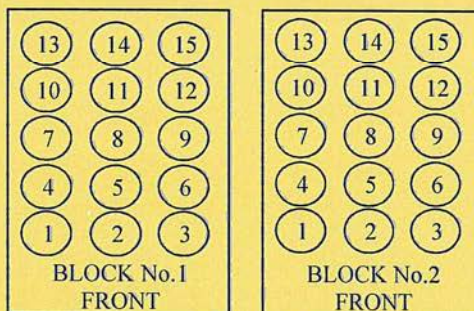
EQUIPMENT : COD REACTOR  
MANUFACTURER : HACH  
ID NUMBER : CRB 06/59  
RECEIVED DATE : 15-Jan-25  
AMBIENT TEMPERATURE : 23° C ± 1° C  
MODEL : DRB 200  
SERIAL NUMBER : 15110C0498  
CALIBRATION DATE : 03-Feb-25  
RELATIVE HUMIDITY : 53 %RH ± 10 % RH

### CONDITION OF THIS RESULTS OF CALIBRATION

- 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.
- REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) DATA LOGGER WITH TC TYPE K	HYDRA 2635A	7301307	24T6467	26-Jun-25
- THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.
- THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
- THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-  
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO., LTD.

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



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

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

NOTE 2 : LOCATION 10 WAS REFERENCE LOCATION.

NOTE 3 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.

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

END OF CALIBRATION REPORT







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** :   
PONGSAK J.

**ISSUED DATE** : 13-Mar-25

**RECEIVED DATE** : 07-Mar-25

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







CERTIFICATE No : 25M2256

PAGE : 2 OF 2

## Calibration Report

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

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) STANDARD WEIGHT SET	E2	QK-I-151	C02250116	28-Jan-27
2) STANDARD WEIGHT	E2	15843	C02250117	29-Jan-27

3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.

4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.

5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-

- NATIONAL INSTITUTE OF METROLOGY (THAILAND)

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

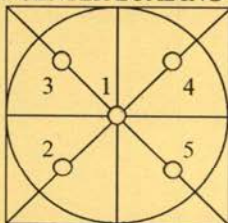
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0.000071 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY ( $\pm$ 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





## MAINTENANCE AND TEST CERTIFICATE MODEL

### OPTIMA 5300DV

<b>Customer :</b> <u>S.P.S.Consulting Service Co.,Ltd</u>	Date Tested: <u>July 1, 2025</u>	
	Recommendation Recertification	
<b>Address :</b> <u>7 Soi Phaholyothin 24</u>	Period <u>6</u> Months	
<u>Paholyothin Road</u>	Recertification Due: <u>January 1, 2026</u>	
<u>Jompol Chatuchak, Bangkok 1090</u>	Date Last Certified: <u>January 6, 2025</u>	
<b>User Name:</b> <u>K.Phenpha Vipasthawatt</u>	Visit Number: <u>1 of 2</u>	
<b>Phone:</b> <u>083-9269252</u>	PerkinElmer Phone: <u>02-719-6420 ext 206</u>	
<b>Fax:</b> <u>02-513-4221</u>	PerkinElmer Fax: <u>02-318-5597</u>	

CONFIGURATION TESTED		ACCESSORIES/COMPONENT NOT INCLUDED
<b>MODEL</b>	<b>SERIAL NUMBER</b>	
<u>OPTIMA 5300DV</u>	<u>077C7042401</u>	
<b>TESTED EQUIPMENT</b>	<b>CALIBRATION NUMBER</b>	<b>EXPIRATION</b>
<u>IPV Methods</u>		
<b>TEST STANDARD USED</b>	<b>PART NUMBER</b>	<b>EXPIRATION DATE</b>
<u>Multielement Standard</u>	<u>N069-1579</u>	<u>December 30, 2024</u>
<u>Wavecal Solution</u>	<u>N058-2152</u>	<u>March 30, 2024</u>
<u>VIS Wavecal solution</u>	<u>N930-2946</u>	<u>February 28, 2024</u>
<u>Instrument Cal. STD4</u>	<u>N930-0221</u>	<u>November 30, 2024</u>
<b>CUSTOMER SUPPLIED</b>	<b>COMMENTS</b>	<b>CUSTOMER INITIALS</b>
<u>2 % HNO3</u>		
<u>10 % HNO3</u>		



## MAINTENANCE AND TEST CERTIFICATE MODEL

### OPTIMA 5300DV

**SERIAL NUMBER** 077C7042401**DATE TESTED** July 1, 2025**1. MECHANICAL CHECKS**

- |  |                             |
|--|-----------------------------|
| A. Inspect and clean all fans and filters.                                       | <input type="checkbox"/> OK |
| B. Inspect and replace as necessary, all torch components including the RF coil. | <input type="checkbox"/> OK |
| C. Inspect all tubing for sign of clacking or leaking.                           | <input type="checkbox"/> OK |
| D. Adjust water and gas pressure regulator settings.                             | <input type="checkbox"/> OK |
| E. Inspect and leak check pneumatics drawers.                                    | <input type="checkbox"/> OK |
| F. Clean the exterior of the instrument.   | <input type="checkbox"/> OK |

**2. OPTICAL CHECKS**

- |   |                             |
|---|-----------------------------|
| A. Inspect and clean all optical components.        | <input type="checkbox"/> OK |
| B. As required, check and replace all purgefilters. | <input type="checkbox"/> OK |
| C. Recheck optical alignment.                       | <input type="checkbox"/> OK |

