

ภาคผนวกที่ 4

เอกสารสอบเทียบความถูกต้องของเครื่องมือ

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

High Volume Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard

Model : TE 5025A

S/N : 3611

Calibration Data

High Volume Air Sampler Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (ft ³ /min)	R ²
B01	B01	05/05/2026	y = 1.106x-2.614	0.997
B02	B02	06/05/2026	y = 1.113x-1.359	0.997
B03	B03	06/05/2026	y = 1.121x-2.504	0.996
B04	B04	05/05/2026	y = 1.099x-1.383	0.997
B05	B05	05/05/2026	y = 1.103x-2.160	0.998
B06	B06	06/05/2026	y = 1.104x-2.338	0.998
B07	B07	05/05/2026	y = 1.110x-1.779	0.997
B08	B08	06/05/2026	y = 1.117x-0.069	0.998
B09	B09	06/05/2026	y = 1.131x+0.633	0.997
B10	B10	06/05/2026	y = 1.109x-1.997	0.996
B11	B11	05/05/2026	y = 1.113x-0.879	0.998
B12	B12	05/05/2026	y = 1.133x-2.636	0.999
B13	B13	06/05/2026	y = 1.121x-1.555	0.996
B14	B14	05/05/2026	y = 1.114x-0.668	0.996
B15	B15	06/05/2026	y = 1.115x-2.223	0.998
B16	B16	06/05/2026	y = 1.119x-1.715	0.996
B17	B17	06/05/2026	y = 1.128x-2.077	0.999
B18	B18	06/05/2026	y = 1.124x-2.201	0.997
B19	B19	06/05/2026	y = 1.126x-2.072	0.998
B20	B20	05/05/2026	y = 1.128x-1.147	0.998
B21	B21	05/05/2026	y = 1.125x-1.507	0.997
B22	B22	06/05/2026	y = 1.129x-3.099	0.998
B23	B23	05/05/2026	y = 1.136x-3.514	0.996
B24	B24	05/05/2026	y = 1.123x-2.620	0.999
B25	B25	07/05/2026	Y = 1.127x-2.205	0.999
B26	B26	06/05/2026	y = 1.101x-1.346	0.997
B27	B27	06/05/2026	y = 1.120x-2.554	0.996
B28	B28	06/05/2026	y = 1.129x-3.221	0.998
B29	B29	06/05/2026	y = 1.123x-2.970	0.996
B30	B30	06/05/2026	y = 1.126x-1.987	0.996
B31	B31	06/05/2026	y = 1.105x-1.053	0.997
B32	B32	05/05/2026	y = 1.118x-2.347	0.998
B33	B33	06/05/2026	y = 1.129x-1.842	0.996
B34	B34	06/05/2026	y = 1.119x-1.939	0.999

Calibrated by :

Adul Dangklom
(Mr.Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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Recorder No.	Blower No.	Date	Actual Flowrate (ft ³ /min)	R ²
B35	B35	06/05/2026	$y = 1.130x - 2.698$	0.999
B36	B36	05/05/2026	$y = 1.112x - 2.644$	0.998
B37	B37	05/05/2026	$y = 1.124x - 2.608$	0.996
B38	B38	06/05/2026	$y = 1.139x - 1.817$	0.999
B39	B39	05/05/2026	$y = 1.099x + 0.749$	0.997
B40	B40	05/05/2026	$y = 1.135x - 2.517$	0.997
B41	B41	06/05/2026	$y = 1.103x - 0.803$	0.998
B42	B42	05/05/2026	$y = 1.138x - 3.754$	0.999
B43	B43	06/05/2026	$y = 1.132x - 2.425$	0.997
B44	B44	06/05/2026	$y = 1.128x - 2.443$	0.998
R01	R01	07/05/2026	$y = 1.103x - 2.879$	0.997
R02	R02	02/05/2026	$y = 1.130x - 2.934$	0.997
R03	R03	05/05/2026	$y = 1.124x - 2.685$	0.996
R04	R04	05/05/2026	$y = 1.114x - 0.914$	0.998
R05	R05	06/05/2026	$y = 1.059x + 0.368$	0.998
R06	R06	06/05/2026	$y = 1.088x + 0.020$	0.996
R07	R07	06/05/2026	$y = 1.122x - 2.809$	0.996
R08	R08	05/05/2026	$y = 1.101x - 1.418$	0.999
R09	R09	05/05/2026	$y = 1.084x + 0.212$	0.997
R10	R10	05/05/2026	$y = 1.104x - 2.080$	0.998
R11	R11	06/05/2026	$y = 1.112x - 2.545$	0.999
R12	R12	05/05/2026	$y = 1.119x - 0.906$	0.997
R13	R13	05/05/2026	$y = 1.116x - 3.391$	0.997
R14	R14	02/05/2026	$y = 1.080x - 1.101$	0.996
R15	R15	06/05/2026	$y = 1.095x - 0.708$	0.998
R16	R16	02/05/2026	$y = 1.104x - 1.452$	0.997
R17	R17	06/05/2026	$y = 1.102x - 1.932$	0.998
R18	R18	02/05/2026	$y = 1.128x - 4.180$	0.997
R19	R19	02/05/2026	$y = 1.090x - 3.037$	0.996
R20	R20	06/05/2026	$y = 1.130x - 2.859$	0.999

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :


