

ภาคผนวกที่ ง

เอกสารสอบเทียบความถูกต้องของเครื่องมือ

ตรวจวัดคุณภาพสิ่งแวดล้อม

**ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง
และเครื่องมือตรวจวิเคราะห์คุณภาพสิ่งแวดล้อม**

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
1. คุณภาพอากาศในบรรยากาศ		
Total Suspended Particulate (TSP)	High Volume Air Sampler No. B03, B14, B39, B42	Digital Balance
Particulate Matter less than 10 Microns (PM-10)	High Volume PM-10 Air Sampler No. B08, B09, B10, B20	Digital Balance
Sulfur Dioxide (SO ₂)	SO ₂ Analyzer No. B03, B10, B12, B13	SO ₂ Analyzer No. B03, B10, B12, B13
Nitrogen Dioxide (NO ₂)	NO ₂ Analyzer No. B02, B03, B10, B15	NO ₂ Analyzer No. B02, B03, B10, B15
2. คุณภาพน้ำ		
Color	-	Spectrophotometer
pH	-	pH Meter
Total Suspended Solids	-	Digital Balance
Total Dissolved Solids	-	Digital Balance
BOD ₅	-	BOD Analyzer
COD	-	COD Reactor
Cadmium	-	Inductively Coupled Plasma
Total Chromium	-	Inductively Coupled Plasma
Lead	-	Inductively Coupled Plasma
Manganese	-	Inductively Coupled Plasma
Nickel	-	Inductively Coupled Plasma
Mercury	-	Atomic Absorption Spectrophotometer
Zinc	-	Inductively Coupled Plasma
Trivalent Chromium	-	Inductively Coupled Plasma
Hexavalent Chromium	-	Spectrophotometer
Fecal Coliform Bacteria	-	Water Bath
Grease & Oil	-	Digital Balance
3. ระดับเสียงในบรรยากาศ		
Leq 24 hr, L _{max} และ L _{dn}	Acoustic Calibrator Sound Level Meter ACO No. B04, B12, B26, B27, R05, R07, R10, R13	-

คุณภาพอากาศในบรรยากาศ



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High Volume Air Sampler Calibration Report

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

Calibration Data

High Volume Air Sampler Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (ft ³ /min)	R ²
B01	B01	03/11/2025	y = 1.118x-3.833	0.997
B02	B02	03/11/2025	y = 1.120x-3.384	0.999
B03	B03	04/11/2025	y = 1.069x-0.968	0.998
B04	B04	03/11/2025	y = 1.096x-2.076	0.996
B05	B05	03/11/2025	y = 1.101x-2.990	0.997
B06	B06	03/11/2025	y = 1.124x-3.707	0.999
B07	B07	03/11/2025	y = 1.133x-2.855	0.999
B08	B08	04/11/2025	y = 1.108x-1.898	0.996
B09	B09	03/11/2025	y = 1.110x-2.993	0.998
B10	B10	03/11/2025	y = 1.116x-3.121	0.999
B11	B11	03/11/2025	y = 1.119x-2.105	0.996
B12	B12	03/11/2025	y = 1.126x-1.525	0.997
B13	B13	05/11/2025	y = 1.093x+0.946	0.998
B14	B14	05/11/2025	y = 1.149x-3.047	0.999
B15	B15	05/11/2025	y = 1.137x-3.875	0.999
B16	B16	03/11/2025	y = 1.079x-2.409	0.998
B17	B17	03/11/2025	y = 1.177x-4.168	0.997
B18	B18	03/11/2025	y = 1.138x-2.900	0.999
B19	B19	03/11/2025	y = 1.109x-1.623	0.996
B20	B20	03/11/2025	y = 1.123x-0.045	0.999
B21	B21	04/11/2025	y = 1.082x+0.484	0.998
B22	B22	04/11/2025	y = 1.110x-1.594	0.996
B23	B23	04/11/2025	y = 1.135x-2.878	0.999
B24	B24	04/11/2025	y = 1.141x-3.242	0.998
B25	B25	03/11/2025	y = 1.011x+3.037	0.997
B26	B26	03/11/2025	y = 1.104x-2.679	0.998
B27	B27	03/11/2025	y = 1.148x-3.947	0.999
B28	B28	03/11/2025	y = 1.120x-3.393	0.998
B29	B29	05/11/2025	y = 1.142x-3.319	0.997
B30	B30	05/11/2025	y = 1.139x-1.015	0.996
B31	B31	05/11/2025	y = 1.152x-2.962	0.997
B32	B32	05/11/2025	y = 1.140x-3.712	0.999
B33	B33	05/11/2025	y = 1.125x-0.806	0.996
B34	B34	04/11/2025	y = 1.150x-3.245	0.996