**3. COOLING SYSTEM CHECKS**

- |   |                              |
|---|------------------------------|
| A. Perform preventive maintenance on chiller. | <input type="checkbox"/> OK  |
| B. Flush out the chiller every year.          | <input type="checkbox"/> N/A |

**4. PERFORMANCE CHECKS**

- |                            |                             |
|----------------------------|-----------------------------|
| A. Torch View Alignment.   | <input type="checkbox"/> OK |
| B. Wavelength Calibration. | <input type="checkbox"/> OK |





## MAINTENANCE AND TEST CERTIFICATE MODEL

### OPTIMA 5300DV

SERIAL NUMBER : 077C7042401DATE TESTED : July 1, 2025

PARAMETER		SPECIFICATION		FINAL VALUE	
Spectral Resolution : UV	As 193.696 nm	≤ 0.007		0.00570	
	Ni 231.604 nm	≤ 0.008		0.00734	
	Ni 341.476 nm	≤ 0.012		0.00763	
Spectral Resolution : VIS	La 408.672 nm	≤ 0.020		0.01627	
	Ba 455.403 nm	≤ 0.025		0.02428	
Precision					
	As 193.656 nm	% RSD	< 1.0	0.82	%
	Zn 213.856 nm	% RSD	< 1.0	0.83	%
	Mn 257.610 nm	% RSD	< 1.0	0.20	%
	La 379.478 nm	% RSD	< 1.0	0.89	%
	Ba 455.403 nm	% RSD	< 1.0	0.92	%
	Ba 493.408 nm	% RSD	< 1.0	0.75	%
Detection Limits : Axial	Tl 190.080 nm	3(sd)		10.65	ppb
	As 193.696 nm	3(sd)		2.48	ppb
	Pb 220.353 nm	3(sd)		3.09	ppb
Detection Limits : Radial	As 193.696 nm	3(sd)		331.50	ppb
	Zn 213.856 nm	3(sd)		0.98	ppb
	Mn 257.610 nm	3(sd)		0.34	ppb
	La 379.478 nm	3(sd)		2.54	ppb
	Ba 455.403 nm	3(sd)		2.19	ppb
	Ba 493.408 nm	3(sd)		4.32	ppb
BEC : Axial (IB X 500)/(IS-IB)	Cd 226.502 nm	≤ 150 ppb		140.03	
BEC : Radial (IB X 1000)/(IS-IB)	Mn 257.610 nm	≤ 45 ppb		24.17	



**MAINTENANCE AND TEST CERTIFICATE MODEL**  
**OPTIMA 5300DV**

**SERIAL NUMBER** 077C7042401

**DATE TESTED** July 1, 2025

**Remarks :**

Commissioning follow as commissioning performance sheets.

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



meets



does not meet

the PerkinElmer Specifications listed on this certificate.

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

**Service Department PerkinElmer Ltd.**

**Authorized Representative:**



( Wiphan Promlumda )

Service Engineer



## MAINTENANCE AND TEST CERTIFICATE MODEL

### OPTIMA 5300DV

<b>Customer :</b> <u>S.P.S.Consulting Service Co.,Ltd</u>	Date Tested: <u>December 18, 2025</u>	
	Recommendation Recertification	
<b>Address :</b> <u>7 Soi Phaholyothin 24</u>	Period <u>6</u> Months	
<u>Paholyothin Road</u>	Recertification Due: <u>June 28, 2026</u>	
<u>Jompol Chatuchak, Bangkok 10900</u>	Date Last Certified: <u>July 1, 2025</u>	
<b>User Name:</b> <u>K.Phenpha Viphasathawat</u>	Visit Number: <u>2 of 2</u>	
<b>Phone:</b> <u>083-9269252</u>	PerkinElmer Phone: <u>02-719-6420 ext 206</u>	
<b>Fax:</b> <u>02-513-4221</u>	PerkinElmer Fax: <u>02-318-5597</u>	

CONFIGURATION TESTED		ACCESSORIES/COMPONENT NOT INCLUDED
<b>MODEL</b>	<b>SERIAL NUMBER</b>	
<u>OPTIMA 5300DV</u>	<u>077C7042401</u>	
<b>TESTED EQUIPMENT</b>	<b>CALIBRATION NUMBER</b>	<b>EXPIRATION</b>
<u>IPV Methods</u>		
<b>TEST STANDARD USED</b>	<b>PART NUMBER</b>	<b>EXPIRATION DATE</b>
<u>Multielement Standard</u>	<u>N069-1579</u>	<u>November 30, 2026</u>
<u>Wavecal Solution</u>	<u>N058-2152</u>	<u>July 30, 2026</u>
<u>VIS Wavecal solution</u>	<u>N930-2946</u>	<u>August 30, 2026</u>
<u>Instrument Cal. STD4</u>	<u>N930-0221</u>	<u>November 30, 2026</u>
<b>CUSTOMER SUPPLIED</b>	<b>COMMENTS</b>	<b>CUSTOMER INITIALS</b>
<u>2 % HNO3</u>		
<u>10 % HNO3</u>		