(Mr. Peera Detudom)



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B28	B28	06/05/2026	y = 1.129x-3.221	0.998
B29	B29	06/05/2026	y = 1.123x-2.970	0.996
B30	B30	06/05/2026	y = 1.126x-1.987	0.996
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R20	R20	06/05/2026	$y = 1.130x - 2.859$	0.999

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :


(Mr. Peera Detudom)



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CALIBRATION REPORT			
PM2.5 AIR SAMPLER (VERY SHARP CUT CYCLONE-VSCC)			
DATE :	11 June 2026	MODEL :	CCZ--30
NO.	PM2.5-11	SERIAL NO.	2024EN0242005
CALIBRATING CONDITION			
Pressure	1010	mmbar	Temp. 24.6 °C % RH 50
Calibration Method : Dry Cal Primary		Model : Defender 510 H	S/N : 136164
CALIBRATION SETTING			
detaCal	PM2.5 AIR SAMPLER		
Flowrate Reading,L/min	Initial Flowrate Reading (Before Adj.),L/min	%Dif.	Final Flowrate Reading (After Adj.),L/min
16.70	16.68	0.120	16.70

Calibrated by : Heeson L
(Mr.Heeson Lormae)

Approved by : Yutthana J
(Mr.Yutthana Tanatharanit)



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CALIBRATION REPORT			
PM2.5 AIR SAMPLER (VERY SHARP CUT CYCLONE-VSCC)			
DATE :	11 June 2026	MODEL :	CCZ--30
NO.	PM2.5-12	SERIAL NO.	2024EN0242003
CALIBRATING CONDITION			
Pressure	1010	mmbar	Temp. 24.6 °C % RH 50
Calibration Method : Dry Cal Primary		Model : Defender 510 H	S/N : 136164
CALIBRATION SETTING			
detaCal	PM2.5 AIR SAMPLER		
Flowrate Reading,L/min	Initial Flowrate Reading (Before Adj.),L/min	%Dif.	Final Flowrate Reading (After Adj.),L/min
16.70	16.66	0.240	16.70

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

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



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CALIBRATION REPORT			
PM2.5 AIR SAMPLER (VERY SHARP CUT CYCLONE-VSCC)			
DATE :	11 June 2026	MODEL :	CCZ--30
NO.	PM2.5-14	SERIAL NO.	2024EN0242001
CALIBRATING CONDITION			
Pressure	1010	mmbar	Temp. 24.6 °C % RH 50
Calibration Method : Dry Cal Primary		Model : Defender 510 H	S/N : 136164
CALIBRATION SETTING			
detaCal	PM2.5 AIR SAMPLER		
Flowrate Reading,L/min	Initial Flowrate Reading (Before Adj.),L/min	%Dif.	Final Flowrate Reading (After Adj.),L/min
16.70	16.69	0.060	16.70

Calibrated by : Heeson L
(Mr.Heeson Lormae)

Approved by : Yutthana J
(Mr.Yutthana Tanatharanit)



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CALIBRATION REPORT			
PM2.5 AIR SAMPLER (VERY SHARP CUT CYCLONE-VSCC)			
DATE :	11 June 2026	MODEL :	CCZ--30
NO.	PM2.5-15	SERIAL NO.	2024EN0242002
CALIBRATING CONDITION			
Pressure	1010	mmbar	Temp. 24.6 °C % RH 50
Calibration Method : Dry Cal Primary		Model : Defender 510 H	S/N : 136164
CALIBRATION SETTING			
detaCal	PM2.5 AIR SAMPLER		
Flowrate Reading,L/min	Initial Flowrate Reading (Before Adj.),L/min	%Dif.	Final Flowrate Reading (After Adj.),L/min
16.70	16.67	0.180	16.70

Calibrated by : Heeson L
(Mr.Heeson Lormae)

Approved by : Yutthana J
(Mr.Yutthana Tanatharanit)



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CALIBRATION REPORT					
SO ₂ ANALYZER					
DATE :	11 June 2026	BRAND :	API	MODEL :	100E
NO.	SO ₂ -R06			SERIAL NO.	066
Calibrator (Dilution System)					
Brand : API			Model : 700		
Last Cal. Date : 01 September 2025			Serial No. : 911		
Reference Standard Gas					
Standard Gas : Sulphur Dioxide (SO ₂)			Cylinder No. : A00814SK		
Certified Date : 21 June 2021		Expired Date : 21 June 2029		Cylinder Conc. : 49.8 ppm	
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.6	°C
			% RH	50	
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	
Zero	0	0.11	-	0	
SO ₂ Span	400.0	400.1	0.025	400.0	

Calibrated by : Heeson L
(Mr.Heeson Lormae)

Approved by : Peera J
(Mr.Peera Detudom)



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CALIBRATION REPORT						
SO ₂ ANALYZER						
DATE :	11 June 2026	BRAND :	TELEDYNE	MODEL :	TML-60	
NO.	SO ₂ -R08			SERIAL NO.	TRS1064	
Calibrator (Dilution System)						
Brand : API			Model : 700			
Last Cal. Date : 01 September 2025			Serial No. : 911			
Reference Standard Gas						
Standard Gas : Sulphur Dioxide (SO ₂)			Cylinder No. : A00814SK			
Certified Date : 21 June 2021		Expired Date : 21 June 2029		Cylinder Conc. : 49.8 ppm		
CALIBRATING CONDITION						
Pressure	1011	mmbar	Temp.	24.6	°C	
% RH						50
CALIBRATION SETTING						
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB		
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response		
Zero	0	0.11	-	0		
SO ₂ Span	400.0	400.4	0.100	400.0		

