

ภาคผนวกที่ 5

เอกสารสอบเทียบความถูกต้องของเครื่องมือ

เอกสาร 5-1	เอกสารสอบเทียบเครื่องมือการตรวจวัดคุณภาพอากาศในบรรยากาศ
เอกสาร 5-2	เอกสารการสอบเทียบเครื่องมือการตรวจวัดคุณภาพอากาศจากปล่อง
เอกสาร 5-3	เอกสารสอบเทียบเครื่องมือการตรวจวิเคราะห์คุณภาพน้ำทิ้ง
เอกสาร 5-4	เอกสารสอบเทียบเครื่องมือการตรวจวัดระดับเสียง
เอกสาร 5-5	เอกสารสอบเทียบเครื่องมือการตรวจวัดสภาพอากาศในสถานประกอบการ
เอกสาร 5-6	เอกสารสอบเทียบเครื่องมือการตรวจวัดเสียงในสถานประกอบการ
เอกสาร 5-7	เอกสารสอบเทียบเครื่องมือการตรวจวัดความร้อนในสถานประกอบการ

**ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง
และเครื่องมือตรวจวิเคราะห์คุณภาพสิ่งแวดล้อม**

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
คุณภาพอากาศในบรรยากาศ		
- PM ₁₀	- High Volume PM ₁₀ Air Sampler No. R03, R05, R18	- Digital Balance
- Sulfur Dioxide	- SO ₂ -Analyzer No. R03, R06, R09	- SO ₂ -Analyzer No. R03, R06, R09
- Nitrogen Dioxide	- NO ₂ -Analyzer No. B02, B12, B17	- NO ₂ -Analyzer No. B02, B12, B17
คุณภาพอากาศจากปล่อง		
- TSP	- Console No. R03, R04 - Pitot Tube No. B38, B58	- Digital Balance
- NO _x	- Vacuum Gauge	- Spectrophotometer
คุณภาพน้ำทิ้ง		
- pH	-	- pH Meter
- Temperature	-	- Thermometer
- Total Suspended Solids	-	- Digital Balance
- BOD ₅	-	- BOD Analyzer
- DO	-	- BOD Analyzer
- Grease & Oil	-	- Digital Balance
- Manganese	-	- AAS, ICP
- FCB	-	- Water Bath
ระดับเสียง		
- Leq 24 hr.	Acoustic Calibrator - Sound Level Meter No. ACO B05, R14	-
คุณภาพอากาศในสถานประกอบการ		
- Respirable Dust	- Personal Pump SKC No. R28, R30 Rotameter No. H-R02	- Digital Balance
ระดับเสียงในสถานประกอบการ		
- Leq 8 hr.	Acoustic Calibrator - Sound Level Meter No. ACO B43, R40	-
ความร้อนในสถานประกอบการ		
- WBGT	- Digital Thermometer No. R04, R05	-

เอกสารแนบ 5-1

เอกสารสอบเทียบเครื่องมือการตรวจวัดคุณภาพอากาศในบรรยากาศ



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, Chaluchak, Bangkok 10900
Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

High Volume PM-10 Air Sampler Calibration Report

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

Calibration Data

High Volume PM-10 Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (ft ³ /min)	R ²
B01	B01	02/02/2026	y = 1.066x-0.702	0.998
B02	B02	02/02/2026	y = 1.076x+0.303	0.999
B03	B03	02/02/2026	y = 1.040x+0.622	0.997
B04	B04	02/02/2026	y = 1.135x-2.410	0.998
B05	B05	02/02/2026	y = 1.073x-1.284	0.997
B06	B06	02/02/2026	y = 1.017x+2.340	0.998
B07	B07	02/02/2026	y = 1.036x+0.117	0.998
B08	B08	02/02/2026	y = 1.144x-2.648	0.997
B09	B09	02/02/2026	y = 1.115x-4.423	0.999
B10	B10	02/02/2026	y = 1.090x-2.056	0.999
B11	B11	03/02/2026	y = 1.112x-3.640	0.997
B12	B12	03/02/2026	y = 1.136x-4.495	0.997
B13	B13	03/02/2026	y = 1.119x-2.873	0.999
B14	B14	03/02/2026	y = 1.145x-3.948	0.996
B15	B15	03/02/2026	y = 1.137x-2.722	0.999
B16	B16	03/02/2026	y = 1.087x+0.251	0.997
B17	B17	03/02/2026	y = 1.096x-0.862	0.998
B18	B18	03/02/2026	y = 1.111x-3.264	0.996
B19	B19	03/02/2026	y = 1.081x+0.507	0.998
B20	B20	03/02/2026	y = 1.137x-3.001	0.999
B21	B21	03/02/2026	y = 1.129x-3.073	0.999
B22	B22	03/02/2026	y = 1.130x-2.275	0.998
B23	B23	03/02/2026	y = 1.149x-4.649	0.997
B24	B24	03/02/2026	y = 1.103x-2.139	0.999
B25	B25	03/02/2026	y = 1.065x-1.466	0.999
B26	B26	03/02/2026	y = 1.035x+0.731	0.998
B27	B27	03/02/2026	y = 1.102x-2.849	0.998
B28	B28	03/02/2026	y = 1.138x-3.306	0.996
B29	B29	03/02/2026	y = 1.046x+0.180	0.997
B30	B30	03/02/2026	y = 1.140x-5.125	0.999
B31	B31	03/02/2026	y = 1.028x+0.644	0.998
B32	B32	04/02/2026	y = 1.044x+1.254	0.999
B33	B33	04/02/2026	y = 1.106x-2.101	0.999
B34	B34	04/02/2026	y = 1.059x+0.598	0.998

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, Chaluchak, Bangkok 10900
Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

High Volume PM-10 Air Sampler Calibration Report

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

Calibration Data

High Volume PM-10 Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (ft ³ /min)	R ²
R01	R01	04/02/2026	y = 1.057x+0.776	0.998
R02	R02	04/02/2026	y = 1.126x-3.479	0.999
R03	R03	04/02/2026	y = 1.099x-1.897	0.996
R04	R04	04/02/2026	y = 1.130x-3.885	0.998
R05	R05	04/02/2026	y = 1.082x-2.165	0.999
R06	R06	04/02/2026	y = 1.132x-2.551	0.997
R07	R07	04/02/2026	y = 1.116x-2.326	0.998
R08	R08	02/02/2026	y = 1.133x-2.404	0.998
R09	R09	02/02/2026	y = 1.063x+0.125	0.998
R10	R10	02/02/2026	y = 1.119x-2.628	0.997
R11	R11	02/02/2026	y = 1.030x+1.723	0.999
R12	R12	02/02/2026	y = 1.035x+0.921	0.999
R13	R13	02/02/2026	y = 1.117x-3.172	0.999
R14	R14	02/02/2026	y = 1.083x-2.455	0.999
R15	R15	02/02/2026	y = 1.103x-3.395	0.997
R16	R16	02/02/2026	y = 1.146x-4.022	0.998
R17	R17	02/02/2026	y = 1.091x-1.835	0.998
R18	R18	02/02/2026	y = 1.104x-4.944	0.998
R19	R19	03/02/2026	y = 1.097x+0.011	0.996
R20	R20	03/02/2026	y = 1.107x-2.872	0.998

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 แขวงจตุจักร เขตจตุจักร กรุงเทพฯ 10900
7 Soi Phaholyothin 24, Phaholyothin Rd., Jomjol, Chatuchak, Bangkok 10900
Tel : (662) 939-070-77 Fax : (662) 513-4221 E-mail : sale@spicon.com www.spicon.com