## MAINTENANCE AND TEST CERTIFICATE MODEL

### OPTIMA 5300DV

**SERIAL NUMBER**    077C7042401
**DATE TESTED**    December 18, 2025
**1. MECHANICAL CHECKS**

A. Inspect and clean all fans and filters.

☐ OK

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

☐ OK

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

☐ OK

D. Adjust water and gas pressure regulator settings.

☐ OK

E. Inspect and leak check pneumatics drawers.

☐ OK

F. Clean the exterior of the instrument.

☐ OK

**2. OPTICAL CHECKS**

A. Inspect and clean all optical components.

☐ OK

B. As required, check and replace all purgefilters.

☐ OK

C. Recheck optical alignment.

☐ OK

**3. COOLING SYSTEM CHECKS**

A. Perform preventive maintenance on chiller.

☐ OK

B. Flush out the chiller every year.

☐ N/A

**4. PERFORMANCE CHECKS**

A. Torch View Alignment.

☐ OK

B. Wavelength Calibration.

☐ OK



## MAINTENANCE AND TEST CERTIFICATE MODEL

### OPTIMA 5300DV

SERIAL NUMBER : 077C7042401				DATE TESTED : December 18, 2025	
PARAMETER	SPECIFICATION			FINAL VALUE	
Spectral Resolution : UV	As	193.696 nm	≤ 0.007	0.00530	
	Ni	231.604 nm	≤ 0.008	0.00708	
	Ni	341.476 nm	≤ 0.012	0.00776	
Spectral Resolution : VIS	La	408.672 nm	≤ 0.020	0.01614	
	Ba	455.403 nm	≤ 0.025	0.02377	
Precision					
	As	193.656 nm	% RSD < 1.0	0.67	%
	Zn	213.856 nm	% RSD < 1.0	0.62	%
	Mn	257.610 nm	% RSD < 1.0	0.88	%
	La	379.478 nm	% RSD < 1.0	0.63	%
	Ba	455.403 nm	% RSD < 1.0	0.65	%
	Ba	493.408 nm	% RSD < 1.0	0.45	%
Detection Limits : Axial	Tl	190.080 nm	3(sd)	3.21	ppb
	As	193.696 nm	3(sd)	6.06	ppb
	Pb	220.353 nm	3(sd)	0.92	ppb
Detection Limits : Radial	As	193.696 nm	3(sd)	17.35	ppb
	Zn	213.856 nm	3(sd)	1.79	ppb
	Mn	257.610 nm	3(sd)	0.18	ppb
	La	379.478 nm	3(sd)	0.76	ppb
	Ba	455.403 nm	3(sd)	0.11	ppb
	Ba	493.408 nm	3(sd)	0.56	ppb
BEC : Axial (IB X 500)/(IS-IB)	Cd	226.502 nm	≤ 150 ppb	40.52	
BEC : Radial (IB X 1000)/(IS-IB)	Mn	257.610 nm	≤ 45 ppb	42.33	



## MAINTENANCE AND TEST CERTIFICATE MODEL

### OPTIMA 5300DV

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

Commissioning follow as commissioning performance sheets.

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



meets



does not meet

the PerkinElmer Specifications listed on this certificate.

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

**Service Department PerkinElmer Ltd.**

**Authorized Representative:**

( Wiphan Promlumda )

Service Engineer



## MAINTENANCE REPORT AND CALIBRATION CERTIFICATE

### FLOW INJECTION MERCURY SYSTEMS MODEL

#### FIAS 100

<b>Customer :</b>	<u>S.P.S.Consulting Service Co.,Ltd</u>	<b>Date Tested:</b>	<u>July 1, 2025</u>
		<b>Recommendation Recertification</b>	
<b>Address :</b>	<u>7 Soi Phaholyothin 24</u>	<b>Period</b>	<u>6</u> Months
	<u>Paholyothin Road</u>	<b>Recertification Due:</b>	<u>January 1, 2026</u>
	<u>Jompol Chatuchak, Bangkok 10900</u>	<b>Date Last Certified:</b>	<u>January 6, 2025</u>
<b>User Name:</b>	<u>K.Phenpha Viphashtawat</u>	<b>Visit Number:</b>	<u>1 of 2</u>
<b>Phone:</b>	<u>083-9269252</u>	<b>PerkinElmer Phone:</b>	<u>02-719-6420 ext 8</u>
<b>Fax:</b>	<u>02-513-4221</u>	<b>PerkinElmer Fax:</b>	<u>02-318-5597</u>

#### CONFIGURATION TESTED

MODEL	SERIAL NUMBER	SOFTWARE
<u>FIAS 100</u>	<u>100S14090404</u>	<u>Syngistix version 7.3</u>
<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>

TEST STANDARD USED	PART NUMBER	EXPIRATION DATE
<u>Mercury (Hg) Std</u>	<u>N9300174</u>	<u>JUN 30, 2026</u>
<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>

# MAINTENANCE REPORT AND CALIBRATION CERTIFICATE

## FLOW INJECTION MERCURY SYSTEMS MODEL

### FIAS 100

**SERIAL NUMBER** 100S14090404

**DATE TESTED** July 1, 2025

#### 1. INSTRUMENT CHECKS

A. The light part, quartz windows and detector. Clean if necessary.

☐ OK

B. Inspect the mercury lamp. Alignment if necessary.

☐ OK

C. Inspect the mercury filter. Replace if necessary.

☐ OK

D. Inspect and clean or replace the dust filter.

☐ OK

E. Inspect peristaltic pump tubes. Replace if necessary.

☐ OK

#### 2. ELECTRONICS CHECKS

A. Electronic power supplies

+ 5 Volts ( $\pm 0.3$ )

+ 4.98 Volts

+ 15 Volts ( $\pm 1.0$ )

+ 15.03 Volts

- 15 Volts ( $\pm 1.0$ )

- 15.07 Volts

+ 40 Volts ( $\pm 1.0$ )