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

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



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

CALIBRATION REPORT					
SO ₂ ANALYZER					
DATE :	11 June 2026	BRAND :	API	MODEL :	100E
NO.	SO ₂ -R09			SERIAL NO.	76
Calibrator (Dilution System)					
Brand : API			Model : 700		
Last Cal. Date : 01 September 2025			Serial No. : 911		
Reference Standard Gas					
Standard Gas : Sulphur Dioxide (SO ₂)			Cylinder No. : A00814SK		
Certified Date : 21 June 2021		Expired Date : 21 June 2029		Cylinder Conc. : 49.8 ppm	
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.6	°C
			% RH	50	
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	
Zero	0	0.10	-	0	
SO ₂ Span	400.0	400.3	0.075	400.0	

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

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



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CALIBRATION REPORT					
SO ₂ ANALYZER					
DATE :	11 June 2026	BRAND :	TELEDYNE	MODEL :	100E
NO.	SO ₂ -R10			SERIAL NO.	TRS1065
Calibrator (Dilution System)					
Brand : API			Model : 700		
Last Cal. Date : 01 September 2025			Serial No. : 911		
Reference Standard Gas					
Standard Gas : Sulphur Dioxide (SO ₂)			Cylinder No. : A00814SK		
Certified Date : 21 June 2021		Expired Date : 21 June 2029		Cylinder Conc. : 49.8 ppm	
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.6	°C
			% RH	50	
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	
Zero	0	0.11	-	0	
SO ₂ Span	400.0	400.2	0.050	400.0	

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

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



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CALIBRATION REPORT					
NO / NO ₂ / NO _x ANALYZER					
DATE :	11 June 2026	BRAND :	API	MODEL :	TML-41M
NO.	NOX-B21			SERIAL NO.	N02374
Calibrator (Dilution System)					
Brand : API			Model : 700		
Last Cal. Date : 01 September 2025			Serial No. : 911		
Reference Standard Gas					
Standard Gas : Nitric Oxide (NO)			Cylinder No. : A00674SV		
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	50	
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response		%Dif	
Zero	0	0.10		-	
NO Span	400	399.7		-0.075	
NO _x Span	400	400.1		0.025	

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

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



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CALIBRATION REPORT					
NO / NO ₂ / NO _x ANALYZER					
DATE :	11 June 2026	BRAND :	API	MODEL :	200E
NO.	NOX-R03			SERIAL NO.	4410
Calibrator (Dilution System)					
Brand : API			Model : 700		
Last Cal. Date : 01 September 2025			Serial No. : 911		
Reference Standard Gas					
Standard Gas : Nitric Oxide (NO)			Cylinder No. : A00674SV		
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	50	
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	
Zero	0	0.10	-	0	
NO Span	400	400.1	0.025	400.0	
NO _x Span	400	400.3	0.075	400.0	

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

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



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CALIBRATION REPORT					
NO / NO ₂ / NO _x ANALYZER					
DATE :	11 June 2026	BRAND :	API	MODEL :	200E
NO.	NOX-R08			SERIAL NO.	243
Calibrator (Dilution System)					
Brand : API			Model : 700		
Last Cal. Date : 01 September 2025			Serial No. : 911		
Reference Standard Gas					
Standard Gas : Nitric Oxide (NO)			Cylinder No. : A00674SV		
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	50	
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	
Zero	0	-0.10	-	0	
NO Span	400	399.8	-0.050	400.0	
NO _x Span	400	400.2	0.050	400.0	

Calibrated by : Heeson L
(Mr.Heeson Lormae)

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



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CALIBRATION REPORT					
NO / NO ₂ / NO _x ANALYZER					
DATE :	11 June 2026	BRAND :	API	MODEL :	200E
NO.	NOX-R10			SERIAL NO.	1991
Calibrator (Dilution System)					
Brand : API			Model : 700		
Last Cal. Date : 01 September 2025			Serial No. : 911		
Reference Standard Gas					
Standard Gas : Nitric Oxide (NO)			Cylinder No. : A00674SV		
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	50	
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response		%Dif	
Zero	0	0.10		-	
NO Span	400	399.9		-0.025	
NO _x Span	400	400.1		0.025	

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

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

เอกสารสอบเทียบเครื่องมือการตรวจวัดคุณภาพอากาศจากแหล่งกำเนิด



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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 :

Peera Detudom
(Mr. Peera Detudom)



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Pitot Tube Calibration Report