CALIBRATION REPORT					
SO ₂ FLUORESCENT ANALYZER					
DATE :	06 March 2026	BRAND :	API	MODEL :	100E
NO.	SO ₂ -R03	SERIAL NO.	3488		
Calibrator (Dilution System)					
Brand	: Teledyne		Model	: 700	
Last Cal. Date	: 24 October 2025		Serial No.	: 421	
Reference Standard Gas					
Standard Gas	: Sulphur Dioxide (SO ₂)		Cylinder No.	: A008145K	
Certified Date	: 21 June 2021		Expired Date	: 21 June 2029	
Cylinder Conc.	: 49.8 ppm				
CALIBRATING CONDITION					
Pressure	1010	mmbar	Temp.	24.5	°C
% RH	49				
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.11	-	0	-
SO ₂ Span	400.0	400.2	0.050	400.0	1.008
API Model 100E SO ₂ Analyzer Check list					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	0-500		
SAMPLE PRESS	28.6	in-Hg	25-35		
SAMPLE FLOW	655	cc/min	650 ± 10%		
PMT	103.2	mV	-20-150 with Zero Air		
UV LAMP	2882.3	mV	1000-4900		
STR. LGT	61.4	PPB	<100		
DRK PMT	63.1	mV	-50 - 200		
DRK LMP	57.8	mV	-50 - 200		
HVPS	670	V	550-900 constant		
DCPS	2518	mV	2500 ± 200		
RCCELL TEMP	50.2	°C	50 ± 1		
BOX TEMP	29.1	°C	5-40		
PMT TEMP	7.0	°C	7 ± 2.0		
SO ₂ Span Conc	400	PPB	20-20,000		
SO ₂ Slope	1.008	-	1.0 ± 0.3		
SO ₂ Offset	22.1	mV	<250		
Stability at Zero	0.1	PPB	<0.2		
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)		

Calibrated by : Heeson L
(Mr.Heeson Lormae)

Approved by : Yutthana S.
(Mr.Yutthana Tanatharanit)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจตุจักร เขตจตุจักร กรุงเทพฯ 10900
7 Soi Phaholyothin 24, Phaholyothin Rd., Jomjol, Chatuchak, Bangkok 10900
Tel : (662) 939-070-77 Fax : (662) 513-4221 E-mail : sale@spicon.com www.spicon.com

CALIBRATION REPORT					
SO ₂ FLUORESCENT ANALYZER					
DATE :	06 March 2026	BRAND :	API	MODEL :	100E
NO.	SO ₂ -R06	SERIAL NO.	066		
Calibrator (Dilution System)					
Brand	: Teledyne		Model	: 700	
Last Cal. Date	: 24 October 2025		Serial No.	: 421	
Reference Standard Gas					
Standard Gas	: Sulphur Dioxide (SO ₂)		Cylinder No.	: A008145K	
Certified Date	: 21 June 2021		Expired Date	: 21 June 2029	
Cylinder Conc.	: 49.8 ppm				
CALIBRATING CONDITION					
Pressure	1010	mmbar	Temp.	24.5	°C
% RH	49				
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.11	-	0	-
SO ₂ Span	400.0	400.1	0.025	400.0	1.005
API Model 100E SO ₂ Analyzer Check list					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	0-500		
SAMPLE PRESS	28.3	in-Hg	25-35		
SAMPLE FLOW	654	cc/min	650 ± 10%		
PMT	103.1	mV	-20-150 with Zero Air		
UV LAMP	3075.3	mV	1000-4900		
STR. LGT	60.9	PPB	<100		
DRK PMT	62.8	mV	-50 - 200		
DRK LMP	57.5	mV	-50 - 200		
HVPS	671	V	550-900 constant		
DCPS	2517	mV	2500 ± 200		
RCCELL TEMP	50.2	°C	50 ± 1		
BOX TEMP	29.1	°C	5-40		
PMT TEMP	7.1	°C	7 ± 2.0		
SO ₂ Span Conc	400	PPB	20-20,000		
SO ₂ Slope	1.005	-	1.0 ± 0.3		
SO ₂ Offset	21.8	mV	<250		
Stability at Zero	0.1	PPB	<0.2		
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)		

Calibrated by : Heeson L
(Mr.Heeson Lormae)

Approved by : Yutthana S.
(Mr.Yutthana Tanatharanit)



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

CALIBRATION REPORT					
SO ₂ FLUORESCENT ANALYZER					
DATE :	06 March 2026	BRAND :	API	MODEL :	100E
NO.	SO ₂ -R09	SERIAL NO.	76		
Calibrator (Dilution System)					
Brand :	Teledyne	Model :	700		
Last Cal. Date :	24 October 2025	Serial No. :	421		
Reference Standard Gas					
Standard Gas :	Sulphur Dioxide (SO ₂)	Cylinder No. :	A008145K		
Certified Date :	21 June 2021	Expired Date :	21 June 2029	Cylinder Conc. :	49.8 ppm
CALIBRATING CONDITION					
Pressure	1010	mmbar	Temp.	24.5	°C
% RH	49				
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Diff	Analyzer Response	Slope
Zero	0	0.10	-	0	-
SO ₂ Span	400.0	400.3	0.075	400.0	1.005
API Model 100E SO ₂ Analyzer Check list					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	0-500		
SAMPLE PRESS	28.3	in-Hg	25-35		
SAMPLE FLOW	654	cc/min	650 ± 10%		
PMT	103.1	mV	-20-150 with Zero Air		
UV LAMP	3017.8	mV	1000-4900		
STR. LGT.	61.2	PPB	<100		
DRK PMT	63.5	mV	-50 - 200		
DRK LMP	57.8	mV	-50 - 200		
HVPS	674	V	550-900 constant		
DCPS	2515	mV	2500 ± 200		
RCCELL TEMP	50.1	°C	50 ± 1		
BOX TEMP	29.3	°C	5-40		
PMT TEMP	7.1	°C	7 ± 2.0		
SO ₂ Span Conc	400	PPB	20-20,000		
SO ₂ Slope	1.005	-	1.0 ± 0.3		
SO ₂ Offset	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 : Heeson L.
(Mr.Heeson Lormae)

Approved by : Yutthana S.
(Mr.Yutthana Tanatharanit)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจตุจักร เขตจตุจักร กรุงเทพฯ 10900
7 Soi Phaholyothin 24, Phaholyothin Rd., Jomjol, 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 ₂ / NO _x ANALYZER					
DATE :	06 March 2026	BRAND :	API	MODEL :	200A
NO.	NO _x -B02	SERIAL NO.	2409		
Calibrator (Dilution System)					
Brand :	Teledyne	Model :	700		
Last Cal. Date :	24 October 2025	Serial No. :	421		
Reference Standard Gas					
Standard Gas :	Nitric Oxide (NO)	Cylinder No. :	A006745V		
Certified Date :	12 March 2025	Expired Date :	12 March 2028	Cylinder Conc. :	48.7 ppm
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.5	°C
% RH	49				
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Diff	Analyzer Response	Slope
Zero	0	0.10	-	0	-
NO Span	400	399.8	-0.050	400.0	1.004
NO ₂ Span	400	400.2	0.050	400.0	1.007
API Model 200A NO _x Analyzer Check list					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	500 standard		
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air		
SAMPLE FLOW	507	cc/min	500 ± 50		
OZONE FLOW	78	cc/min	80 ± 15		
PMT	102.9	mV	-20 - 150		
AZERO	93.9	mV	-20 - 150		
HVPS	670	V	420 - 900 constant		
RCCELL TEMP	50.3	°C	50 ± 1		
BOX TEMP	28.9	°C	8 - 48		
PMT TEMP	7.2	°C	7 ± 2		
MOLY TEMP	314.8	°C	315 ± 5		
RCCELL PRESS	8.4	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 ₂ Span Conc	400	PPB	20 - 20,000		
NO Slope	1.004	-	1.0 ± 0.3		
NO ₂ Slope	1.007	-	1.0 ± 0.3		
NO Offset	0.9	mV	-20 to +150		
NO ₂ Offset	0.5	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by : Heeson L.
(Mr.Heeson Lormae)

Approved by : Yutthana S.
(Mr.Yutthana Tanatharanit)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจตุจักร กรุงเทพฯ 10900
7 Soi Phaholyothin 24, Phaholyothin Rd., Jomjol, 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 ₂ / NO _x ANALYZER					
DATE :	06 March 2026	BRAND :	API	MODEL :	200A
NO.	NOX-B12	SERIAL NO.	2675		
Calibrator (Dilution System)					
Brand	: Teledyne		Model	: 700	
Last Cal. Date	: 24 October 2025		Serial No.	: 421	
Reference Standard Gas					
Standard Gas	: Nitric Oxide (NO)		Cylinder No.	: A006745V	
Certified Date	: 12 March 2025		Expired Date	: 12 March 2028	
Cylinder Conc.	: 48.7 ppm				
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.6	°C
% RH	49				
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Diff	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
NO Span	400	400.1	0.025	400.0	1.002
NO _x Span	400	400.3	0.075	400.0	1.004
API Model 200A NO _x Analyzer Check List					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	500 standard		
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air		
SAMPLE FLOW	506	cc/min	500 ± 50		
OZONE FLOW	78	cc/min	80 ± 15		
PMT	103.3	mV	-20 - 150		
AZERO	93.6	mV	-20 - 150		
HVPS	668	V	420 - 900 constant		
RCELL TEMP	50.2	°C	50 ± 1		
BOX TEMP	28.9	°C	8 - 48		
PMT TEMP	7.3	°C	7 ± 2		
MOLY TEMP	314.9	°C	315 ± 5		
RCELL PRESS	8.3	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.5	IN-Hg-A	25 - 30 constant		
NO Span Conc	400	PPB	20 - 20,000		
NO _x Span Conc	400	PPB	20 - 20,000		
NO Slope	1.002	-	1.0 ± 0.3		
NO ₂ Slope	1.004	-	1.0 ± 0.3		
NO Offset	1.0	mV	-20 to +150		
NO _x Offset	0.5	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by : Heeson L.
(Mr.Heeson Lormae)