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

Calibration Data

High Volume Air Sampler Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (ft ³ /min)	R ²
B35	B35	04/11/2025	y = 1.088x-1.183	0.997
B36	B36	04/11/2025	y = 1.131x-2.774	0.996
B37	B37	04/11/2025	y = 1.068x+0.301	0.999
B38	B38	03/11/2025	y = 1.109x-3.757	0.998
B39	B39	03/11/2025	y = 1.027x+0.098	0.999
B40	B40	04/11/2025	y = 1.117x-1.067	0.997
B41	B41	04/11/2025	y = 1.097x-1.570	0.997
B42	B42	04/11/2025	y = 1.142x-3.608	0.997
B43	B43	05/11/2025	y = 1.100x-0.506	0.998
B44	B44	05/11/2025	y = 1.149x-3.077	0.999
R01	R01	05/11/2025	y = 1.114x-0.751	0.998
R02	R02	03/11/2025	y = 1.144x-3.923	0.999
R03	R03	03/11/2025	y = 1.161x-4.126	0.999
R04	R04	03/11/2025	y = 1.113x-2.188	0.997
R05	R05	03/11/2025	y = 1.139x-0.779	0.999
R06	R06	03/11/2025	y = 1.106x-1.148	0.996
R07	R07	03/11/2025	y = 1.128x-3.641	0.999
R08	R08	03/11/2025	y = 1.135x-4.572	0.996
R09	R09	03/11/2025	y = 1.121x-4.112	0.998
R10	R10	03/11/2025	y = 1.117x-2.052	0.999
R11	R11	03/11/2025	y = 1.110x-2.812	0.996
R12	R12	03/11/2025	y = 1.120x-1.259	0.996
R13	R13	04/11/2025	y = 1.146x-5.407	0.998
R14	R14	04/11/2025	y = 1.150x-3.484	0.999
R15	R15	04/11/2025	y = 1.143x-5.066	0.998
R16	R16	04/11/2025	y = 1.153x-6.481	0.996
R17	R17	03/11/2025	y = 1.126x-3.877	0.998
R18	R18	03/11/2025	y = 1.147x-5.065	0.997
R19	R19	03/11/2025	y = 1.119x-4.625	0.999
R20	R20	03/11/2025	y = 1.148x-4.605	0.997



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High Volume PM-10 Air Sampler Calibration Report

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

Calibration Data

High Volume PM-10 Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (ft ³ /min)	R ²
B01	B01	03/11/2025	$y = 1.092x + 0.521$	0.996
B02	B02	03/11/2025	$y = 1.024x + 2.593$	0.996
B03	B03	03/11/2025	$y = 1.069x + 0.165$	0.996
B04	B04	03/11/2025	$y = 1.116x - 5.830$	0.996
B05	B05	04/11/2025	$y = 1.087x - 2.138$	0.996
B06	B06	05/11/2025	$y = 1.029x + 2.022$	0.997
B07	B07	05/11/2025	$y = 1.074x - 2.035$	0.998
B08	B08	05/11/2025	$y = 1.067x + 0.556$	0.996
B09	B09	05/11/2025	$y = 1.109x - 4.546$	0.999
B10	B10	03/11/2025	$y = 1.104x - 1.785$	0.998
B11	B11	03/11/2025	$y = 1.125x - 2.889$	0.998
B12	B12	03/11/2025	$y = 1.104x - 1.785$	0.998
B13	B13	03/11/2025	$y = 1.093x - 1.516$	0.999
B14	B14	04/11/2025	$y = 1.120x - 3.358$	0.999
B15	B15	04/11/2025	$y = 1.124x - 2.135$	0.998
B16	B16	04/11/2025	$y = 1.063x + 1.099$	0.998
B17	B17	03/11/2025	$y = 1.126x - 1.558$	0.996
B18	B18	03/11/2025	$y = 1.115x - 3.865$	0.997
B19	B19	05/11/2025	$y = 1.059x + 1.880$	0.998
B20	B20	05/11/2025	$y = 1.111x - 2.098$	0.998
B21	B21	05/11/2025	$y = 1.103x - 2.131$	0.998
B22	B22	03/11/2025	$y = 1.090x - 0.933$	0.997
B23	B23	03/11/2025	$y = 1.133x - 4.167$	0.996
B24	B24	03/11/2025	$y = 1.104x - 2.632$	0.999
B25	B25	03/11/2025	$y = 1.129x - 4.611$	0.997
B26	B26	05/11/2025	$y = 1.071x - 1.320$	0.998
B27	B27	04/11/2025	$y = 1.130x - 4.771$	0.999
B28	B28	03/11/2025	$y = 1.099x - 1.988$	0.996
B29	B29	04/11/2025	$y = 1.107x - 3.409$	0.996
B30	B30	04/11/2025	$y = 1.122x - 4.108$	0.998
B31	B31	04/11/2025	$y = 1.038x + 0.165$	0.999
B32	B32	04/11/2025	$y = 1.021x + 2.454$	0.998
B33	B33	03/11/2025	$y = 1.067x + 0.089$	0.999
B34	B34	03/11/2025	$y = 1.043x + 2.363$	0.996



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High Volume PM-10 Air Sampler Calibration Report

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

Calibration Data

High Volume PM-10 Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (ft ³ /min)	R ²
R01	R01	03/11/2025	$y = 1.055x + 0.899$	0.998
R02	R02	03/11/2025	$y = 1.132x - 3.919$	0.998
R03	R03	03/11/2025	$y = 1.113x - 2.991$	0.996
R04	R04	03/11/2025	$y = 1.126x - 3.936$	0.996
R05	R05	04/11/2025	$y = 1.103x - 2.678$	0.996
R06	R06	04/11/2025	$y = 1.107x - 1.644$	0.996
R07	R07	04/11/2025	$y = 1.085x - 0.497$	0.998
R08	R08	03/11/2025	$y = 1.071x + 0.571$	0.998
R09	R09	03/11/2025	$y = 1.116x - 2.909$	0.999
R10	R10	03/11/2025	$y = 1.089x - 1.636$	0.996
R11	R11	03/11/2025	$y = 1.045x + 1.442$	0.999
R12	R12	03/11/2025	$y = 1.058x - 0.370$	0.998
R13	R13	03/11/2025	$y = 1.100x - 2.187$	0.998
R14	R14	03/11/2025	$y = 1.099x - 1.650$	0.999
R15	R15	03/11/2025	$y = 1.128x - 4.768$	0.997
R16	R16	05/11/2025	$y = 1.093x - 2.124$	0.997
R17	R17	05/11/2025	$y = 1.101x - 2.286$	0.997
R18	R18	05/11/2025	$y = 1.118x - 5.339$	0.999
R19	R19	03/11/2025	$y = 1.054x + 1.212$	0.996
R20	R20	03/11/2025	$y = 1.068x - 1.764$	0.997