Calibration Method

Standard Pitot Tube

Calibration Data					
Pitot Tube Data			Calibration Data		
No.	Type of Pitot	Coefficient of Standard Pitot	Date	Avg. of Cp (test)	
				Side A	Side B
B03	S	0.99	05/05/2026	0.84	0.83
B04	S	0.99	05/05/2026	0.84	0.85
B05	S	0.99	05/05/2026	0.84	0.83
B07	S	0.99	05/05/2026	0.84	0.84
B08	S	0.99	05/05/2025	0.84	0.84
B09	S	0.99	05/05/2026	0.85	0.84
B11	S	0.99	05/05/2026	0.84	0.84
B16	S	0.99	06/05/2026	0.84	0.84
B18	S	0.99	06/05/2026	0.85	0.84
B19	S	0.99	06/05/2025	0.84	0.85
B21	S	0.99	05/05/2026	0.84	0.84
B24	S	0.99	05/05/2026	0.84	0.85
B27	S	0.99	05/05/2026	0.85	0.84
B30	S	0.99	05/05/2026	0.84	0.85
B31	S	0.99	05/05/2026	0.83	0.84
B33	S	0.99	05/05/2026	0.84	0.84
B35	S	0.99	03/05/2026	0.84	0.85

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

Calibrated by :

Adul Dangklom

(Mr. Adul Dangklom)

Approved by :

Peera Detudom

(Mr. Peera Detudom)



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Pitot Tube Calibration Report

Calibration Method

Standard Pitot Tube

Calibration Data					
Pitot Tube Data			Calibration Data		
No.	Type of Pitot	Coefficient of Standard Pitot	Date	Avg. of Cp (test)	
				Side A	Side B
B36	S	0.99	05/05/2026	0.84	0.84
B37	S	0.99	03/05/2026	0.84	0.85
B38	S	0.99	03/05/2026	0.84	0.84
B39	S	0.99	06/05/2026	0.84	0.85
B40	S	0.99	06/05/2026	0.85	0.84
B41	S	0.99	05/05/2026	0.84	0.85
B44	S	0.99	06/05/2026	0.84	0.83
B45	S	0.99	05/05/2026	0.84	0.84
B46	S	0.99	05/05/2026	0.84	0.85
B47	S	0.99	03/05/2026	0.84	0.84
B48	S	0.99	03/05/2026	0.85	0.84
B49	S	0.99	03/05/2026	0.84	0.84
B54	S	0.99	05/05/2026	0.85	0.84
B56	S	0.99	03/05/2026	0.84	0.84
B57	S	0.99	05/05/2026	0.84	0.84
B58	S	0.99	03/05/2026	0.84	0.84

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

Calibrated by :

Adul Dangklom

(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

Environmental Conditions

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

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (ml/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R ²
R01	SKC	224-PCXR4	602467	01/04/2026	1,000	1,500	2,000	1,001	1,500	2,007	1.005x - 6.003	1.000
R02	SKC	224-PCXR4	626450	05/04/2026	1,000	2,000	3,000	1,000	1,503	2,001	1.001x - 0.383	1.000
R03	SKC	224-PCXR4	691592	03/04/2026	1,000	1,500	2,000	1,005	1,501	2,000	1.007x - 15.384	0.999
R04	SKC	224-PCXR4	691672	03/04/2026	1,000	1,500	2,000	1,007	1,513	1,999	0.996x + 5.855	0.999
R05	SKC	224-PCXR4	798470	05/04/2026	1,000	1,500	2,000	1,000	1,499	1,997	0.997x + 3.107	1.000
R06	SKC	224-PCXR4	798456	03/04/2026	1,000	1,500	2,000	998	1,497	1,996	0.998x + 0.120	1.000
R07	SKC	224-PCXR4	798480	05/04/2026	1,000	1,500	2,000	1,002	1,506	2,001	0.999x + 3.219	1.000
R08	SKC	224-PCXR4	883215	03/04/2026	1,000	1,500	2,000	1,004	1,501	1,992	1.003x - 9.877	0.999
R09	SKC	224-PCXR4	034650	03/04/2026	1,000	1,500	2,000	998	1,506	2,003	1.004x - 5.723	1.000
R10	SKC	224-PCXR4	091765	03/04/2026	1,000	1,500	2,000	999	1,507	1,996	1.005x - 13.080	0.999
R11	SKC	224-PCXR4	091763	05/04/2026	1,000	1,500	2,000	1,001	1,504	2,001	1.000x + 0.104	1.000
R12	SKC	224-PCXR4	091568	03/04/2026	1,000	1,500	2,000	998	1,505	1,996	0.998x + 1.482	1.000
R13	SKC	224-PCXR4	091638	03/04/2026	1,000	1,500	2,000	1,001	1,504	2,000	0.999x + 2.097	1.000
R14	SKC	224-PCXR4	091764	05/04/2026	1,000	1,500	2,000	1,007	1,506	2,001	1.004x - 8.866	0.999
R15	SKC	224-PCXR8	529457	05/04/2026	1,000	1,500	2,000	998	1,492	1,999	1.001x - 6.322	1.000
R16	SKC	224-PCXR8	529643	03/04/2026	1,000	1,500	2,000	1,004	1,506	2,004	1.007x - 11.726	0.999
R17	SKC	224-PCXR8	529645	05/04/2026	1,000	1,500	2,000	998	1,503	1,998	1.000x - 0.703	1.000
R18	SKC	224-PCXR8	566756	03/04/2026	1,000	1,500	2,000	999	1,508	1,995	1.002x - 8.012	0.999
R19	SKC	224-PCXR8	566802	05/04/2026	1,000	1,500	2,000	998	1,502	1,998	1.000x - 0.823	1.000
R20	SKC	224-PCXR8	529089	03/04/2026	1,000	1,500	2,000	999	1,503	1,996	0.997x + 2.001	1.000
R21	SKC	224-PCXR8	665728	03/04/2026	1,000	1,500	2,000	998	1,505	1,999	1.000x - 0.483	1.000
R22	SKC	224-PCXR8	707444	05/04/2026	1,000	1,500	2,000	1,007	1,496	2,000	1.001x - 6.418	0.999
R23	SKC	224-PCXR8	761067	05/04/2026	1,000	1,500	2,000	1,001	1,502	2,004	1.002x - 1.446	1.000
R24	SKC	224-PCXR8	707893	03/04/2026	1,000	1,500	2,000	1,002	1,503	2,001	0.999x + 2.560	1.000
R25	SKC	224-PCXR8	761052	03/04/2026	1,000	1,500	2,000	1,009	1,504	2,005	0.997x + 4.106	0.999
R26	SKC	224-PCXR8	707956	05/04/2026	1,000	1,500	2,000	1,002	1,503	2,000	0.998x + 4.497	1.000
R27	SKC	224-PCXR8	707398	03/04/2026	1,000	1,500	2,000	1,001	1,505	2,004	1.003x - 1.921	1.000
R28	SKC	224-PCXR8	707481	05/04/2026	1,000	1,500	2,000	1,010	1,513	2,006	0.997x + 5.531	0.999
R29	SKC	224-PCXR8	707402	03/04/2026	1,000	1,500	2,000	1,003	1,502	1,992	1.003x - 10.216	0.999
R30	SKC	224-PCXR8	093811	05/04/2026	1,000	1,500	2,000	999	1,512	2,005	1.007x - 9.705	1.000
R31	SKC	224-PCXR8	093183	05/04/2026	1,000	1,500	2,000	1,011	1,510	2,011	1.001x + 2.983	0.999
R32	SKC	224-PCXR8	671950	03/04/2026	1,000	1,500	2,000	1,001	1,500	2,001	0.999x + 2.272	1.000
R33	SKC	224-PCXR4	626254	05/04/2026	1,000	1,500	2,000	998	1,507	2,002	1.005x - 10.975	1.000
R34	SKC	224-PCXR4	626131	05/04/2026	1,000	1,500	2,000	997	1,496	2,000	1.007x - 14.230	1.000
R35	SKC	224-PCXR8	707460	05/04/2026	1,000	1,500	2,000	998	1,509	1,996	1.000x - 2.915	1.000
R36	SKC	224-PCXR8	707446	05/04/2026	1,000	1,500	2,000	1,003	1,492	2,003	1.007x - 16.135	0.999
R37	SKC	224-PCXR8	707432	03/04/2026	1,000	1,500	2,000	999	1,507	2,005	1.003x - 6.095	1.000
R38	SKC	224-PCXR8	707349	03/04/2026	1,000	1,500	2,000	1,003	1,499	1,999	0.997x + 2.141	1.000
R39	SKC	224-PCXR8	761095	05/04/2026	1,000	1,500	2,000	1,005	1,508	2,004	1.000x - 0.152	0.999