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



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจตุจักร กรุงเทพฯ 10900
7 Soi Phaholyothin 24, Phaholyothin Rd., Jomjol, 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 ₂ / NO _x ANALYZER					
DATE :	06 March 2026	BRAND :	API	MODEL :	200A
NO.	NOX-B17	SERIAL NO.	1977		
Calibrator (Dilution System)					
Brand	: Teledyne		Model	: 700	
Last Cal. Date	: 24 October 2025		Serial No.	: 421	
Reference Standard Gas					
Standard Gas	: Nitric Oxide (NO)		Cylinder No.	: A006745V	
Certified Date	: 12 March 2025		Expired Date	: 12 March 2028	
Cylinder Conc.	: 48.7 ppm				
CALIBRATING CONDITION					
Pressure	1010	mmbar	Temp.	24.6	°C
% RH	49				
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Diff	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
NO Span	400	399.7	-0.075	400.0	1.004
NO _x Span	400	400.1	0.025	400.0	1.007
API Model 200A NO _x Analyzer Check List					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	500 standard		
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air		
SAMPLE FLOW	507	cc/min	500 ± 50		
OZONE FLOW	79	cc/min	80 ± 15		
PMT	103.5	mV	-20 - 150		
AZERO	94.2	mV	-20 - 150		
HVPS	673	V	420 - 900 constant		
RCELL TEMP	50.2	°C	50 ± 1		
BOX TEMP	29.2	°C	8 - 48		
PMT TEMP	7.1	°C	7 ± 2		
MOLY TEMP	315.2	°C	315 ± 5		
RCELL PRESS	8.3	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.5	IN-Hg-A	25 - 30 constant		
NO Span Conc	400	PPB	20 - 20,000		
NO _x Span Conc	400	PPB	20 - 20,000		
NO Slope	1.004	-	1.0 ± 0.3		
NO ₂ Slope	1.007	-	1.0 ± 0.3		
NO Offset	0.7	mV	-20 to +150		
NO _x Offset	0.3	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 : Heeson L.
(Mr.Heeson Lormae)

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



CERTIFICATE No : 26M2266
REFERENCE No : 80204-1

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE
MANUFACTURER : METTLER TOLEDO
MODEL : XS105DU
SERIAL No : 1126422905
ID No : BA 05/50
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 : SUCHAT S.
CALIBRATION DATE : 05-Mar-26

APPROVED BY : PONGSAK J.
ISSUED DATE : 06-Mar-26
RECEIVED DATE : 05-Mar-26



CERTIFICATE No : 26M2266

Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : XS105DU
MANUFACTURER : METTLER TOLEDO S/N : 1126422905
ID No : BA 05/50 RECEIVED DATE : 05-Mar-26
AIR PRESSURE : 1004mbar ± 1mbar CALIBRATION DATE : 05-Mar-26
AMBIENT TEMPERATURE : 25° C ± 1° C RELATIVE HUMIDITY : 50 %RH ± 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

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

2. REFERENCE STANDARD INSTRUMENTS :-

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

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

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

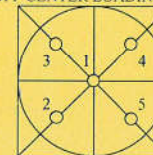
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND)

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL
2. TARE FUNCTION : NORMAL
3. REPEATABILITY OF READING AT 120 g WAS 0.000055 g
4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (± g)
0.00	0.00000	0.00000	0.000065
0.02	0.02000	0.00000	0.000065
0.10	0.10000	0.00000	0.000066
0.20	0.20000	0.00000	0.000066
0.50	0.50001	-0.00001	0.000065
1.00	1.00001	-0.00001	0.000066
2.00	2.00000	0.00000	0.000067
5.00	5.00001	-0.00001	0.000068
10.00	10.00004	-0.00004	0.000070
20.00	20.00006	-0.00006	0.000078
50.00	50.00000	0.00000	0.00012
100.00	100.00002	-0.00002	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



เอกสารแนบ 5-2

เอกสารการสอบเทียบเครื่องมือการตรวจวัดคุณภาพอากาศจากปล่อง



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

Console Calibration Report

Calibration Method

Critical Orifices

Calibration Data

Console Data		Calibration Data		
No.	Serial No.	Date	y	ΔH_g (mmH ₂ O)
B01	1563	02/03/2026	0.998	49.85
B02	8002514	02/03/2026	1.003	49.77
B03	1503016	03/03/2026	0.997	49.68
B04	00006659	03/03/2026	0.996	49.82
B05	00007428	02/03/2026	0.999	49.65
R01	1561	03/03/2026	1.002	49.98
R02	8002513	03/03/2026	1.004	49.56
R03	1570	03/03/2026	0.997	49.73
R04	8002519	03/03/2026	0.999	49.80
R05	1503015	02/03/2026	1.003	49.95

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

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

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :


(Mr. Peera Detudom)



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

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	04/02/2026	0.85	0.84
B37	S	0.99	02/02/2026	0.84	0.83
B38	S	0.99	03/02/2026	0.83	0.84
B39	S	0.99	03/02/2026	0.85	0.84
B40	S	0.99	02/02/2026	0.84	0.84
B41	S	0.99	02/02/2026	0.83	0.84
B44	S	0.99	04/02/2026	0.84	0.84
B45	S	0.99	04/02/2026	0.85	0.84
B46	S	0.99	04/02/2026	0.83	0.84
B47	S	0.99	04/02/2026	0.84	0.85
B48	S	0.99	03/02/2026	0.84	0.84
B49	S	0.99	03/02/2026	0.85	0.84
B54	S	0.99	02/02/2026	0.84	0.84
B56	S	0.99	02/02/2026	0.84	0.83
B57	S	0.99	03/02/2026	0.84	0.85
B58	S	0.99	03/02/2026	0.84	0.84

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

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :


(Mr. Peera Detudom)



CALIBRATION LABORATORY Co.,LTD.

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



CERTIFICATE OF CALIBRATION

FOR

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

CUSTOMER S.P.S. CONSULTING SERVICE CO., LTD.
7 SOI PHAHOLYOTHEN 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. Q24076546

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



REPORT OF CALIBRATION

FOR

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

ENVIRONMENT CONDITIONS

Temperature : (23 $\pm$ 2) °C

Relative Humidity (55 $\pm$ 10) %RH

PROCEDURE USED :

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

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

REFERENCE STANDARD USED :

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

TRACEABILITY :

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

UNCERTAINTY :

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

Certificate No. Q24076546

F3-011-05/12-23

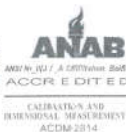
page 2 of 3



CALIBRATION LABORATORY Co., LTD.