+ 40.02 Volts

#### 3. GAS SYSTEM CHECK

A. Leak test all internal and external gas box joints.

☐ OK

B. Inspect solenoid valve and pressure switch.

☐ OK

C. Inspect non return valve. Replace sleeve if necessary.

☐ OK

D. Inspect flow meter and needle valve. Clean if necessary.

☐ OK

#### 4. MECHANICAL CHECKS

A. Inspect pump motor and pump roller.

☐ OK

B. Inspect and clean switching valve.

☐ OK

C. Inspect, clean and lubricant autosample.

☐ OK

# MAINTENANCE REPORT AND CALIBRATION CERTIFICATE

## FLOW INJECTION MERCURY SYSTEMS MODEL

### FIAS 100

<b>SERIAL NUMBER</b>	<u>100S14090404</u>	<b>DATE TESTED</b>	<u>July 1, 2025</u>
<b>PARAMETER</b>		<b>SPECIFICATION</b>	<b>ACTUAL VALUE</b>
<b>5. PERFORMANCE TEST</b>			
A. Baseline Noise Test			
(measure peak area at 10 replicates without any sample)			
	SD	$\leq 0.0015 \text{ A*s}$	<u>0.0025</u> A*s
B. Sensitivity Check			
(10 ppb Hg Standard at 11 replicates)			
	Mean Absorbance	$\geq 0.0800 \text{ Abs.}$	<u>0.1201</u> Abs.
C. Characteristic mass( $m_0$ )			
(10 ppb Hg Standard at 11 replicates)			
	$m_0$	$\leq 314 \text{ pg}$	<u>183.2</u> pg/0.0044A
D. Precision Check (%RSD)			
(10 ppb Hg Standard at 11 replicates)			
	%RSD	$\leq 2.5 \%$	<u>1.65</u> %



# MAINTENANCE REPORT AND CALIBRATION CERTIFICATE

## FLOW INJECTION MERCURY SYSTEMS MODEL

FIAS 100

SERIAL NUMBER 100S14090404

DATE TESTED July 1, 2025

Remarks :

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



meets



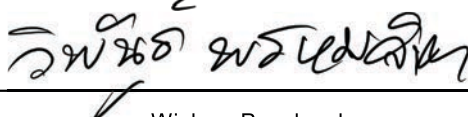
does not meet

the PerkinElmer Specifications listed on this certificate.

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

**Service Department PerkinElmer Ltd.**

Customer Service Engineer:



(


Wiphan Promlumda

)

Service Engineer

## ***PinAAcle 900T Preventive Maintenance (PM)***

<b>Company Name:</b>	S.P.S Consulting Service Co.,Ltd		
<b>Address (Instrument Location):</b>	Phaholyothin 24, Phaholyothin Rd, Ladyao, Jatujak, Bangkok 10900		
<b>Serial Number:</b>	PTCS1411103	<b>PM Number:</b>	2/2
<b>Customer Name (if applicable):</b>	K.Phenpha	<b>Telephone Number:</b>	WO-11540402
<b>Customer Support Engineer Name:</b>	Prasit	<b>Service Order Number:</b>	083-9269252
<b>Date PM Performed: (DD-MMM-YYYY)</b>	18 DEC 2025	<b>Next PM Due Date: (DD-MMM-YYYY)</b>	18 JUN 2026
<b>Standard Labor Hours to Complete PM :</b>		<b>5 hours</b>	

Part Number	Release	Publication Date	
09370143 Rev.9	A	January 2018	

### **Scope**

The purpose of this PM is to ensure the continued functionality of the PinAAcle 900T by inspecting and replacing any worn or damaged parts. This service should only be performed by a trained representative of PerkinElmer.

The customer should save their method before the PM begins.

### **General Instructions:**

The customer must provide the engineer operational data to demonstrate recent instrument performance prior to starting the PM. Always check with the customer before making any changes that may affect the customer's analysis or calibration, including a current back-up of system software and/or data files. The completed document should be signed by an authorized PerkinElmer and customer representative and left with the customer. Update the PM sticker and instrument logbook as required.

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## Component List

Component / Specific Model	Serial #	Configuration Notes
PinAAcle900T	PTCS1411103	WinLab32 Ver 7.4.1.0730

## Parts Lists

Parts Included with the PM		
Part Number (if applicable)	Description	Quantity
B0501696	Fan Filters	N/A <input type="text"/>
B3002013	THGA Contact Cylinders	N/A <input type="text"/>
B3141064	Glycerol for THGA Cooling	N/A
N3160156	O-Ring Kits for Sampling Introduction ( Stainless Steels Nebulizer)	N/A
N3160157	O-Ring Kits for Sampling Introduction ( Plastic Nebulizer)	N/A <input type="text"/>
N9301714	Replacement Acetylene Filter Cartridge	N/A <input type="text"/>
TH001022	Replacement Air Filter Cartridge	N/A <input type="text"/>

Additional Reagents and Standards Required for PM				
Part Number (if applicable)	Description	Quality	Batch/Lot #	Expired Date (MM/YY)
N9300183	1000 mg/L Copper Standard	AR	27-156CUY1	SEP-2026
N9300244	GFAAS Mixed Standard	AR		

Additional Reagents and Standards Required for PM (Customer Support Solution)				
Part Number (if applicable)	Description	Quantity	Batch/Lot #	Expiration Date (MM/YY)
N/A	DI Water	250 ml.	AR	AR
N/A	0.5% HNO <sub>3</sub>	250 ml.	AR	AR



Additional Tools Required for PM			
Part Number (if applicable)	Description	Quantity	Serial #
N1013000	0.2A Neutral density filter	1	MG0-704
N1013002	1.0A Neutral density filter	1	MG2-891
B3100652 Or N9307029	Electronic Flow Meter	1	
B0505495	Test Jig	1	
03030997	System 2 EDL Driver	1	030309-97E
N3050605	As System 2 EDL	1	17986
N3050121	Cu Lumina HCL	1	000003793D12
N3050109	Ba Lumina HCL	1	041123-010120
N3050139	K Lumina HCL	1	0000037B8E1D
N3050152	Ni Lumina HCL	1	
N3050119	Cr Lumina HCL	1	010324-0300050

# Procedure Checklist

Use (✓) to check off those steps in the checklist that have been completed.