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

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

7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900

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

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

Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

Environmental Conditions

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

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (ml/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R ²
R40	SKC	224-PCXR4	612753	05/04/2026	1,000	1,500	2,000	1,004	1,497	2,000	0.998x + 1.430	1.000
R41	SKC	224-PCXR4	626140	03/04/2026	1,000	1,500	2,000	998	1,498	1,997	0.999x + 0.943	1.000
R42	SKC	224-PCXR4	626463	05/04/2026	1,000	1,500	2,000	1,005	1,513	1,998	0.997x + 4.138	0.999
R43	SKC	224-PCXR4	626129	03/04/2026	1,000	1,500	2,000	1,003	1,498	2,000	0.998x + 2.029	1.000
R44	SKC	224-PCXR4	602753	03/04/2026	1,000	1,500	2,000	996	1,509	1,997	1.003x - 8.036	1.000
R45	SKC	224-PCXR4	626137	05/04/2026	1,000	1,500	2,000	1,011	1,514	2,005	0.995x + 8.367	0.999

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 : 136833

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	01/04/2026	500	1,000	2,000	499.7	1000.6	1996.7	1.000x - 0.544	1.000
H-R02	Dwyer	VFB-65	01/04/2026	500	1,000	2,000	501.2	992.4	1990.0	1.001x - 5.362	0.999
H-R03	Dwyer	VFB-65	03/04/2026	500	1,000	2,000	501.4	997.5	1997.3	0.998x + 2.606	1.000
H-R04	Dwyer	VFB-65	05/04/2026	500	1,000	2,000	502.5	993.6	1985.2	0.999x - 2.085	0.999
H-R05	Dwyer	VFB-65	05/04/2026	500	1,000	2,000	500.4	1001.3	1999.8	1.000x + 1.247	1.000
H-R06	Dwyer	VFB-65	03/04/2026	500	1,000	2,000	500.8	997.2	1994.6	0.999x - 0.348	1.000

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)

Calibration & Test Certificate

FOR

Equipment Name : Vacuum Gauge

Received Date : Jul 13, 2026

Manufacturer : Nuova Fima

Calibration Date : Jul 20, 2026

Model : MGS10 DS63A

Recommended Due Date : N/A

Serial Number : 64-220066-2

Location of Calibration : In Lab

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

7 SOI PHAHOLYOTHIN 24 ROAD, JOMPHOL, CHATUCHAK,
BANGKOK 10900

CONDITION AS RECIVED : Normal

Environmental Conditions

Ambient Temperature : (25 ± 2) °C

Relative Humidity : (50 ± 15) %RH

Result : No Adjustment (See data attached in page 2 to the end of certificate)

1. The report applies to the item and shall not be reproduced except in full, without written approval by Calibration Laboratory, Envir Service Co., Ltd.
2. The working standard is indicated in page 2 of this certificate.
3. This result of this report only to the item calibrated.