2/1Q-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230

Tel. 02-578-D353-4 Fax:02-578-2672 ww.w.caLaboratory.com E-mail:sale@cal-laboratory.com



CONDITION OF CALIBRATION ITEM :RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS: (X) without adjustment () adjustment

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

CALIBRATION DATA

CORRECTION OF PRESSURE

DUC Test point (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	-15.07	-15.10	-4.5	-4.5	+0.5	+0.5
-10	-32.50	-32.84	-9.6	-9.7	+0.4	+0.3
-15	-49.44	-49.77	-14.6	-14.7	+0.4	+0.3
-20	-66.70	-66.70	-19.7	-19.7	+0.3	+0.3
-25	-83.63	-83.97	-24.7	-24.8	+0.3	+0.2
-30	-100.39	-100.39	-29.6	-29.6	+0.4	+0.4

Uncertainty of measurement± 0.2 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. Q24076546

F3-011-05/ 12-23



CERTIFICATE No : 26M2266
REFERENCE No : 80204-1

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE
MANUFACTURER : METTLER TOLEDO
MODEL : XS105DU
SERIAL No : 1126422905
ID No : BA 05/50
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 : SUCHAT S.
CALIBRATION DATE : 05-Mar-26

APPROVED BY : PONGSAK J.
ISSUED DATE : 06-Mar-26
RECEIVED DATE : 05-Mar-26



CERTIFICATE No : 26M2266

Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : XS105DU
MANUFACTURER : METTLER TOLEDO S/N : 1126422905
ID No : BA 05/50 RECEIVED DATE : 05-Mar-26
AIR PRESSURE : 1004mbar ± 1mbar CALIBRATION DATE : 05-Mar-26
AMBIENT TEMPERATURE : 25° C ± 1° C RELATIVE HUMIDITY : 50 %RH ± 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

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

2. REFERENCE STANDARD INSTRUMENTS :-

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

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

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

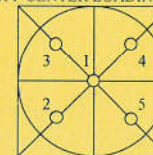
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND)

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL
2. TARE FUNCTION : NORMAL
3. REPEATABILITY OF READING AT 120 g WAS 0.000055 g
4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (± g)
0.00	0.00000	0.00000	0.000065
0.02	0.02000	0.00000	0.000065
0.10	0.10000	0.00000	0.000066
0.20	0.20000	0.00000	0.000066
0.50	0.50001	-0.00001	0.000065
1.00	1.00001	-0.00001	0.000066
2.00	2.00000	0.00000	0.000067
5.00	5.00001	-0.00001	0.000068
10.00	10.00004	-0.00004	0.000070
20.00	20.00006	-0.00006	0.000078
50.00	50.00000	0.00000	0.00012
100.00	100.00002	-0.00002	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



Cert. No. : SP25026

Pages : 1 of 4

Calibration Certificate

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

Condition As Found : GOOD

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

Location : ORGANIC LABORATORY IV

Ambient Temperature : (22.9 ± 5) °C

Relative Humidity : (53.7 ± 25) %

Received Date : 22 AUGUST 2025

Calibration Date : 22 AUGUST 2025

Date of Issue : 25 AUGUST 2025

Calibrated by : Nitinun Srihawan

Approved by : *Wichok B.*
(Wichok Ekpongpradit)

Cert. No. : SP25026

Job No. : VC68SP0019

Pages : 2 of 4

Calibration Method :

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

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

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

Condition of this result of calibration :

1. Certified reference materials

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

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

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

3.1 The UK National Physical Laboratory (NPL)

Result of calibration : Wavelength Accuracy

(Without adjustment)

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

UUC* = Unit Under Calibration

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

Result of calibration : Photometric Accuracy

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

UUC* = Unit Under Calibration

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	
Transmission T(%)	Absorbance(A)
0.020	3.7032

**Specific Acceptance :

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

**Stray light not TISI Accredited

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

End of Calibration Certificate

เอกสารแนบ 5-3

เอกสารสอบเทียบเครื่องมือการตรวจวิเคราะห์คุณภาพน้ำทิ้ง



CERTIFICATE No : 26E3363
REFERENCE No : 80514-1

PAGE : 1 OF 3

Certificate of Calibration

EQUIPMENT : pH METER
MANUFACTURER : HANNA
MODEL : HI3512
SERIAL No : TH118035
ID No : PH 04/56
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : S.P.S. CONSULTING SERVICE CO., LTD.
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD.,
JOMPOL, CHATUCHAK, BANGKOK 10900

CALIBRATED BY : ATSAWIN Y.
CALIBRATION DATE : 02-Apr-26

APPROVED BY : PONGSAK J.

ISSUED DATE : 02-Apr-26

RECEIVED DATE : 01-Apr-26

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



CERTIFICATE No : 26E3363

PAGE : 2 OF 3

Calibration Report

EQUIPMENT : pH METER
MANUFACTURER : HANNA
ID No : PH 04/56
RECEIVED DATE : 01-Apr-26
AMBIENT TEMPERATURE : 23 ° C ± 3 ° C
MODEL : HI3512
SERIAL NUMBER : TH118035
CALIBRATION DATE : 02-Apr-26
RELATIVE HUMIDITY : 50 % RH ± 10% RH

CONDITION OF THIS RESULTS OF CALIBRATION

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

INSTRUMENT	MODEL	SERIAL No/ LOT No	CERTIFICATE No	DUE DATE
1) pH STANDARD SOLUTION	00651-36	CC829914	4956-16178366	11-Sep-27
2) pH STANDARD SOLUTION	00651-38	CC831093	4957-16224157	01-Oct-27
3) pH STANDARD SOLUTION	00651-40	CC826321	4958-16046326	10-Jul-27
4) PROCESS CALIBRATOR	CA150	91S6079	26E936	17-Mar-27
5) BATH	260014	1247 48074	25T9431	12-Sep-26
6) THERMOMETER WITH PROBE	421504	55000379	25T9466	12-Sep-26

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

RESULT OF CALIBRATION : ADJUSTMENT

1. DISPLAY UNIT ONLY

SLOPE FACTOR $k = 2.303 \text{ RT/F} = 59 \text{ mV/pH}$

mV APPLIED	UUC READING (mV)	CORRECTION (mV)	UUC READING (pH)	UNCERTAINTY OF MEASUREMENT (± mV)	COVERAGE FACTOR k
414.11	414.3	-0.19	-0.256	0.15	2.00
354.95	355.1	-0.15	0.759	0.15	2.00
295.80	296.0	-0.20	1.773	0.15	2.00
236.64	236.8	-0.16	2.787	0.15	2.00
177.48	177.7	-0.22	3.801	0.15	2.00
118.32	118.5	-0.18	4.816	0.15	2.00
59.16	59.4	-0.24	5.831	0.15	2.00
0.00	0.2	-0.20	6.845	0.15	2.00
-59.16	-58.9	-0.26	7.878	0.15	2.00
-118.32	-118.1	-0.22	8.915	0.15	2.00
-177.48	-177.2	-0.28	9.952	0.15	2.00
-236.64	-236.4	-0.24	10.990	0.15	2.00
-295.80	-295.5	-0.30	12.027	0.15	2.00
-354.95	-354.7	-0.25	13.064	0.15	2.00
-414.11	-413.8	-0.31	14.101	0.15	2.00

END OF CALIBRATION REPORT PAGE 2 OF 3



**QUALITY CALIBRATION CO., LTD.**

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

CERTIFICATE No : 26E3363

PAGE : 3 OF 3

Calibration Report**RESULT OF CALIBRATION (CONTINUE):****2. DISPLAY UNIT WITH pH ELECTRODE S/N: 11340D0M**

STANDARD pH BUFFER SOLUTION (pH)	UUC READING (pH)	CORRECTION (pH)	VALUE BEFORE ADJUSTMENT	UNCERTAINTY OF MEASUREMENT ($\pm$ pH)	COVERAGE FACTOR k
4.008	4.008	0.000	4.142	0.012	2.00
6.998	7.000	-0.002	7.068	0.012	2.00
10.007	10.009	-0.002	10.226	0.014	2.00

3. DISPLAY UNIT WITH TEMPERATURE

STANDARD READING (°C)	UUC READING (°C)	CORRECTION (°C)	VALUE BEFORE ADJUSTMENT	UNCERTAINTY OF MEASUREMENT ($\pm$ °C)	COVERAGE FACTOR k
25.004	25.0	0.004	---	0.0085	2.00

4. PERCENT SLOPE 91%

UUC : UNIT UNDER CALIBRATION

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

END OF CALIBRATION REPORT



Certificate of Calibration

Certificate No. : 69-400023-2

Page : 1 of 2

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

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

Equipment : Liquid in Glass Thermometer

Manufacturer : SK

Model : N/A

Range : 0 °C to 100 °C

Resolution : 1 °C

Serial No. : N/A

Immersion : Total

ID No. : TM21/59

Environment : Ambient Temperature : (23 ± 2) °C

Relative Humidity : (50 ± 15) %

Line Voltage : (220 ± 22) VAC

Date of Received : 13 January 2026

Date of Calibration : 16 January 2026

Date of Issue : 16 January 2026

Calibrated by : Chortip Samchusri

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

The temperature scale used was based on ITS-90

Reference Standard Instruments : This certification is traceable to the International System of Units

1. Platinum Resistance Thermometer (PRT)

ID No.	Cert. No.	Due Date
400001	TT-0023-24	16 Feb 2026

Traceability
National Institute of Metrology Thailand (NIMT)

2. Standard Digital Thermometer

ID No.	Cert. No.	Due Date
400003	25E1656	22 May 2027
400004	25E1656	22 May 2027

Traceability
National Institute of Metrology Thailand (NIMT)
National Institute of Metrology Thailand (NIMT)

Approved by :

(Permon Chanpu)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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



Certificate of Calibration

Certificate No. : 69-400023-2

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

Ice point check : UUC* reading 0 °C Standard reading 0.4773 °C

Standard Reading (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (± °C)
20.3922	20	0.4	0.31

Remark

UUC : Unit Under Calibration

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

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

- o(0) -





CERTIFICATE No : 26M2268
REFERENCE No : 80204-3

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE
MANUFACTURER : SARTORIUS
MODEL : BSA224S-CW
SERIAL No : 36591843
ID No : BA 09/61
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : S.P.S. CONSULTING SERVICE CO., LTD.
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD.,
JOMPOL, CHATUCHAK, BANGKOK 10900

CALIBRATED BY : SUCHAT S.
CALIBRATION DATE : 05-Mar-26

APPROVED BY : PONGSAK J.