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CALIBRATION REPORT					
SO ₂ FLUORESCENT ANALYZER					
DATE :	06 November 2025	BRAND :	API	MODEL :	100A
NO.	SO ₂ -B03	SERIAL NO.	1846		
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	1011	mmbar	Temp.	24.6	°C
% RH	50				
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Diff	Analyzer Response	Slope
Zero	0	0.11	-	0	-
SO ₂ Span	400.0	400.2	0.050	400.0	1.013
API Model 100A SO ₂ Analyzer Check list					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	0-500		
SAMPLE PRESS	28.5	in-Hg	25-35		
SAMPLE FLOW	658	cc/min	650 ± 10%		
PMT	103.3	mV	-20-150 with Zero Air		
UV LAMP	3032.1	mV	1000-4900		
STR. LGT	61.6	PPB	<100		
DRK PMT	63.0	mV	-50 - 200		
DRK LMP	57.8	mV	-50 - 200		
HVPS	673	V	550-900 constant		
DCPS	2527	mV	2500 ± 200		
RCELL TEMP	50.2	°C	50 ± 1		
BOX TEMP	29.3	°C	5-40		
PMT TEMP	7.4	°C	7 ± 2.0		
SO ₂ Span Conc	400	PPB	20-20,000		
SO ₂ Slope	1.013	-	1.0 ± 0.3		
SO ₂ Offset	22.1	mV	<250		
Stability at Zero	0.1	PPB	<0.2		
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)		



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CALIBRATION REPORT					
SO ₂ FLUORESCENT ANALYZER					
DATE :	11 November 2025	BRAND :	Thermo	MODEL :	43C
NO.	SO2-B10	SERIAL NO.	43C-69604-364		
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	1011	mmbar	Temp.	24.6	°C
% RH	50				
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Diff	Analyzer Response	
Zero	0	0.10	-	0	
SO ₂ Span	400.0	399.9	-0.025	400.0	
INSTRUMENT STATUS					
CHAMBER TEMP	44.3	°C	FLOW	1.0 LPM	
PRESSURE	728.6	mm Hg			

CALIBRATION REPORT					
SO ₂ FLUORESCENT ANALYZER					
DATE :	11 November 2025	BRAND :	TELEDYNE	MODEL :	TML-50
NO.	SO ₂ -812	SERIAL NO.	1886		
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	1011 mmbar	Temp.	24.6 °C	% RH	50
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Diff	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
SO ₂ Span	400.0	399.8	-0.050	400.0	1.010
API Model TML-50 SO ₂ Analyzer Check list					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	0-500		
SAMPLE PRESS	28.6	in-Hg	25-35		
SAMPLE FLOW	660	cc/min	650 ± 10%		
PMT	103.1	mV	-20-150 with Zero Air		
UV LAMP	3020.4	mV	1000-4900		
STR. LGT	61.9	PPB	<100		
DRK PMT	63.4	mV	-50 - 200		
DRK LMP	58.2	mV	-50 - 200		
HVPS	675	V	550-900 constant		
DCPS	2520	mV	2500 ± 200		
RCCELL TEMP	50.3	°C	50 ± 1		
BOX TEMP	29.2	°C	5-40		
PMT TEMP	7.1	°C	7 ± 2.0		
SO ₂ Span Conc	400	PPB	20-20,000		
SO ₂ Slope	1.010	-	1.0 ± 0.3		
SO ₂ Offset	22.2	mV	<250		
Stability at Zero	0.1	PPB	<0.2		
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)		

CALIBRATION REPORT					
SO ₂ FLUORESCENT ANALYZER					
DATE :	06 November 2025	BRAND :	TELEDYNE	MODEL :	TML-50
NO.	SO ₂ -813	SERIAL NO.	1891		
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	1011 mmbar	Temp.	24.6 °C	% RH	50
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Diff	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
SO ₂ Span	400.0	399.6	-0.100	400.0	1.007
API Model TML-50 SO ₂ Analyzer Check list					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	0-500		
SAMPLE PRESS	28.4	in-Hg	25-35		
SAMPLE FLOW	657	cc/min	650 ± 10%		
PMT	103.2	mV	-20-150 with Zero Air		
UV LAMP	3026.5	mV	1000-4900		
STR. LGT	61.7	PPB	<100		
DRK PMT	63.1	mV	-50 - 200		
DRK LMP	57.9	mV	-50 - 200		
HVPS	674	V	550-900 constant		
DCPS	2524	mV	2500 ± 200		
RCCELL TEMP	50.1	°C	50 ± 1		
BOX TEMP	29.4	°C	5-40		
PMT TEMP	7.5	°C	7 ± 2.0		
SO ₂ Span Conc	400	PPB	20-20,000		
SO ₂ Slope	1.007	-	1.0 ± 0.3		
SO ₂ Offset	21.8	mV	<250		
Stability at Zero	0.1	PPB	<0.2		
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)		