Date of Calibration : Jul 20, 2026

Valid to : Jul 19, 2027

Calibrated By :

กิตติศักดิ์ จันทะวงษ์
Kittisak Jansangwattana
(Technician)



Approved By :



Pasagorn Samol
(Technician Manager)

We hereby certify that the instrument under mentioned has been certainly calibrated according to our calibration standard and the testing result in the calibration procedure has been good enough within the tolerance regulated in our specification.

Reference Standard

Main Standard of measurement Used in the Calibration

Name/No.	Verification or Certification Organization/Certificate No.	Expiry date
Digital Pressure Gauge Model : 15PSIXP21 Serial Number : 158670	20P3515	Sep. 01, 2026

1. This instrument was installed in vertical orientation and center of the dial was used as the reference level.
2. This result of calibration was made on requested at the point specified by customer.
3. Scale and conversion factor is 1 kPa = 0.01 bar
4. This instrument was used clean air as pressure media.
5. This result of calibration was calibrated while opening the plug to vent the atmospheric pressure.
6. The certificate is valid only to the item calibrated on date and place of calibration.
7. This Certification is traceable to the international System of Unit maintained at :-
-National Institute of Metrology Thailand (NIMT)

Result of Calibration:- Without adjustment

Range: 0 bar to -1 bar

Function:- Vacuum Pressure Measurement

Scale Interval: 0.002 bar

Increasing Pressure

Applied Pressure (bar)	0.0000	-0.2001	-0.4001	-0.6001	-0.8000	-0.8998
UUC Indication (bar)	0.000	-0.240	-0.436	-0.632	-0.840	-0.936
Error (bar)	0.0000	-0.0399	-0.0359	-0.0319	-0.0400	-0.0362

Decreasing Pressure

Applied Pressure (bar)	-0.8998	-0.8000	-0.6001	-0.4001	-0.2001	0.0000
UUC Indication (bar)	-0.936	-0.840	-0.632	-0.436	-0.240	0.000
Error (bar)	-0.0362	-0.0400	-0.0319	-0.0359	-0.0399	0.0000

The uncertainty of measurement was ± 0.0047 bar

* UUC = Unit Under Calibration

เอกสารสอบเทียบเครื่องมือการตรวจวิเคราะห์คุณภาพน้ำทิ้ง



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





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 $\pm$ 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 :-

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

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

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

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

- NATIONAL INSTITUTE OF METROLOGY (THAILAND)

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

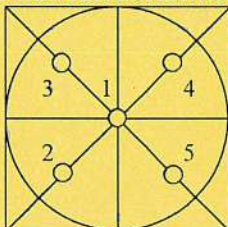
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0.000055 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

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

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)



CERTIFICATE No : 26T0464

REFERENCE No : 79659-1

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : COD REACTOR

MANUFACTURER : HACH

MODEL : DRB 200

SERIAL No : 15110C0497

ID No : DRB 04/59

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

CALIBRATED BY : SOMCHAI S.

CALIBRATION DATE : 30-Jan-26

APPROVED BY : 
PONGSAK J.

ISSUED DATE : 30-Jan-26

RECEIVED DATE : 30-Jan-26





CERTIFICATE No : 26T0464

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : COD REACTOR
MANUFACTURER : HACH
ID NUMBER : DRB 04/59
RECEIVED DATE : 30-Jan-26
AMBIENT TEMPERATURE : 23° C ± 1° C

MODEL : DRB 200
SERIAL NUMBER : 15110C0497
CALIBRATION DATE : 30-Jan-26
RELATIVE HUMIDITY : 54 %RH ± 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BY DIRECT MEASUREMENT METHOD WITH CALIBRATED THERMOCOUPLE TYPE K UNDER NO LOAD CONDITION. THE THERMOCOUPLES WERE PLACED ON POINTS AND LOCATED AS THE PICTURE.

2. REFERENCE STANDARD INSTRUMENTS :-

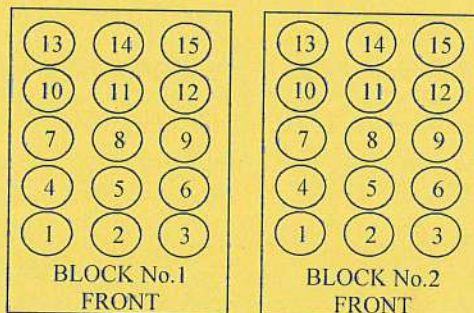
INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) DATA LOGGER WITH TC TYPE K	HYDRA 2635A	6849323	25T5342	18-Jun-26

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 ADJUSTMENT



TEMPERATURE MEASUREMENT ACCURACY TEST

Block No.	1	2
Controller temperature (°C)	144	145
Indicating Temperature	144	145
Measured Temperature (°C) at Spread Locations	1	149.3
	2	149.1
	3	149.9
	4	149.6
	5	149.3
	6	149.5
	7	149.1
	8	149.7
	9	149.7
	10	149.5
	11	149.9
	12	149.4
	13	150.2
	14	149.4
	15	149.6
Uncertainty of Measurement(± °C)	0.89	0.89

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

NOTE 2 : LOCATION 10 WAS REFERENCE LOCATION.