ISSUED DATE : 06-Mar-26

RECEIVED DATE : 05-Mar-26

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



CERTIFICATE No : 26M2268

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : BSA224S-CW
MANUFACTURER : SARTORIUS S/N : 36591843
ID No : BA 09/61 RECEIVED DATE : 05-Mar-26
AIR PRESSURE : 1004mbar ± 1mbar CALIBRATION DATE : 05-Mar-26
AMBIENT TEMPERATURE : 25° C ± 1° C RELATIVE HUMIDITY : 50 %RH ± 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

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

2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) STANDARD WEIGHT SET	E2	OK-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.

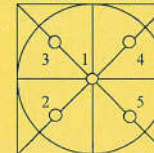
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND)

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL
2. TARE FUNCTION : NORMAL
3. REPEATABILITY OF READING AT 200 g WAS 0.000055 g
4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (± g)
0.0	0.0000	0.0000	0.00010
0.1	0.1000	0.0000	0.00011
0.2	0.2000	0.0000	0.00010
0.5	0.5000	0.0000	0.00011
1.0	1.0000	0.0000	0.00011
2.0	2.0000	0.0000	0.00011
5.0	5.0000	0.0000	0.00011
10.0	10.0000	0.0000	0.00011
20.0	20.0001	-0.0001	0.00011
50.0	50.0000	0.0000	0.00013
100.0	100.0001	-0.0001	0.00019
200.0	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





CERT.No.: HS-X014C

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

Certificate of Calibration

Calibration Date : 16 March 2026

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)	9.09	(PASS)	-
Measurement 2 (mg/l)	9.09	(PASS)	-
Measurement 3 (mg/l)	9.09	(PASS)	-
Measurement 4 (mg/l)	9.09	(PASS)	-
Measurement 5 (mg/l)	9.09	(PASS)	-
Measurement 6 (mg/l)	9.08	(PASS)	-
Measurement 7 (mg/l)	9.08	(PASS)	-
Measurement 8 (mg/l)	9.08	(PASS)	-
Measurement 9 (mg/l)	9.08	(PASS)	-
Measurement 10 (mg/l)	9.08	(PASS)	-

Mean Measurement	9.09	mg/l	-	-
Inaccuracy	0.00	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)



PinAAcle 900T Preventive Maintenance Report

Company Name: S.P.S. Consulting Service Co.,Ltd.

Instrument Location: 7, 24 Soi Phaholyothin,
Ladyao, Khet, Bangkok 10900

Instrument Serial No.: PTCS14111103

Date: 18 Jun 2026

PinAAcle 900T Preventive Maintenance (PM)

Company Name:	S.P.S. Consulting Service Co.,Ltd.		
Address (Instrument Location):	7, 24 Soi Phaholyothin, Ladyao, Khet, Bangkok 10900		
Serial Number:	PTCS14111103	PM Number:	1 of 2
Customer Name (if applicable):	K. Phenpha	Telephone Number:	083-926-9252
Customer Support Engineer Name:	K. Chayanan	Service Order Number:	WO-11540403
Date PM Performed: (DD-MMM-YYYY)	18 Jun 2026	Next PM Due Date: (DD-MMM-YYYY)	18 Jun 2027
Standard Labor Hours to Complete PM :		5 hours	

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.

Copyright Information

This document contains proprietary information that is protected by copyright. All rights are reserved. No part of this publication may be reproduced in any form whatsoever or translated into any language without the prior, written permission of PerkinElmer, Inc. **Copyright © 2013 PerkinElmer, Inc.**

Trademarks

Registered names, trademarks, etc. used in this document, even when not specifically marked as such, are protected by law. PerkinElmer is a registered trademark of PerkinElmer, Inc. All other trademarks and registered trademarks not owned by PerkinElmer, Inc. or its subsidiaries that are depicted herein are the property of their respective owners.

Except as specifically set forth in its terms and conditions of sale, PerkinElmer makes no Warranty of any kind with regard to this document, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose.

PerkinElmer shall not be liable for incidental or consequential damages in connection with the furnishing or use of this document.

Component List

Component / Specific Model	Serial #	Configuration Notes
PinAAcle900T	PTCS14111103	Winlab32
Fias100	100514090404	Winlab32

Parts Lists

Parts Included with the PM		
Part Number (if applicable)	Description	Quantity
B0501696	Fan Filters	1
B3002013	THGA Contact Cylinders	1
B3141064	Glycerol for THGA Cooling	1
N3160156	O-Ring Kits for Sampling Introduction (Stainless Steels Nebulizer)	N/A
N3160157	O-Ring Kits for Sampling Introduction (Plastic Nebulizer)	2
N9301714	Replacement Acetylene Filter Cartridge	1
TH001022	Replacement Air Filter Cartridge	1

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	28-83CUY1	Nov 26
N9300244	GFAAS Mixed Standard	AR	60-004CRY1	Jun 26

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 ₃	250 ml.	AR	AR

Additional Tools Required for PM			
Part Number (if applicable)	Description	Quantity	Serial #
N1013000	0.2A Neutral density filter	1	101N0089015
N1013002	1.0A Neutral density filter	1	101N0089015
B3100652 Or N9307029	Electronic Flow Meter	1	NA
B0505495	Test Jig	1	NA
03030997	System 2 EDL Driver	1	030309-97E
N3050605	As System 2 EDL	1	000003-26798A
N3050121	Cu Lumina HCL	1	060419-030180
N3050109	Ba Lumina HCL	1	061219-020041
N3050139	K Lumina HCL	1	030819-010130
N3050152	Ni Lumina HCL	1	052719-020020
N3050119	Cr Lumina HCL	1	060419-030180

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-C₂H₂ and N₂O-C₂H₂ 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 ₂ H ₂ Flame correctly shuts down	Active	Passed
Drain Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Nebulizer Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
C ₂ H ₂ Pressure Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Air Pressure Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Burner Head Sensor	Choosing Nitrous Oxide as the oxidant should trigger an interlock shuts down	Active	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.	2.0405	1.9997	Passed
0.2 A ND Filter	± 5% from Cert.	0.1953	0.1855	Passed

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	0.001	Passed

8.3 AA Baseline Noise with Copper

Description: Check baseline noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.001	0.0001	Passed

8.4 D₂ Background Compensation with Copper

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

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.010	0.0001	Passed

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	0.0003	Passed

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	≤ 0.005	0.0001	Passed

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.	NA	Not Applicable
2 mg/L Sensitivity HS Neb (if applicable)	> 0.250 Abs.	0.356	Passed

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 ± 25 mL/min	260	Passed
External Flow Rate	100 mL/min ± 10 mL/min	105	Passed

9.2 Chromium Baseline Noise

Description: Signal to noise check.

Parameter	Specification	Results	Pass/Fail
Baseline Noise	≤ 0.005 Abs.	0.0002	Passed
Standard Deviation	≤ 0.005	0.0001	Passed

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	≤ 7.0 pg/0.0044 A·s	5.4	Passed
Precision	≤ 2.0 %	0.14	Passed

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 ₀ Result	≤ 16.5 pg/0.0044 A-s	14.5	Passed
Zeeman Ratio	0.52 ± 0.04	0.54	Passed

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

=

Atomic Signal (Peak area)

Atomic Signal (Peak area) + Background Signal (Peak area)

0.1551

0.1551+0.1315

=

0.54

Review

The preventive maintenance checks and if applicable performance tests for PinAAcle 900T have been completed.