## 1. General:

- ☒ Review the instrument performance with the customer and document any recent problems.
- ☒ Inspect the customer log book and make any appropriate PM entries.
- ☒ Perform general inspection of system for cleanliness.

## 2. PC Instrument Software:

- ☒ Instrument Software user files/databases archived, packed, and/or deleted as needed.

## 3. Mechanical:

- ☒ Inspect and clean all fans and filters. Replace filters if necessary
- ☒ Inspect all gas and water lines for leaks and/or wear. Replace if needed. Thoroughly inspect all quick connects. Replace the Y connector, P/N 09921079, if needed.
- ☒ Clean exterior of the instrument.

### 3.1 Flame Technique

- ☒ Inspect the burner head, burner chamber, and nebulizer. Clean if needed as stated in the Hardware Guide.
- ☒ Check burner head dimensions with the feeler gauge as stated in the Hardware Guide in the Maintenance chapter section on cleaning the burner head and checking sloth width. Replace if out of specification
- ☒ Check the condition of the end cap, burner head, and nebulizer O-rings. Replace if necessary.
- ☒ Check the drain system for signs of wear. Replace worn or damaged parts.
- ☒ Visually check for proper flame conditions when igniting the Air-C<sub>2</sub>H<sub>2</sub> and N<sub>2</sub>O-C<sub>2</sub>H<sub>2</sub> flames (if applicable).

### 3.2 THGA Technique

- ☒ Inspect the pole pieces and clean where the pole pieces contact the furnace. Replace the pole piece p-rings as needed, P/N's B0501018 & B0501250. Grease the O-rings as needed with Apiezon L grease, P/N 09905148
- ☒ Inspect the four insulation pads on the front contact housing of the THGA in furnace. If the pads are missing replace the THGA furnace or replace the insulator pads on the furnace.
- ☒ Inspect the graphite tube and clean the contact cylinders. Replace if necessary.
- ☒ Check internal and external gas flows with the Electronic Gas Flow Meter and the Gas Flow Test Probe as described in the Service Manual. Correct if necessary.
- ☒ Check furnace open/close function.
- ☒ Verify the operation of the GFTV Camera for proper operation and viewing alignment in the furnace camera Tube View window. Align if needed.
- ☒ Check the operation of the Halogen Light ASSY for the GFTV Camera. Replace if needed.
- ☒ Check the water level/quality in the recirculation (if applicable). Add distilled water if necessary.
- ☒ Check the cooling system fluid flow rate with the FCS In-Line Flow Meter for proper levels if needed. Refer to SDB# COSY008.STN

- ☒ Perform Cooling System maintenance if needed per SDB# COSY005.STN.
- ☒ Check auto sampler operation.
- ☒ Perform an auto sampler check valve test as described in the Service Manual.
- ☒ Lubricate the spindles of the auto sampler pumps and all moving parts of the tray mechanics as described in the Service Manual.
- ☒ Inspect the auto sampler sampling capillary as described in the Service Manual. Replace if necessary.

#### 4. Electrical:

- ☒ Inspect PC boards. Clean if necessary.
- ☒ Carefully check all internal and external cable connections.
- ☒ Check instrument firmware revisions upgrade to current levels (if necessary)
- ☒ Run Diagnostics Test within the Advanced function of the Spectrometer page. Check the results in the service log folder in the Spectrometer BM Log Viewer.

#### 5. Optics:

- ☒ Inspect and clean the sample compartment windows, if needed.
- ☒ Inspect and clean the furnace windows, if needed.
- ☒ Inspect and clean the GFTV camera lens, if needed.
- ☒ Inspect optics. Clean or replace if necessary,

#### 6. Gasses:

- ☒ Verify that the Gasses supplied to the instrument are within the pressure and purity specifications found in the PinAAcle 900 Series Pre-installation Checklist SDB.
- ☒ Verify that the air filter element is dry. Replace if necessary.

#### 7. Flame Interlock Check:

Description: Check to ensure that all safety interlocks are closed.

Parameter	Specification	Test Results	Pass/Fail
Flame Sensor	Air/C <sub>2</sub> H <sub>2</sub> Flame correctly shuts down	Active <input type="checkbox"/>	Passed
Drain Sensor	Air/C <sub>2</sub> H <sub>2</sub> Flame correctly shuts down	Active <input type="checkbox"/>	Passed
Nebulizer Sensor	Air/C <sub>2</sub> H <sub>2</sub> Flame correctly shuts down	Active <input type="checkbox"/>	Passed
C <sub>2</sub> H <sub>2</sub> Pressure Sensor	Air/C <sub>2</sub> H <sub>2</sub> Flame correctly shuts down	Active <input type="checkbox"/>	Passed
Air Pressure Sensor	Air/C <sub>2</sub> H <sub>2</sub> Flame correctly shuts down	Active <input type="checkbox"/>	Passed
Burner Head Sensor	Choosing Nitrous Oxide as the oxidant should trigger an interlock shuts down	Active <input type="checkbox"/>	Passed



## 8. After PM Performance tests [Flame]:

### 8.1 Detector Linearity with Barium

Description: Ensures that the detector is linear in the Visible Range.