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

CALIBRATION REPORT

CHEMILUMINESCENT NO / NO₂ / NO_x ANALYZER

DATE : 06 November 2025 BRAND : API MODEL : 200A
NO. NOX-802 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. : A00726SV
Certified Date : 05 January 2023 Expired Date : 05 January 2026 Cylinder Conc. : 48.8 ppm

CALIBRATING CONDITION

Pressure 1011 mmbar Temp. 24.6 °C % RH 50

CALIBRATION SETTING

Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
	Expected Concentration	Analyzer Response	%Diff	Analyzer Response	Slope
Zero	0	0.11	-	0	-
NO Span	400	400.1	0.025	400.0	1.010
NO _x Span	400	400.2	0.050	400.0	1.013

API Model 200A NO_x Analyzer Check List

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	500 standard
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air
SAMPLE FLOW	510	cc/min	500 ± 50
OZONE FLOW	79	cc/min	80 ± 15
PMT	103.4	mV	-20 - 150
AZERO	94.2	mV	-20 - 150
HVPS	671	V	420 - 900 constant
RCCELL TEMP	50.3	°C	50 ± 1
BOX TEMP	29.2	°C	8 - 48
PMT TEMP	7.4	°C	7 ± 2
MOLY TEMP	315.3	°C	315 ± 5
RCCELL PRESS	8.5	IN-Hg-A	2 - 10 constant
SAMPLE PRESS	28.7	IN-Hg-A	25 - 30 constant
NO Span Conc	400	PPB	20 - 20,000
NO _x Span Conc	400	PPB	20 - 20,000
NO Slope	1.010	-	1.0 ± 0.3
NO _x Slope	1.013	-	1.0 ± 0.3
NO Offset	1.5	mV	-20 to +150
NO _x Offset	0.9	mV	-20 to 150
Stability at Zero	0.1	PPB	< 0.2
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas



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CALIBRATION REPORT

CHEMILUMINESCENT NO / NO₂ / NO_x ANALYZER

DATE : 06 November 2025 BRAND : API MODEL : 200A
NO. NOX-803 SERIAL NO. 2617

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. : A00726SV
Certified Date : 05 January 2023 Expired Date : 05 January 2026 Cylinder Conc. : 48.8 ppm

CALIBRATING CONDITION

Pressure 1011 mmbar Temp. 24.6 °C % RH 50

CALIBRATION SETTING

Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
	Expected Concentration	Analyzer Response	%Diff	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
NO Span	400	399.9	-0.025	400.0	1.009
NO _x Span	400	400.1	0.025	400.0	1.012

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	509	cc/min	500 ± 50
OZONE FLOW	79	cc/min	80 ± 15
PMT	103.1	mV	-20 - 150
AZERO	93.8	mV	-20 - 150
HVPS	675	V	420 - 900 constant
RCCELL TEMP	50.4	°C	50 ± 1
BOX TEMP	29.1	°C	8 - 48
PMT TEMP	7.0	°C	7 ± 2
MOLY TEMP	315.2	°C	315 ± 5
RCCELL 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	1.009	-	1.0 ± 0.3
NO _x Slope	1.012	-	1.0 ± 0.3
NO Offset	1.6	mV	-20 to +150
NO _x Offset	1.0	mV	-20 to 150
Stability at Zero	0.1	PPB	< 0.2
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas



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CALIBRATION REPORT

CHEMILUMINESCENT NO / NO₂ / NO_x ANALYZER

DATE : 06 November 2025 BRAND : API MODEL : 200E
NO. NOX-B10 SERIAL NO. 4465

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. : A00726SV
Certified Date : 05 January 2023 Expired Date : 05 January 2026 Cylinder Conc. : 48.8 ppm

CALIBRATING CONDITION

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

CALIBRATION SETTING

Span Set Point	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.10	-	0	-
NO Span	400	399.8	-0.050	400.0	1.008
NO _x Span	400	400.2	0.050	400.0	1.012

API Model 200E NO_x Analyzer Check List

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	500 standard
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air
SAMPLE FLOW	512	cc/min	500 ± 50
OZONE FLOW	79	cc/min	80 ± 15
PMT	103.2	mV	-20 - 150
AZERO	93.9	mV	-20 - 150
HVPS	672	V	420 - 900 constant
RCCELL TEMP	50.1	°C	50 ± 1
BOX TEMP	29.0	°C	8 - 48
PMT TEMP	7.2	°C	7 ± 2
MOLY TEMP	314.9	°C	315 ± 5
RCCELL PRESS	8.4	IN-Hg-A	2 - 10 constant
SAMPLE PRESS	28.6	IN-Hg-A	25 - 30 constant
NO Span Conc	400	PPB	20 - 20,000
NO _x Span Conc	400	PPB	20 - 20,000
NO Slope	1.008	-	1.0 ± 0.3
NO _x Slope	1.012	-	1.0 ± 0.3
NO Offset	1.4	mV	-20 to +150
NO _x Offset	0.9	mV	-20 to 150
Stability at Zero	0.1	PPB	< 0.2
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas



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CALIBRATION REPORT

CHEMILUMINESCENT NO / NO₂ / NO_x ANALYZER

DATE : 06 November 2025 BRAND : API MODEL : 200A
NO. NOX-B15 SERIAL NO. 213

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. : A00726SV
Certified Date : 05 January 2023 Expired Date : 05 January 2026 Cylinder Conc. : 48.8 ppm