This PinAAcle 900T Passes ☒ Fails ☐ the preventive maintenance.

Review of Preventive Maintenance:

Authorized PerkinElmer Representative:

Chayanan ✎

Authorized Customer Representative:

Date:

18 Jun 2026

(DD-MMM-YYYY)

Date:

18 Jun 2026

(DD-MMM-YYYY)

PinAAcle 900T Preventive Maintenance (PM)

Page 9 of 9



WO-11962532

MAINTENANCE AND IPV TEST CERTIFICATE MODEL**Optima 5300**

Customer : S.P.S. Consulting Service Co.,Ltd. **Date Tested:** June 18, 2026
Address : 7, 24 Soi Phaholyothin, Ladyao, **Period** 6 **Months**
Recertification Due: June 18, 2027
Khet, Bangkok 10900 **Date Last Certified:** N/A
User Name: K. Phenpha **Visit Number:** 1 of 2
Phone: 083-926-9252 **PerkinElmer Phone:** 02-719-6420 ext 206
E - Mail : phenpha@spscon.com **PerkinElmer Fax:** 02-318-5597

CONFIGURATION TESTED

MODEL	SERIAL NUMBER	SOFTWARE
Optima5300	077C7042401	Winlab32
TESTED EQUIPMENT	CALIBRATION NUMBER	EXPIRATION
IPV Method	N/A	N/A
TEST STANDARD USED	PART NUMBER	EXPIRATION DATE
Multielement Standard	N069-1579	Dec-26
Instrument Cal. STD4	N930-0221	Dec-26
CUSTOMER SUPPLIED	COMMENTS	CUSTOMER INITIALS
2 % HNO3	N/A	N/A
10 % HNO3	N/A	N/A



WO-11962532

MAINTENANCE AND IPV TEST CERTIFICATE MODEL**Optima 5300**

SERIAL NUMBER: 077C7042401 **DATE TESTED:** June 18, 2026

1. MECHANICAL CHECKS

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

2. OPTICAL CHECKS

- A. Inspect and clean all optical components.
- B. As required, check and replace all purgefilters.
- C. Recheck optical alignment.

3. COOLING SYSTEM CHECKS

- A. Perform preventive maintenance on chiller.
- B. Flush out the chiller every year.

4. PERFORMANCE CHECKS

- A. Torch View Alignment.
- B. Wavelength Calibration.



WO-11962532

MAINTENANCE AND IPV TEST CERTIFICATE MODEL

Optima 5300

SERIAL NUMBER: 077C7042401	DATE TESTED: June 18, 2026	
PARAMETER	SPECIFICATION	FINAL VALUE
Spectral Resolution : UV		
As 193.696 nm	≤ 0.009 nm	0.006 nm
Ni 231.604 nm	≤ 0.011 nm	0.008 nm
Ni 341.476 nm	≤ 0.015 nm	0.011 nm
Spectral Resolution : VIS		
Ba 455.403 nm	≤ 0.020 nm	0.015 nm
Precision		
Zn 206.200 nm	% RSD ≤ 1.0 %	0.39 %
Mg 280.271 nm	% RSD ≤ 1.0 %	0.41 %
Mg 285.213 nm	% RSD ≤ 1.0 %	0.31 %
Ba 455.403 nm	% RSD ≤ 1.0 %	0.68 %
Detection Limits : Axial		
Tl 190.801 nm	3(sd) <10	9.23 ppb
As 193.696 nm	3(sd) <10	6.78 ppb
Se 196.026 nm	3(sd) <5	4.12
Pb 220.353 nm	3(sd) <3	2.34 ppb
Detection Limits : Radial		
		1.23
As 193.696 nm	3(sd) <60	55.23 ppb
Zn 213.857 nm	3(sd) <2	1.03 ppb
Mn 257.610 nm	3(sd) <0.75	0.65 ppb
La 379.478 nm	3(sd) <3	3.15 ppb
Ba 455.403 nm	3(sd) <0.3	0.23 ppb
Ba 493.408 nm	3(sd) <0.6	1.11 ppb
BEC : Axial (IB X 1000)/(IS-IB)		
Mn 257.610 nm	≤ 30 ppb	15.87 ppb
BEC : Radial (IB X 1000)/(IS-IB)		
Mn 257.610 nm	≤ 30 ppb	10.35 ppb



WO-11962532

MAINTENANCE AND IPV TEST CERTIFICATE MODEL

Optima 5300

SERIAL NUMBER: 077C7042401	DATE TESTED: June 18, 2026
Remarks :	
Test all pass	
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:	Chayanan K.
	(Chayanan Kanan)
	Sr. Customer Support Engineer

**QUALITY CALIBRATION CO., LTD.**

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

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

www.qcalibration.com

CERTIFICATE No : 26T2274
REFERENCE No : 80205-1

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 : CHARUKIT L.**CALIBRATION DATE** : 05-Mar-26**APPROVED BY** : PONGSAK J.**ISSUED DATE** : 09-Mar-26**RECEIVED DATE** : 05-Mar-26THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF
QUALITY CALIBRATION CO., LTD.**QUALITY CALIBRATION CO., LTD.**

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

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

www.qcalibration.com

CERTIFICATE No : 26T2274

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : WATER BATH
MANUFACTURER : MEMMERT
ID NUMBER : WB 05/58
RECEIVED DATE : 05-Mar-26
AMBIENT TEMPERATURE : 26 °C ± 1 °C
MODEL : WNB29
SERIAL NUMBER : L614.0123
CALIBRATION DATE : 05-Mar-26
RELATIVE HUMIDITY : 53 %RH ± 10 % RH

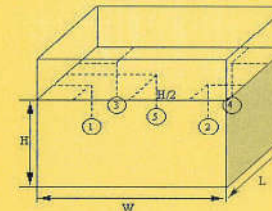
CONDITION OF THIS RESULTS OF CALIBRATION

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	25T5341	04-Jun-26

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 ADJUSTMENTPROBE INSTALLATION
POSITION IN THE BATH**GENERAL INFORMATION**

Overall Variation of Ambient Temperature around the Bath (°C) : 0.8
Overall Variation of Line Voltage (V) : 6
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	50.3	0.03	0.05	0.04	0.08
60.0	60.3	0.03	0.07	0.05	0.13

TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Indicating Temp (°C)	Measured Temperature (°C) at Spread Locations					Uncertainty (± °C)
		#1	#2	#3	#4	Ref. 5	
50.3	50.3	49.88	49.89	49.94	49.93	49.92	0.14
60.3	60.3	59.94	59.93	60.01	60.00	59.99	0.15

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



เอกสารแนบ 5-4

เอกสารสอบเทียบเครื่องมือการตรวจวัดระดับเสียง



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-69/0204

MTC No. EEL. BP. 152/0169

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 :

Ambient Environment

Description : Sound Calibrator

Temperature : (23 ± 3) °C

Manufacturer : ACO

Relative Humidity : (50 ± 15) %

Model : 2127

Ambient Pressure : (101.325 ± 1.500) kPa

Serial No. : 130006

- Standards used :
1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
 2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.
 3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.
 4. Digital Multimeter Agilent 34401A S/N MY44005560.
 5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.
 6. Audio Analyzer Keithley 2015 P S/N 4106495.
 7. Condenser Microphone Bruel&Kjaer 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 : 29 Jan. 2026

Date of Calibration : 11 Feb. 2026

1/2

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

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

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 Bangpoo Mai, 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

FM.BL.MTC.002 Rev.5



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-69/0204

MTC No. EEL. BP. 152/0169

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

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

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

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	93.89	-0.11	± 0.10	± 0.40 dB

2. Frequency

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

3. Total Distortion

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	1.90	± 0.50	± 3.0%

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :

(Mr. Weerachai Deechaiyae)

Approved by :

(Mr. Prawate Khuaypa)
Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 11 Feb. 2026

Date of Issue : 12 Feb. 2026

Ref : 2011269012900497001

End of Certificate

2 / 2

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

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

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 Bangpoo Mai, 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

FM.BL.MTC.002 Rev.5



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

Noise R_118/26

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	11 February 2026
		Due Date	11 February 2027