Parameter	Specification	Certificate Value at 553.6 nm (Abs.)	Test Results	Pass/Fail
1.0 A ND Filter	± 5% from Cert.	0.9874	0.9644	Passed <input type="button" value="v"/>
0.2 A ND Filter	± 5% from Cert.	0.1886	0.1727	Passed <input type="button" value="v"/>

### 8.2 Baseline Noise at 1.0 Absorbance with Barium

Description: Ensures that a high absorbance will not produce excessive noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.010	0.0016	Passed <input type="button" value="v"/>

### 8.3 AA Baseline Noise with Copper

Description: Check baseline noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.001	0.0001	Passed <input type="button" value="v"/>

### 8.4 D<sub>2</sub> Background Compensation with Copper

Description: Verifies the instruments ability to compensate for Background absorption.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.010	0.0069	Not Applicable <input type="button" value="v"/>

### 8.5 AA-BG Baseline Noise with Copper

Description: Ensures that background correction does not produce excessive noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.005	0.0005	Not Applicable <input type="button" value="v"/>

### 8.6 AA-BG Baseline Noise with Arsenic

Description: Ensures that background correction does not produce excessive noise at a low wavelength.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	$\leq 0.005$	0.0013	Not Applicable <input type="button" value="v"/>

### 8.7 Flame Sensitivity

Description: Instrument Sensitivity checked against Copper standard.

Standard Copper Sensitivity	Specification	Results (Abs.)	Pass/Fail
5 mg/L Sensitivity SS Neb (if applicable)	> 0.250 Abs.	N/A	Not Applicable
2 mg/L Sensitivity HS Neb (if applicable)	> 0.250 Abs.	0.3544	Passed <input type="button" value="v"/>

## 9. After PM Performance tests [THGA]:

### 9.1 Furnace Gas Flows

Description: Ensures the flow rates are within specification.

Parameter	Specification	Test Results	Pass/Fail
Internal Flow Rate	250 mL/min $\pm$ 25 mL/min	252	Passed <input type="button" value="v"/>
External Flow Rate	100 mL/min $\pm$ 10 mL/min	97	Passed <input type="button" value="v"/>

### 9.2 Chromium Baseline Noise

Description: Signal to noise check.

Parameter	Specification	Results	Pass/Fail
Baseline Noise	$\leq 0.005$ Abs.	-0.0010	Passed <input type="button" value="v"/>
Standard Deviation	$\leq 0.005$	0.0009	Passed <input type="button" value="v"/>

### 9.3 Chromium Characteristic Mass and Precision

Description: Calculate the characteristic mass using the characteristic mass tool and precision from the integrated absorbance values.

Parameter	Specification	Results	Pass/Fail
Cr $m_0$ Results	$\leq 7.0$ pg/0.0044 A-s	6.8	Passed <input type="button" value="v"/>
Precision	$\leq 2.0$ %	0.38	Passed <input type="button" value="v"/>

#### 9.4 Copper Characteristic Mass and Zeeman Ratio

Description: Calculate the characteristic mass using the characteristic mass tool and check the Zeeman Ratio.

Parameter	Specification	Results	Pass/Fail
Cu m <sub>0</sub> Result	≤ 16.5 pg/0.0044 A-s	15.4	Not Applicable
Zeeman Ratio	0.52 ± 0.04	0.51	Not Applicable

#### 10. Review:


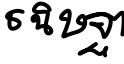
- ☒ Review with the customer PM work performed.
- ☒ Review with the customer routine maintenance procedures.
- ☒ Discuss recommended customer supplied materials to have on hand.
- ☒ Attach PM sticker.



## Additional Comments

Additional Comments Regarding the PM	
Zeeman Ratio	$= \frac{\text{Atomic Signal (Peak area)}}{\text{Atomic Signal (Peak area)} + \text{Background Signal (Peak area)}}$ $= \frac{0.1442}{0.1442+0.1337}$ $= 0.518$

## Review

<i>The preventive maintenance checks and if applicable performance tests for PinAAcle 900T have been completed.</i>	
<i>This PinAAcle 900T Passes <input checked="" type="checkbox"/> Fails <input type="checkbox"/> the preventive maintenance.</i>	
<b>Review of Preventive Maintenance:</b>	
Authorized PerkinElmer Representative:	<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="text-align: center;">  </div> <div style="text-align: right;">           Date:            18 DEC 2025  <small>(DD-MMM-YYYY)</small> </div> </div>
Authorized Customer Representative:	<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="text-align: center;">  </div> <div style="text-align: right;">           Date:            18 DEC 2025  <small>(DD-MMM-YYYY)</small> </div> </div>



MIRACLE INTERNATIONAL TECHNOLOGY CO.,LTD

214 Bangwaek Rd. Bangpai Bangkac Bangkok 10160  
Tel.: 0-2865-4647-8 Fax: 0-2865-4649 <http://www.mit.in.th>



## CALIBRATION CERTIFICATE

Page 1 of 2

Certificate No. : S2025070410-0003

Date Issued : 24-Jul-25

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

**Equipment** : Incubator

**Manufacturer** : BINDER

**Model** : BD 115

**Serial No.** : 12-16967

**ID No./Tag No.** : IN 05/56

**Date Received** : 22-Jul-25

**Date Calibrated** : 22-Jul-25

**Calibrated by** : Auttapol Kunaumpal

### Calibration Method or Calibration Procedure Used

Standard method : CP-05 TLAS G-20.

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

### Result of Calibration

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor  $k = 2$ , providing a level confidence approximately 95 percent.