CALIBRATING CONDITION

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

CALIBRATION SETTING

Span Set Point	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.11	-	0	-
NO Span	400	400.1	0.025	400.0	1.010
NO _x Span	400	400.3	0.075	400.0	1.014

API Model 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	511	cc/min	500 ± 50
OZONE FLOW	79	cc/min	80 ± 15
PMT	103.0	mV	-20 - 150
AZERO	93.6	mV	-20 - 150
HVPS	670	V	420 - 900 constant
RCCELL TEMP	50.2	°C	50 ± 1
BOX TEMP	29.3	°C	8 - 48
PMT TEMP	7.1	°C	7 ± 2
MOLY TEMP	314.7	°C	315 ± 5
RCCELL PRESS	8.2	IN-Hg-A	2 - 10 constant
SAMPLE PRESS	28.4	IN-Hg-A	25 - 30 constant
NO Span Conc	400	PPB	20 - 20,000
NO _x Span Conc	400	PPB	20 - 20,000
NO Slope	1.010	-	1.0 ± 0.3
NO _x Slope	1.014	-	1.0 ± 0.3
NO Offset	1.7	mV	-20 to +150
NO _x Offset	1.1	mV	-20 to 150
Stability at Zero	0.1	PPB	< 0.2
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas



CERTIFICATE No : 25M2254
REFERENCE No : 76365-1

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE
MANUFACTURER : METTLER TOLEDO
MODEL : XS105DU
SERIAL No : 1126422905
ID No : BA05/50
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : S.P.S. CONSULTING SERVICE CO., LTD.
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD.,
JOMPOL, CHATUCHAK, BANGKOK 10900

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

APPROVED BY :
ISSUED DATE : 13-Mar-25
RECEIVED DATE : 07-Mar-25

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



F-G010 REV 03



CERTIFICATE No : 25M2254

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE
MANUFACTURER : METTLER TOLEDO
ID No : BA05/50
AIR PRESSURE : 1009mbar \pm 1mbar
AMBIENT TEMPERATURE : 24° C \pm 1° C
MODEL : XS105DU
S/N : 1126422905
RECEIVED DATE : 07-Mar-25
CALIBRATION DATE : 07-Mar-25
RELATIVE HUMIDITY : 54%RH \pm 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

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

2. REFERENCE STANDARD INSTRUMENTS :-

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

- ZERO SETTING FUNCTION : NORMAL
- TARE FUNCTION : NORMAL
- REPEATABILITY OF READING AT 120 g WAS 0.000055 g
- DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (\pm g)
0.00	0.00000	0.00000	0.000065
0.02	0.01999	0.00001	0.000065
0.10	0.10001	-0.00001	0.000066
0.20	0.20001	-0.00001	0.000066
0.50	0.50002	-0.00002	0.000065
1.00	1.00003	-0.00003	0.000066
2.00	2.00001	-0.00001	0.000067
5.00	5.00002	-0.00002	0.000068
10.00	10.00000	0.00000	0.000070
20.00	20.00004	-0.00004	0.000078
50.00	50.00000	0.00000	0.00013
100.00	100.0001	-0.0001	0.00019
120.00	120.0002	-0.0002	0.00022

5. OFF CENTER LOADING ERROR



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

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

END OF CALIBRATION REPORT



คุณภาพน้ำ

Cert. No. : SP24020

Pages 1 of 3

Calibration Certificate

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

Condition As Found : GOOD

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

Location : WET CHEMISTRY LABORATORY IV

Ambient Temperature : (28.1 ± 5) °C
Relative Humidity : (47.2 ± 25) %

Received Date : 27 AUGUST 2024
Calibration Date : 27 AUGUST 2024
Date of Issue : 27 AUGUST 2024

Calibrated by : Nathakorn Pisutpaisan

Approved by :

Cert. No. : SP24020

Job No. : VC67SP0013

Pages : 2 of 3

Calibration Method :

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

Condition of this result of calibration :

1. Certified reference materials

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

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

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

3.1 The UK National Physical Laboratory (NPL)

3.2 The National Institute of Standards and Technology, NIST.

Result of calibration : Wavelength Accuracy

(Without adjustment)

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

UUC* = Unit Under Calibration

SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY

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

SITHIPORN
 associates



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

Result of calibration : Photometric Accuracy

(Without adjustment)

Material	Wavelength (nm)	Filter S/N	Nominal Absorbance (A)	Certified Absorbance (A)	UUC* Reading Absorbance (A)	Error (A)	Uncertainty ± (A)	k Factor
Neutral Density glass filter	440.0	29360	1.0	1.0517	1.0550	0.0033	0.0029	2.00
		29914	0.7	0.7445	0.7460	0.0015	0.0029	2.00
		29381	0.5	0.5416	0.5431	0.0015	0.0030	2.00
	546.1	29360	1.0	0.9821	0.9820	-0.0001	0.0028	2.00
		29914	0.7	0.6961	0.6958	-0.0003	0.0028	2.00
		29381	0.5	0.5073	0.5080	0.0007	0.0029	2.00
	590.0	29360	1.0	1.0222	1.0210	-0.0012	0.0028	2.00
		29914	0.7	0.7237	0.7221	-0.0016	0.0029	2.00
		29381	0.5	0.5361	0.5361	0.0000	0.0031	2.00
	635.0	29360	1.0	0.9753	0.9745	-0.0008	0.0028	2.00
		29914	0.7	0.6910	0.6900	-0.0010	0.0029	2.00
		29381	0.5	0.5211	0.5210	-0.0001	0.0032	2.00