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

END OF CALIBRATION REPORT





MAINTENANCE AND IPV TEST CERTIFICATE MODEL

Optima 5300

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

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

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.

☐ 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.

☐ OK**4. PERFORMANCE CHECKS**

A. Torch View Alignment.

☐ OK

B. Wavelength Calibration.

☐ OK

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

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 ✱

(Chayanan Kanan)

Sr. Customer Support Engineer

**QUALITY CALIBRATION CO., LTD.**

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



CERTIFICATE No : 26E3363
REFERENCE No : 80514-1

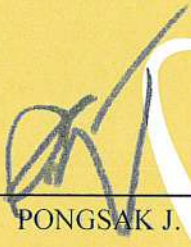
PAGE : 1 OF 3

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.



**QUALITY CALIBRATION CO., LTD.**

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

CERTIFICATE No : 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 :-

<u>INSTRUMENT</u>	<u>MODEL</u>	<u>SERIAL No/</u> <u>LOT No</u>	<u>CERTIFICATE No</u>	<u>DUE DATE</u>
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 INSTUTITE OF METROLOGY (THAILAND)

RESULT OF CALIBRATION : ADJUSTMENT**1. DISPLAY UNIT ONLY**SLOPE FACTOR $k = 2.303 RT/F = 59 \text{ mV/pH}$

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





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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 ($^{\circ}$ C)	UUC READING ($^{\circ}$ C)	CORRECTION ($^{\circ}$ C)	VALUE BEFORE ADJUSTMENT	UNCERTAINTY OF MEASUREMENT ($\pm$ $^{\circ}$ 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



SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY

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

SITHIPORN
associates



Cert. No. : SP25026

Pages : 1 of 4

Calibration Certificate

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

Condition As Found : GOOD

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

Location : ORGANIC LABORATORY IV

Ambient Temperature : (22.9 $\pm$ 5) °C
Relative Humidity : (53.7 $\pm$ 25) %

Received Date : 22 AUGUST 2025
Calibration Date : 22 AUGUST 2025
Date of Issue : 25 AUGUST 2025

Calibrated by :

Nitinun Srihawan

Approved by :

Wichok B.
(Wichok Ekpongpradit)

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

Cert. No. : SP25026

Job No. : VC68SP0019

Pages : 2 of 4

Calibration Method :

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

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

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

Condition of this result of calibration :

1. Certified reference materials

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

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

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

3.1 The UK National Physical Laboratory (NPL)

Result of calibration : Wavelength Accuracy

(Without adjustment)

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	
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

เอกสารสอบเทียบเครื่องมือการตรวจวิเคราะห์คุณภาพน้ำใต้ดิน



QUALITY CALIBRATION CO., LTD.

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



CERTIFICATE No : 26E3363
REFERENCE No : 80514-1

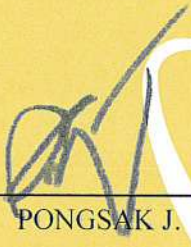
PAGE : 1 OF 3

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.





QUALITY CALIBRATION CO., LTD.

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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 :-

<u>INSTRUMENT</u>	<u>MODEL</u>	<u>SERIAL No/</u> <u>LOT No</u>	<u>CERTIFICATE No</u>	<u>DUE DATE</u>
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 INSTUTITE OF METROLOGY (THAILAND)

RESULT OF CALIBRATION : ADJUSTMENT

1. DISPLAY UNIT ONLY

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

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





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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 ($^{\circ}$ C)	UUC READING ($^{\circ}$ C)	CORRECTION ($^{\circ}$ C)	VALUE BEFORE ADJUSTMENT	UNCERTAINTY OF MEASUREMENT ($\pm$ $^{\circ}$ 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





MAINTENANCE AND IPV TEST CERTIFICATE MODEL

Optima 5300

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

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

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.

☐ 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.

☐ OK**4. PERFORMANCE CHECKS**

A. Torch View Alignment.

☐ OK

B. Wavelength Calibration.

☐ OK

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 ppb
Pb	220.353 nm	3(sd) <3	2.34 ppb
Detection Limits : Radial			
			1.23 ppb
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

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 ✱

(Chayanan Kanan)

Sr. Customer Support Engineer

เอกสารสอบเทียบเครื่องมือการตรวจวัดระดับเสียงทั่วไป



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 :

Description : Sound Calibrator

Manufacturer : ACO

Model : 2127

Serial No. : 130006

Ambient Environment

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

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

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

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

FM.BL.MTC.002 Rev.5

Head Office

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

Office/Laboratory

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

Office

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

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-69/0204

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 20 μ Pa at 1000 Hz

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

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	93.89	-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	$\pm 1.0\%$

3. Total Distortion

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

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :


(Mr. Weerachai Deechaiyae)

Approved by :


(Mr. Prawate Kluaypa)
Director

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

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

Noise R_358/26

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-R14	ACO	6236	00090517	11 June 2026	93.9	93.9
ACO-R33	ACO	6236	00192045	11 June 2026	93.8	93.9
ACO-R36	ACO	6236	00172038	11 June 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)