Calibration Data

Sound Level Meter Data

Calibration Data

SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-B02	ACO	6236	00090370	06 March 2026	93.9	93.9
ACO-B05	ACO	6236	00142002	06 March 2026	93.9	93.9
ACO-R03	ACO	6236	00132031	06 March 2026	93.9	93.9
ACO-R14	ACO	6236	00172061	06 March 2026	93.9	93.9
ACO-R44	ACO	6236	00192056	06 March 2026	93.9	93.9
ACO-R47	ACO	6236	00192059	06 March 2026	93.9	93.9
ACO-B48	ACO	6236	00192060	06 March 2026	93.9	93.9

Acoustic Certified Value : Thailand Institute of Scientific and Technological Research
(TISTR)

93.81 ± 0.10 dB

Calibrated by :

Heeson L
(Mr. Heeson Lormae)

Approved by :

Yutthana J.
(Mr. Yutthana Tanatharanit)

เอกสารแนบ 5-5

เอกสารสอบเทียบเครื่องมือการตรวจวัดสภาพอากาศ

ในสถานประกอบการ



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 : 136853

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.)			y		
					1	2	3	1	2	3			
R01	SKC	224-PCXR8	602867	05/01/2026	1,000	1,500	2,000	999	1,505	2,009	1.011x - 15.308	1.000	
R02	SKC	224-PCXR4	626450	05/01/2026	1,000	1,500	2,000	1,001	1,505	2,005	1.003x - 5.625	1.000	
R03	SKC	224-PCXR4	691592	05/01/2026	1,000	1,500	2,000	998	1,499	2,010	1.009x - 11.382	1.000	
R04	SKC	224-PCXR4	691672	05/01/2026	1,000	1,500	2,000	999	1,496	2,000	0.992x + 5.045	0.999	
R05	SKC	224-PCXR4	798470	06/01/2026	1,000	1,500	2,000	997	1,480	1,991	0.995x - 8.487	0.999	
R06	SKC	224-PCXR4	798456	06/01/2026	1,000	1,500	2,000	1,000	1,502	1,992	0.993x + 2.874	0.999	
R07	SKC	224-PCXR4	798480	06/01/2026	1,000	1,500	2,000	1,000	1,508	2,000	1.000x + 1.559	1.000	
R08	SKC	224-PCXR4	883215	07/01/2026	1,000	1,500	2,000	1,001	1,500	2,000	1.004x - 8.216	1.000	
R09	SKC	224-PCXR4	034650	05/01/2026	1,000	1,500	2,000	999	1,509	2,005	1.005x - 6.025	1.000	
R10	SKC	224-PCXR4	091765	05/01/2026	1,000	1,500	2,000	1,001	1,509	2,008	1.007x - 0.311	1.000	
R11	SKC	224-PCXR4	091763	05/01/2026	1,000	1,500	2,000	999	1,502	1,995	1.002x + 10.594	0.999	
R12	SKC	224-PCXR4	091568	06/01/2026	1,000	1,500	2,000	999	1,495	1,994	0.994x - 1.683	0.999	
R13	SKC	224-PCXR4	091638	06/01/2026	1,000	1,500	2,000	999	1,499	1,994	0.998x - 7.136	0.999	
R14	SKC	224-PCXR4	091764	06/01/2026	1,000	1,500	2,000	1,004	1,507	2,006	1.007x - 8.975	1.000	
R15	SKC	224-PCXR8	529457	06/01/2026	1,000	1,500	2,000	1,004	1,502	2,002	0.999x + 1.731	1.000	
R16	SKC	224-PCXR8	529643	05/01/2026	1,000	1,500	2,000	1,001	1,511	2,010	1.010x - 13.433	1.000	
R17	SKC	224-PCXR8	529645	06/01/2026	1,000	1,500	2,000	1,004	1,502	2,003	0.998x + 4.238	1.000	
R18	SKC	224-PCXR8	566756	05/01/2026	1,000	1,500	2,000	1,003	1,504	2,006	1.004x - 3.774	1.000	
R19	SKC	224-PCXR8	566802	05/01/2026	1,000	1,500	2,000	1,003	1,498	1,995	1.001x - 8.224	0.999	
R20	SKC	224-PCXR8	529089	06/01/2026	1,000	1,500	2,000	997	1,509	1,985	0.994x + 5.269	0.999	
R21	SKC	224-PCXR8	665728	06/01/2026	1,000	1,500	2,000	1,000	1,510	1,995	0.998x - 1.139	0.999	
R22	SKC	224-PCXR8	707444	05/01/2026	1,000	1,500	2,000	1,004	1,507	2,008	1.004x - 5.709	1.000	
R23	SKC	224-PCXR8	761067	05/01/2026	1,000	1,500	2,000	1,009	1,504	2,006	1.000x + 1.179	1.000	
R24	SKC	224-PCXR8	707893	05/01/2026	1,000	1,500	2,000	999	1,497	1,992	0.998x - 8.383	0.999	
R25	SKC	224-PCXR8	761052	06/01/2026	1,000	1,500	2,000	998	1,503	1,975	0.984x + 17.071	0.999	
R26	SKC	224-PCXR8	707956	05/01/2026	1,000	1,500	2,000	997	1,492	1,992	0.991x + 0.388	1.000	
R27	SKC	224-PCXR8	707398	05/01/2026	1,000	1,500	2,000	1,000	1,495	2,002	1.002x - 3.898	1.000	
R28	SKC	224-PCXR8	707481	06/01/2026	1,000	1,500	2,000	1,009	1,503	2,008	0.996x + 8.659	1.000	
R29	SKC	224-PCXR8	707402	07/01/2026	1,000	1,500	2,000	1,006	1,513	2,009	1.002x - 1.219	0.999	
R30	SKC	224-PCXR8	093811	07/01/2026	1,000	1,500	2,000	1,001	1,513	2,008	1.008x - 9.239	1.000	
R31	SKC	224-PCXR8	093183	06/01/2026	1,000	1,500	2,000	1,010	1,507	2,013	1.003x - 0.780	1.000	
R32	SKC	224-PCXR8	671950	06/01/2026	1,000	1,500	2,000	999	1,498	1,999	1.000x + 0.668	1.000	
R33	SKC	224-PCXR4	626254	06/01/2026	1,000	1,500	2,000	1,000	1,508	2,007	1.004x - 5.149	1.000	
R34	SKC	224-PCXR4	626131	05/01/2026	1,000	1,500	2,000	996	1,498	2,003	1.010x - 18.178	1.000	
R35	SKC	224-PCXR8	707460	05/01/2026	1,000	1,500	2,000	1,006	1,496	2,004	0.999x + 0.388	1.000	
R36	SKC	224-PCXR8	707446	05/01/2026	1,000	1,500	2,000	1,006	1,504	2,008	1.005x - 6.281	1.000	
R37	SKC	224-PCXR8	707432	06/01/2026	1,000	1,500	2,000	1,003	1,505	2,004	1.004x - 5.005	1.000	
R38	SKC	224-PCXR8	707349	06/01/2026	1,000	1,500	2,000	998	1,498	1,997	0.999x - 1.655	1.000	
R39	SKC	224-PCXR8	761095	06/01/2026	1,000	1,500	2,000	1,000	1,497	2,003	1.005x - 8.068	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

Rotameter Calibration Report (For Personal Pump High Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136853

Calibration Data

Rotameter Data			Calibration Data									
No.	Brand	Model	Date	Flow Rate (ml/min)						Value From Calibration Curve		
				Flow Rate (Reading)			Actual (Q std.)					
				1	2	3	1	2	3	y	R ²	
H-R01	Dwyer	VFB-65	05/01/2026	500	1,000	2,000	503.6	992.4	1980.9	0.999x - 3.140	0.999	
H-R02	Dwyer	VFB-65	06/01/2026	500	1,000	2,000	500.8	995.8	1986.2	1.002x - 5.343	1.000	
H-R03	Dwyer	VFB-65	05/01/2026	500	1,000	2,000	495.3	992.1	1982.9	1.004x - 17.510	0.999	
H-R04	Dwyer	VFB-65	05/01/2026	500	1,000	2,000	496.4	994.6	2019.5	1.007x - 11.385	1.000	
H-R05	Dwyer	VFB-65	06/01/2026	500	1,000	2,000	497.2	991.5	1987.3	1.003x - 7.563	1.000	
H-R06	Dwyer	VFB-65	06/01/2026	500	1,000	2,000	501.1	992.4	1982.9	1.001x - 6.139	0.999	

Calibrated by :

Adul Dangklom
(Mr. Adul. Dangklom)

Approved by :

Peera Detudom
(Mr. Peera. Detudom)



CERTIFICATE No : 26M2266
REFERENCE No : 80204-1

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE
MANUFACTURER : METTLER TOLEDO
MODEL : XS105DU
SERIAL No : 1126422905
ID No : BA 05/50
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 : SUCHAT S.
CALIBRATION DATE : 05-Mar-26

APPROVED BY : PONGSAK J.
ISSUED DATE : 06-Mar-26
RECEIVED DATE : 05-Mar-26



CERTIFICATE No : 26M2266

Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : XS105DU
MANUFACTURER : METTLER TOLEDO S/N : 1126422905
ID No : BA 05/50 RECEIVED DATE : 05-Mar-26
AIR PRESSURE : 1004mbar $\pm$ 1mbar CALIBRATION DATE : 05-Mar-26
AMBIENT TEMPERATURE : 25° C $\pm$ 1° C RELATIVE HUMIDITY : 50 %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.