Material	Wavelength (nm)	Solution (mg/l)	Certified Absorbance (A)	UUC* Reading Absorbance (A)	Error (A)	Uncertainty ± (A)	k Factor
RM-0204060810	235.0	20	0.2422	0.2418	-0.0004	0.0101	2.00
		40	0.4866	0.4852	-0.0014	0.0115	2.00
		60	0.7414	0.7389	-0.0025	0.0067	2.00
		80	0.9858	0.9842	-0.0016	0.0093	2.00
		100	1.2442	1.2414	-0.0028	0.0086	2.00

UUC* = Unit Under Calibration

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

Resolution of Wavelength Mode 0.1 nm
 Resolution of Photometric Mode 0.0001 A

Parameter Setting
 Measurement Mode Wavelength, Absorbance

Wavelength Scan 1100 nm-190 nm
 Scanning Speed 7.5 nm/min
 Data Pitch 0.1 nm
 Band width(Wavelength) 1.0 nm
 Band width(Vis) 1.0 nm
 Band width(Uv) 1.0 nm

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

**Specific Acceptance :

Transmission ≤ 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

Cert. No. : SP25026

Pages : 1 of 4

Calibration Certificate

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

Condition As Found : GOOD

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

Location : ORGANIC LABORATORY IV

Ambient Temperature : (22.9 ± 5) °C

Relative Humidity : (53.7 ± 25) %

Received Date : 22 AUGUST 2025

Calibration Date : 22 AUGUST 2025

Date of Issue : 25 AUGUST 2025

Calibrated by : Nitinun Srihawan

Approved by :



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

Cert. No. : SP25026

Job No. : VC68SP0019

Pages : 2 of 4

Calibration Method :

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

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

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

Condition of this result of calibration :

1. Certified reference materials

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

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

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

3.1 The UK National Physical Laboratory (NPL)

Result of calibration : Wavelength Accuracy

(Without adjustment)

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

UUC* = Unit Under Calibration

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

Result of calibration : Photometric Accuracy

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

UUC* = Unit Under Calibration

Michon B.

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

Result of calibration : Photometric Accuracy

(Without adjustment)

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

UUC* = Unit Under Calibration

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

Resolution of Wavelength Mode 0.1 nm

Resolution of Photometric Mode 0.001 A

Parameter Setting

Measurement Mode Wavelength, Absorbance

Wavelength Scan 190 nm - 1100 nm

Scanning Speed 7.5 nm/min

Band width(Wavelength) 1.0

Band width(Vis) 1.0

Band width(Uv) 1.0

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

**Specific Acceptance :

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

**Stray light not TISI Accredited

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

End of Calibration Certificate



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

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

DATE OF RECEIVED : 17 June 2025

DATE OF ISSUED : 20 June 2025

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

Calibrated By : Sukgasem Seehanart
Wenick Inchaisri
Calibration Engineer

Approved By :

Authorized Signatory
20 June 2025

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

Certificate No. Q25070523

F3-011-05/12-23

page 1 of 4



CALIBRATION LABORATORY Co., LTD.

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



REPORT OF CALIBRATION

FOR

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

ENVIRONMENT CONDITIONS :

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

PROCEDURE USED :

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

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

REFERENCE STANDARD USED :

1. pH Standard Solution, NIMT TRM CODE TRM-S-2003, TRM CODE TRM-S-2007.
2. pH Standard Solution, Control Company Catalog Number 06664260, 11754256, Lot Number CC787362.
3. Calibration Bath, Kambic Model OB-22/2 ULT S/N. 17115653.
4. Precision Thermometer, ASL Model T250 S/N. 1334023800.
5. IPRT, Wika Model CTP5000-250-D S/N. PO00043543-1-10-1.

Certificate No. Q25070523

F3-011-05/12-23

page 2 of 4





CALIBRATION LABORATORY Co.,LTD.

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



TRACEABILITY :

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

UNCERTAINTY :

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

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

Certificate No. Q25070523

F3-011-05/12-23

page 3 of 4



@clccalibration



CALIBRATION LABORATORY Co.,LTD.

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



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

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

CALIBRATION DATA

1. pH METER RESULT @ 25 °C

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

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

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

2. TEMPERATURE RESULT

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

Technical Note. Type of sensor : Thermistor

Probe Ø 3 mm

Materials : Metal Sheath.

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

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

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

End of Certificate

Certificate No. Q25070523

F3-011-05/12-23

page 4 of 4



@clccalibration



CERTIFICATE No : 25M2256
REFERENCE No : 76365-3

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE
MANUFACTURER : SARTORIUS
MODEL : BSA224S-CW
SERIAL No : 36591843
ID No : BA09/61
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : S.P.S. CONSULTING SERVICE CO., LTD.
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD.,
JOMPOL, CHATUCHAK, BANGKOK 10900

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

APPROVED BY :
ISSUED DATE : 13-Mar-25
RECEIVED DATE : 07-Mar-25

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



F-G010 REV 03



CERTIFICATE No : 25M2256

PAGE : 2 OF 2

Calibration Report

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

CONDITION OF THIS RESULTS OF CALIBRATION

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

2. REFERENCE STANDARD INSTRUMENTS :-

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

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

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

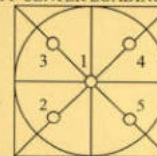
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND)