This certificate may not be reproduced other than in full except with the prior written approval of the Miracle International Technology Company Limited.

Approved by:

K. Nathong  
(Nathapong Krudaum)



**Certificate No. :** S2025070410-0003

**Environment :** Ambient Temperature : Start record 25.1 °C, Stop record 25.1 °C  
Relative Humidity : Start record 48.9 %RH, Stop record 49.3 %RH

Calibration Temperature (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Stability <sup>1</sup> (°C)	Measured Uniformity <sup>2</sup> (°C)	Overall Variation <sup>3</sup> (°C)
35	35.0	35.0	0.13	0.37	0.57
41.5	41.5	41.5	0.10	0.35	0.49

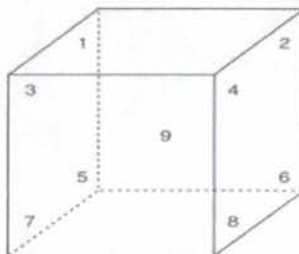
Without adjustment

Calibration Temperature (°C)	STD No. 1 (°C)	STD No. 2 (°C)	STD No. 3 (°C)	STD No. 4 (°C)	STD No. 5 (°C)	STD No. 6 (°C)	STD No. 7 (°C)	STD No. 8 (°C)	STD No. 9 (°C)	Uncertainty <sup>4</sup> (±°C)
35	34.97	34.91	34.96	34.82	34.81	34.86	34.83	35.11	34.95	0.23
41.5	41.51	41.37	41.40	41.26	41.27	41.42	41.43	41.53	41.50	0.23

**STD = Standard**

Note : Probe No. 9 is Reference Probe

Setting Air Fresh No. OFF



Condition As-Received : Used Item

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

**Measurement Standards Used & Traceability :**

The International System of Units (SI) through

MIT Certificate No. L202412300-0027 for Temperature Indicator with Sensor Serial No. US37020317, Due 09-Sep-25

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

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

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

4. The uncertainty of measurement is included temperature stability.

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

**End of Certificate**





CERTIFICATE No : 25T2261  
REFERENCE No : 76365-8


PAGE : 1 OF 2

## Certificate of Calibration

EQUIPMENT : WATER BATH  
MANUFACTURER : MEMMERT  
MODEL : WNB29  
SERIAL No : L614.0123  
ID No : WB 05/58  
CONDITION AS RECEIVED : USED ITEM  
SUBMITTED BY : S.P.S. CONSULTING SERVICE CO., LTD.  
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD.,  
JOMPOL, CHATUCHAK, BANGKOK 10900

CALIBRATED BY : SUCHART S.

CALIBRATION DATE : 07-Mar-25

APPROVED BY :   
PONGSAK J.

ISSUED DATE : 13-Mar-25

RECEIVED DATE : 07-Mar-25

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







CERTIFICATE No : 25T2261

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : WATER BATH  
MANUFACTURER : MEMMERT  
ID NUMBER : WB 05/58  
RECEIVED DATE : 07-Mar-25  
AMBIENT TEMPERATURE : 24 °C ± 1 °C

MODEL : WNB29  
SERIAL NUMBER : L614.0123  
CALIBRATION DATE : 07-Mar-25  
RELATIVE HUMIDITY : 51 %RH ± 10 % RH

### CONDITION OF THIS RESULTS OF CALIBRATION

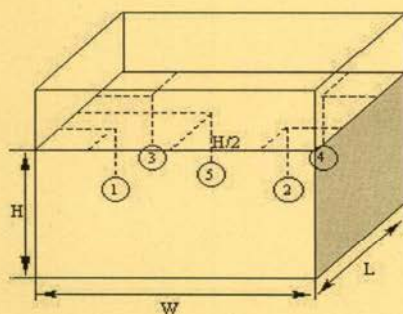
1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO ASTM E715-80 (REAPPROVED 2001) BY COMPARISON WITH CALIBRATED RTD. THE PROBES WERE PLACED ON FIVE POINTS AND LOCATED ONE PROBE IN EACH OF THE FOUR CORNERS OF THE BATH AND PLACED THE FIFTH RTD WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE WATER VOLUME (REFERENCE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

2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) DATA LOGGER WITH RTD	2625A	6603614	24T6473	01-Jul-25

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

### RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



PROBE INSTALLATION  
POSITION IN THE BATH

### GENERAL INFORMATION

Overall Variation of Ambient Temperature around the Bath (°C) : 0.6
Overall Variation of Line Voltage (V) : 12
Instrument Condition : Normal
Bath Inner Size (W*L*H) : 60*40*10 cm

### BATH PERFORMANCE

Calibration Point (°C)	Controller Temperature (°C)	Temperature Stability (±°C)	Radius Uniformity (°C)	Axial Uniformity (°C)	Overall Variation (°C)
50.0	50.2	0.06	0.05	0.03	0.16
60.0	60.2	0.06	0.08	0.04	0.17

### TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Indicating Temp (°C)	Measured Temperature (°C) at Spread Locations					Uncertainty (± °C)
		#1	#2	#3	#4	Ref. 5	
50.2	50.2	49.84	49.88	49.86	49.88	49.89	0.15
60.2	60.2	59.83	59.84	59.85	59.86	59.91	0.16