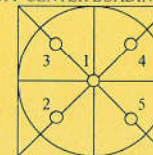
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND)

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	0.02000	0.00000	0.000065
0.10	0.10000	0.00000	0.000066
0.20	0.20000	0.00000	0.000066
0.50	0.50001	-0.00001	0.000065
1.00	1.00001	-0.00001	0.000066
2.00	2.00000	0.00000	0.000067
5.00	5.00001	-0.00001	0.000068
10.00	10.00004	-0.00004	0.000070
20.00	20.00006	-0.00006	0.000078
50.00	50.00000	0.00000	0.00012
100.00	100.00002	-0.00002	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



เอกสารแนบ 5-6

เอกสารสอบเทียบเครื่องมือการตรวจวัดเสียงในสถานประกอบการ



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-69/0204

MTC No. EEL. BP. 152/0169

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 :

Ambient Environment

Description : Sound Calibrator

Temperature : (23 ± 3) °C

Manufacturer : ACO

Relative Humidity : (50 ± 15) %

Model : 2127

Ambient Pressure : (101.325 ± 1.500) kPa

Serial No. : 130006

- Standards used :
1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
 2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.
 3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.
 4. Digital Multimeter Agilent 34401A S/N MY44005560.
 5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.
 6. Audio Analyzer Keithley 2015 P S/N 4106495.
 7. Condenser Microphone Bruel&Kjaer 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 : 29 Jan. 2026

Date of Calibration : 11 Feb. 2026

1/2

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

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

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

FM.BL.MTC.002 Rev.5



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-69/0204

MTC No. EEL. BP. 152/0169

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

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

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

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	93.89	-0.11	± 0.10	±0.40 dB

2. Frequency

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

3. Total Distortion

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	1.90	± 0.50	±3.0%

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :

(Mr. Weerachai Deechaiyae)

Approved by :

(Mr. Prawate Khuaypa)
Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 11 Feb. 2026

Date of Issue : 12 Feb. 2026

Ref : 2011269012900497001

End of Certificate

2 / 2

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

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

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

FM.BL.MTC.002 Rev.5



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

Noise R_117/26

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	11 February 2026
		Due Date	11 February 2027

Calibration Data

Sound Level Meter Data

Calibration Data

SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-B43	ACO	6236	00192034	07 March 2026	93.9	93.9
ACO-R40	ACO	6236	00192052	07 March 2026	93.9	93.9
ACO-R41	ACO	6236	00192053	07 March 2026	93.9	93.9
ACO-R50	ACO	6236	00192062	07 March 2026	93.9	93.9
ACO-R51	ACO	6236	00192063	07 March 2026	93.9	93.9
ACO-R52	ACO	6236	00192064	07 March 2026	93.9	93.9

Acoustic Certified Value : Thailand Institute of Scientific and Technological Research
(TISTR)

93.81 ± 0.10 dB

Calibrated by :

Heeson L.

(Mr. Heeson Lormae)

Approved by :

Yutthana J.

(Mr. Yutthana Tanatharanit)

เอกสารแนบ 5-7

เอกสารสอบเทียบเครื่องมือการตรวจวัดความร้อน
ในสถานประกอบการ



Certificate of Calibration

Certificate Number : SPR25100063-4 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 : TEN040005
ID. Number : R04
Environmental Conditions
Ambient Temperature : 23 °C ± 2 °C Received Date : 06 Oct 2025
Relative Humidity : 50 % ± 15 % Calibration Date : 08 Oct 2025
Location of Calibration : In-Lab Recommend Due Date : 08 Oct 2026
Calibration Procedure : SP-CPT-04-13 Date of Issue : 09 Oct 2025

Method of Calibration

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

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

Calibrated by : Mr. Navaporn Uengseng

Calibration Officer

Approved by

(Mr. Pootthipong A.)

Authorized Signatory



SP-FM-04-15 rev.0



Calibration Report

Certificate Number : SPR25100063-4 Page : 2 of 3

Reference Standards

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

Traceability

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

NA - NA Caltechnologies Co., Ltd.

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

SP-FM-04-15 rev.0



Result of Calibration

Certificate Number : SPR25100063-4

Page : 3 of 3

Temperature Accuracy in the Measurement. (WET)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.014	29.8	-0.214	0.20
35.0	35.012	34.8	-0.212	0.20
40.0	40.018	39.8	-0.218	0.20

Temperature Accuracy in the Measurement. (DRY)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.014	29.7	-0.314	0.20
35.0	35.012	34.7	-0.312	0.20
40.0	40.018	39.7	-0.318	0.20

Temperature Accuracy in the Measurement. (GLOVE)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.014	29.8	-0.214	0.20
35.0	35.012	34.8	-0.212	0.20
40.0	40.018	39.8	-0.218	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 R006

Heat Stress WBGT Meter Verification Report			
Verification Data			
Heat Stress WBGT Meter No.	: R04	Verification Date	: 07 March 2026
Brand	: Quest Technologies	Ambient Temp.	: 24.6 °C
Model	: QUESTemp 34	Barometric Pressure	: 1011 mmbar
Serial No.	: TEN040005	Relative Humidity	: 49 %
Verification Module (Electronic Sensor Check) :			
Verification Module No. : 21 WB = 12.5 °C, DB = 47.1 °C, G = 69.3 °C			
Result of Verification : Without Adjustment			
Wet Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
12.5	12.6	-0.1	± 0.5
Dry Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
47.1	47.3	-0.2	± 0.5
Globe Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
69.3	69.2	0.1	± 0.5
UUC* = UNIT UNDER CALIBRATION			

Verified by :

Heeson L.

(Mr. Heeson Lormae)

Approved by :

Yutthana J.

(Mr. Yutthana Tanatharanit)



Certificate of Calibration

Certificate Number : SPR26010387-2 Page : 1 of 3

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

Equipment Name : Area Heat Stress Monitor

Manufacturer : Metrosonics

Model : hs-32

Serial Number : MCD070035

ID. Number : R05

Environmental Conditions

Ambient Temperature : $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$ Received Date : 30 Jan 2026

Relative Humidity : $50\% \pm 15\%$ Calibration Date : 03 Feb 2026

Location of Calibration : In-Lab Recommend Due Date : 03 Feb 2027

Calibration Procedure : SP-CPT-04-13 Date of Issue : 04 Feb 2026

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.Jirasak Pumbut

Calibration Officer

Approved by



(Mr.Worapong Sinthusopa)

Authorized Signatory

SP-FM-04-15 rev.0



Calibration Report

Certificate Number : SPR26010387-2 Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
THERMO-HYGROMETER	5020A	A47046	TMU2500342	29 Jan 2027
Temp & Humidity Test Chamber	TEMI1500-01/SD/N/N/	S7110ZL742 1014	SPR25040010-13	20 Apr 2026

Traceability

This certification is traceable to the International System of Unit maintained at :
NA - NA Caltechnologies Co., Ltd.

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

SP-FM-04-15 rev.0



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

Page : 3 of 3

Unit : °C

Unit : °CUnit : °CSP-FM-04-15 REV.0



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 R006

Heat Stress WBGT Meter Verification Report			
Verification Data			
Heat Stress WBGT Meter No.	: R05	Verification Date	: 07 March 2026
Brand	: METROSONICS	Ambient Temp.	: 24.6 °C
Model	: hs-32	Barometric Pressure	: 1011 mmbar
Serial No.	: MCD070035	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	47.2	-0.1	± 0.5
Globe Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
69.3	69.1	0.2	± 0.5
UUC* = UNIT UNDER CALIBRATION			

Verified by : Heeson L
(Mr. Heeson Lormae)

Approved by : Yutthana J
(Mr. Yutthana Tanatharanit)