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

- ZERO SETTING FUNCTION : NORMAL
- TARE FUNCTION : NORMAL
- REPEATABILITY OF READING AT 200 g WAS 0.000071 g
- DEPARTURE FROM NOMINAL VALUE/ LINEARITY

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

5. OFF CENTER LOADING ERROR



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

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

END OF CALIBRATION REPORT





CERT.No.: HS-W015C

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 : 18 Mar 25

Submitted by : S.P.S CONSULTING SERVICE CO.,LTD

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

Avg Room Temp : 20 °C

Avg Water Temp : 20 °C

Air Pressure : 760.00 mmHg

Salinity : 0 ppt

Model : YSI 5000

S/N : 15B100751

Probe : YSI 5010

S/N : 22D100097

ID NO. : -

Air Temp ref : S/N. F8065C26

Barometric ref : S/N. F8065C26

Water Temp ref : -

ID NO. HS001

Technician : Kittipong M.

Calibration Details

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

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

Overall Status (PASS)

Manufacturer Specification

Accuracy = +/- 0.02 mg/l

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



CERTIFICATE No : 25T0520
REFERENCE No : 75853-1

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : COD REACTOR
MANUFACTURER : HACH
MODEL : DRB 200
SERIAL No : 15110C0497
ID No : DRB 05/59
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : S.P.S. CONSULTING SERVICE CO., LTD.
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD.,
JOMPOL, CHATUCHAK, BANGKOK 10900

CALIBRATED BY : CHAICHARN CH.
CALIBRATION DATE : 27-Jan-25

APPROVED BY :
ISSUED DATE : 27-Jan-25
RECEIVED DATE : 15-Jan-25

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



CERTIFICATE No : 25T0520

PAGE : 2 OF 2

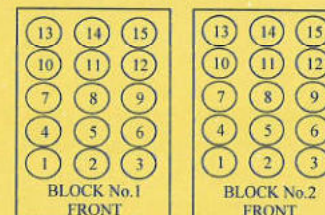
Calibration Report

EQUIPMENT : COD REACTOR
MANUFACTURER : HACH
ID NUMBER : DRB 05/59
RECEIVED DATE : 15-Jan-25
AMBIENT TEMPERATURE : 23° C ± 1° C
MODEL : DRB 200
SERIAL NUMBER : 15110C0497
CALIBRATION DATE : 27-Jan-25
RELATIVE HUMIDITY : 53 %RH ± 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

- THIS INSTRUMENT WAS CALIBRATED BY DIRECT MEASUREMENT METHOD WITH CALIBRATED THERMOCOUPLE TYPE K UNDER NO LOAD CONDITION. THE THERMOCOUPLES WERE PLACED ON POINTS AND LOCATED AS THE PICTURE.
- REFERENCE STANDARD INSTRUMENTS :-
1) DATA LOGGER WITH TC TYPE K
2) THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.
3) THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
4) THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO., LTD.

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



Block No.	1	2
Calibration Point (°C)	150	150
Controller temperature (°C)	144	144
Indicating Temperature	144	144
Measured Temperature (°C) at Spread Locations	1	150.01
	2	149.57
	3	150.69
	4	150.40
	5	149.46
	6	150.22
	7	149.89
	8	150.27
	9	149.75
	10	150.51
	11	150.45
	12	150.24
	13	150.03
	14	150.20
	15	150.08
Uncertainty of Measurement(± °C)	0.87	0.87

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





WO-11540198/2025

MAINTENANCE AND TEST CERTIFICATE MODEL
OPTIMA 5300DV

Customer : S.P.S.Consulting Service Co.,Ltd **Date Tested:** July 1, 2025
Address : 7 Soi Phaholyothin 24 **Recommendation Recertification**
Paholyothin Road **Period** 6 **Months**
Jompoi Chatuchak, Bangkok 10900 **Recertification Due:** January 1, 2026
User Name: K.Phenpha Vipasthawatt **Date Last Certified:** January 6, 2025
Phone: 083-9269252 **Visit Number:** 1 of 2
Fax: 02-513-4221 **PerkinElmer Phone:** 02-719-6420 ext 206
PerkinElmer Fax: 02-318-5597

CONFIGURATION TESTED

MODEL **SERIAL NUMBER**
OPTIMA 5300DV 077C7042401

TESTED EQUIPMENT **CALIBRATION NUMBER** **EXPIRATION**
IPV Methods

TEST STANDARD USED **PART NUMBER** **EXPIRATION DATE**
Multielement Standard N069-1579 December 30, 2024
Wavecal Solution N058-2152 March 30, 2024
VIS Wavecal solution N930-2946 February 28, 2024
Instrument Cal. STD4 N930-0221 November 30, 2024

CUSTOMER SUPPLIED **COMMENTS** **CUSTOMER INITIALS**
2 % HNO3
10 % HNO3

ACCESSORIES/COMPONENT
NOT INCLUDED

Page 1 of 4



WO-11540198/2025

MAINTENANCE AND TEST CERTIFICATE MODEL
OPTIMA 5300DV

SERIAL NUMBER 077C7042401 **DATE TESTED** July 1, 2025

1. MECHANICAL CHECKS

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

2. OPTICAL CHECKS

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

3. COOLING SYSTEM CHECKS

A. Perform preventive maintenance on chiller. ☐ OK
B. Flush out the chiller every year. ☐ N/A

4. PERFORMANCE CHECKS

A. Torch View Alignment. ☐ OK
B. Wavelength Calibration. ☐ OK

Page 2 of 4



MAINTENANCE AND TEST CERTIFICATE MODEL

OPTIMA 5300DV

SERIAL NUMBER : 077C7042401

DATE TESTED : July 1, 2025

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

Page 3 of 4



MAINTENANCE AND TEST CERTIFICATE MODEL

OPTIMA 5300DV

SERIAL NUMBER 077C7042401

DATE TESTED July 1, 2025

Remarks :

Commissioning follow as commissioning performance sheets.