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

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

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

END OF CALIBRATION REPORT





**Cert. No. : SP24020**

**Pages 1 of 3**

## Calibration Certificate

**Equipment :** UV-VIS SPECTROPHOTOMETER

**Manufacturer :** PERKINELMER

**Model :** LAMBDA 25

**Serial No.:** 501S14123010

**ID No.:** SP03/58

**Calibration Mode :** WAVELENGTH ACCURACY  
PHOTOMETRIC ACCURACY

**Condition As Found :** GOOD

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

**Location :** WET CHEMISTRY LABORATORY IV

**Ambient Temperature :** ( 28.1  $\pm$  5 ) °C

**Relative Humidity :** ( 47.2  $\pm$  25 ) %

**Received Date :** 27 AUGUST 2024

**Calibration Date :** 27 AUGUST 2024

**Date of Issue :** 27 AUGUST 2024

**Calibrated by :** Nathakorn Pisutpaisan

**Approved by :**

  
( Thanakul Petchurai )



# SITHIPORN ASSOCIATES CO., LTD.

## CALIBRATION LABORATORY

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

SITHIPORN  
associates



Cert. No. : SP24020

Job No. : VC67SP0013

Pages : 2 of 3

### Calibration Method :

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

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

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

### Condition of this result of calibration :

#### 1. Certified reference materials

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

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

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

3.1 The UK National Physical Laboratory (NPL)

3.2 The National Institute of Standards and Technology, NIST.

### Result of calibration : Wavelength Accuracy

(Without adjustment)

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

UUC\* = Unit Under Calibration

*G. Peter*

# SITHIPORN ASSOCIATES CO., LTD.

## CALIBRATION LABORATORY

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

SITHIPORN  
associates



Cert. No. : SP24020

Job No. : VC67SP0013

Pages : 3 of 3

### Result of calibration : Photometric Accuracy

(Without adjustment)

Material	Wavelength (nm)	Filter S/N	Nominal Absorbance (A)	Certified Absorbance (A)	UUC* Reading Absorbance (A)	Error (A)	Uncertainty ± (A)	k Factor
Neutral Density glass filter	440.0	29360	1.0	1.0517	1.0550	0.0033	0.0029	2.00
		29914	0.7	0.7445	0.7460	0.0015	0.0029	2.00
		29381	0.5	0.5416	0.5431	0.0015	0.0030	2.00
	546.1	29360	1.0	0.9821	0.9820	-0.0001	0.0028	2.00
		29914	0.7	0.6961	0.6958	-0.0003	0.0028	2.00
		29381	0.5	0.5073	0.5080	0.0007	0.0029	2.00
	590.0	29360	1.0	1.0222	1.0210	-0.0012	0.0028	2.00
		29914	0.7	0.7237	0.7221	-0.0016	0.0029	2.00
		29381	0.5	0.5361	0.5361	0.0000	0.0031	2.00
	635.0	29360	1.0	0.9753	0.9745	-0.0008	0.0028	2.00
		29914	0.7	0.6910	0.6900	-0.0010	0.0029	2.00
		29381	0.5	0.5211	0.5210	-0.0001	0.0032	2.00
Material	Wavelength (nm)	Solution (mg/l)	Certified Absorbance (A)	UUC* Reading Absorbance (A)	Error (A)	Uncertainty ± (A)	k Factor	
RM-0204060810	235.0	20	0.2422	0.2418	-0.0004	0.0101	2.00	
		40	0.4866	0.4852	-0.0014	0.0115	2.00	
		60	0.7414	0.7389	-0.0025	0.0067	2.00	
		80	0.9858	0.9842	-0.0016	0.0093	2.00	
		100	1.2442	1.2414	-0.0028	0.0086	2.00	

UUC\* = Unit Under Calibration

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

Resolution of Wavelength Mode	0.1 nm
Resolution of Photometric Mode	0.0001 A
Parameter Setting	
Measurement Mode	Wavelength, Absorbance
Wavelength Scan	1100 nm-190 nm
Scanning Speed	7.5 nm/min
Data Pitch	0.1 nm
Band width(Wavelength)	1.0 nm
Band width(Vis)	1.0 nm
Band width(Uv)	1.0 nm

Stray Light** UUC* Reading at 220 nm	
Transmission T(%)	Absorbance(A)
0.0117	3.8659

\*\*Specific Acceptance :

Transmission  $\leq$  1.0 T(%), Absorbance  $\geq$  2.0 A

\*\*Stray light not TISI Accredited

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

End of Calibration Certificate

*T. Ketch*

**SITHIPORN ASSOCIATES CO., LTD.**  
**CALIBRATION LABORATORY**

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

SITHIPORN  
associates



Cert. No. : SP25026

Pages : 1 of 4

## Calibration Certificate

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



**Cert. No. : SP25026**

**Job No. : VC68SP0019**

**Pages : 2 of 4**

**Calibration Method :**

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

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

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

**Condition of this result of calibration :**

1. Certified reference materials

<u>Material</u>	<u>Ref. type</u>	<u>Cell serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
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)

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

UUC\* = Unit Under Calibration

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

**Result of calibration : Photometric Accuracy**

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

UUC\* = Unit Under Calibration

Cert. No. : SP25026

Job No. : VC68SP0019

Pages : 4 of 4

**Result of calibration : Photometric Accuracy**

(Without adjustment)

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

UUC\* = Unit Under Calibration

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

Resolution of Wavelength Mode 0.1 nm

Resolution of Photometric Mode 0.001 A

Parameter Setting

Measurement Mode Wavelength, Absorbance

Wavelength Scan 190 nm - 1100 nm

Scanning Speed 7.5 nm/min

Band width(Wavelength) 1.0

Band width(Vis) 1.0

Band width(Uv) 1.0

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

\*\*Specific Acceptance :

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

\*\*Stray light not TISI Accredited

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

**End of Calibration Certificate**