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



meets



does not meet

the PerkinElmer Specifications listed on this certificate.

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

Service Department PerkinElmer Ltd.

Authorized Representative:

(

Service Engineer

Page 4 of 4

MAINTENANCE REPORT AND CALIBRATION CERTIFICATE

FLOW INJECTION MERCURY SYSTEMS MODEL

FIAS 100

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

CONFIGURATION TESTED

MODEL	SERIAL NUMBER	SOFTWARE
FIAS 100	100S14090404	Syngistix version 7.3

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

MAINTENANCE REPORT AND CALIBRATION CERTIFICATE

FLOW INJECTION MERCURY SYSTEMS MODEL

FIAS 100

SERIAL NUMBER 100S14090404 DATE TESTED July 1, 2025

1. INSTRUMENT CHECKS

- A. The light part, quartz windows and detector. Clean if necessary.
- B. Inspect the mercury lamp. Alignment if necessary.
- C. Inspect the mercury filter. Replace if necessary.
- D. Inspect and clean or replace the dust filter.
- E. Inspect peristaltic pump tubes. Replace if necessary.

OK
OK
OK
OK
OK

2. ELECTRONICS CHECKS

- A. Electronic power supplies

+ 5 Volts (\pm 0.3)	+ 4.98	Volts
+ 15 Volts (\pm 1.0)	+ 15.03	Volts
- 15 Volts (\pm 1.0)	- 15.07	Volts
+ 40 Volts (\pm 1.0)	+ 40.02	Volts

3. GAS SYSTEM CHECK

- A. Leak test all internal and external gas box joints.
- B. Inspect solenoid valve and pressure switch.
- C. Inspect non return valve. Replace sleeve if necessary.
- D. Inspect flow meter and needle valve. Clean if necessary.

OK
OK
OK
OK

4. MECHANICAL CHECKS

- A. Inspect pump motor and pump roller.
- B. Inspect and clean switching valve.
- C. Inspect, clean and lubricant autosample.

OK
OK
OK

**MAINTENANCE REPORT AND CALIBRATION CERTIFICATE**

FLOW INJECTION MERCURY SYSTEMS MODEL


FIAS 100

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

**MAINTENANCE REPORT AND CALIBRATION CERTIFICATE**

FLOW INJECTION MERCURY SYSTEMS MODEL

FIAS 100

SERIAL NUMBER	100S14090404	DATE TESTED	July 1, 2025
Remarks :			
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This is to certify that the above tests have been performed and the configuration tested			
<input checked="" type="checkbox"/> meets			
<input type="checkbox"/> 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: 			
()			
Service Engineer			

ระดับเสียงในบรรยากาศ



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0220

MTC No. EEL. BP. 44/0268

CALIBRATION CERTIFICATE

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

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

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

Instrument Calibrated :

Description : Sound Calibrator

Manufacturer : ACO

Model : 2127

Serial No. : 130006

Ambient Environment

Temperature : (23 ± 3) °C

Relative Humidity : (50 ± 15) %

Ambient Pressure : (101.325 ± 1.500) kPa

Standards used : 1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.

2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.

3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.

4. Digital Multimeter Agilent 34401A S/N MY44005560.

5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.

6. Audio Analyzer Panasonic VP-7722A S/N 041477D122.

7. Condenser Microphone B&K 4180 S/N 2889871.

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

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

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

Date of Receipt : 19 Feb. 2025

Date of Calibration : 21 Feb. 2025

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

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

FM.BLMTC.002 Rev.5

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(66) 08 1889 6827



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0220

MTC No. EEL. BP. 44/0268

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

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

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

1. Sound Pressure Level

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

2. Frequency

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

3. Total Distortion

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

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :

Date of Calibration : 21 Feb. 2025

Date of Issue : 24 Feb. 2025

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Ref : 2011268021900739001

End of Certificate

2 / 2

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

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FM.BLMTC.002 Rev.5

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

Noise B_377/25

Sound Level Meter Calibration Report

Acoustic Calibrator Data

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

Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-R05	ACO	8236	00142024	06 August 2025	93.9	93.9
ACO-R07	ACO	8236	00172033	06 August 2025	93.9	93.9
ACO-R10	ACO	8236	00172037	06 August 2025	93.6	93.0
ACO-R13	ACO	8236	00172041	06 August 2025	93.7	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.81 ± 0.10 dB	



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

Noise B_572/25

Sound Level Meter Calibration Report

Acoustic Calibrator Data

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

Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-B04	ACO	8236	00222298	30 November 2025	93.7	93.9
ACO-B12	ACO	8236	00152061	30 November 2025	93.9	93.9
ACO-B26	ACO	8236	00182007	30 November 2025	93.9	93.9
ACO-B27	ACO	8236	00182008	30 November 2025	93.8	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.81 ± 0.10 dB	