เอกสารสอบเทียบเครื่องมือการตรวจวิเคราะห์
คุณภาพอากาศในสถานประกอบการ



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Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

Environmental Conditions

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

Personal Pump Data					Calibration Data							
No.	Brand	Model	Serial No.	Date	Flow Rate (ml/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)			y	R ²
					1	2	3	1	2	3		
R01	SKC	224-PCXR4	602467	01/04/2026	1,000	1,500	2,000	1,001	1,500	2,007	1.005x - 6.003	1.000
R02	SKC	224-PCXR4	626450	05/04/2026	1,000	2,000	3,000	1,000	1,503	2,001	1.001x - 0.383	1.000
R03	SKC	224-PCXR4	691592	03/04/2026	1,000	1,500	2,000	1,005	1,501	2,000	1.007x - 15.384	0.999
R04	SKC	224-PCXR4	691672	03/04/2026	1,000	1,500	2,000	1,007	1,513	1,999	0.996x + 5.855	0.999
R05	SKC	224-PCXR4	798470	05/04/2026	1,000	1,500	2,000	1,000	1,499	1,997	0.997x + 3.107	1.000
R06	SKC	224-PCXR4	798456	03/04/2026	1,000	1,500	2,000	998	1,497	1,996	0.998x + 0.120	1.000
R07	SKC	224-PCXR4	798480	05/04/2026	1,000	1,500	2,000	1,002	1,506	2,001	0.999x + 3.219	1.000
R08	SKC	224-PCXR4	883215	03/04/2026	1,000	1,500	2,000	1,004	1,501	1,992	1.003x - 9.877	0.999
R09	SKC	224-PCXR4	034650	03/04/2026	1,000	1,500	2,000	998	1,506	2,003	1.004x - 5.723	1.000
R10	SKC	224-PCXR4	091765	03/04/2026	1,000	1,500	2,000	999	1,507	1,996	1.005x - 13.080	0.999
R11	SKC	224-PCXR4	091763	05/04/2026	1,000	1,500	2,000	1,001	1,504	2,001	1.000x + 0.104	1.000
R12	SKC	224-PCXR4	091568	03/04/2026	1,000	1,500	2,000	998	1,505	1,996	0.998x + 1.482	1.000
R13	SKC	224-PCXR4	091638	03/04/2026	1,000	1,500	2,000	1,001	1,504	2,000	0.999x + 2.097	1.000
R14	SKC	224-PCXR4	091764	05/04/2026	1,000	1,500	2,000	1,007	1,506	2,001	1.004x - 8.866	0.999
R15	SKC	224-PCXR8	529457	05/04/2026	1,000	1,500	2,000	998	1,492	1,999	1.001x - 6.322	1.000
R16	SKC	224-PCXR8	529643	03/04/2026	1,000	1,500	2,000	1,004	1,506	2,004	1.007x - 11.726	0.999
R17	SKC	224-PCXR8	529645	05/04/2026	1,000	1,500	2,000	998	1,503	1,998	1.000x - 0.703	1.000
R18	SKC	224-PCXR8	566756	03/04/2026	1,000	1,500	2,000	999	1,508	1,995	1.002x - 8.012	0.999
R19	SKC	224-PCXR8	566802	05/04/2026	1,000	1,500	2,000	998	1,502	1,998	1.000x - 0.823	1.000
R20	SKC	224-PCXR8	529089	03/04/2026	1,000	1,500	2,000	999	1,503	1,996	0.997x + 2.001	1.000
R21	SKC	224-PCXR8	665728	03/04/2026	1,000	1,500	2,000	998	1,505	1,999	1.000x - 0.483	1.000
R22	SKC	224-PCXR8	707444	05/04/2026	1,000	1,500	2,000	1,007	1,496	2,000	1.001x - 6.418	0.999
R23	SKC	224-PCXR8	761067	05/04/2026	1,000	1,500	2,000	1,001	1,502	2,004	1.002x - 1.446	1.000
R24	SKC	224-PCXR8	707893	03/04/2026	1,000	1,500	2,000	1,002	1,503	2,001	0.999x + 2.560	1.000
R25	SKC	224-PCXR8	761052	03/04/2026	1,000	1,500	2,000	1,009	1,504	2,005	0.997x + 4.106	0.999
R26	SKC	224-PCXR8	707956	05/04/2026	1,000	1,500	2,000	1,002	1,503	2,000	0.998x + 4.497	1.000
R27	SKC	224-PCXR8	707398	03/04/2026	1,000	1,500	2,000	1,001	1,505	2,004	1.003x - 1.921	1.000
R28	SKC	224-PCXR8	707481	05/04/2026	1,000	1,500	2,000	1,010	1,513	2,006	0.997x + 5.531	0.999
R29	SKC	224-PCXR8	707402	03/04/2026	1,000	1,500	2,000	1,003	1,502	1,992	1.003x - 10.216	0.999
R30	SKC	224-PCXR8	093811	05/04/2026	1,000	1,500	2,000	999	1,512	2,005	1.007x - 9.705	1.000
R31	SKC	224-PCXR8	093183	05/04/2026	1,000	1,500	2,000	1,011	1,510	2,011	1.001x + 2.983	0.999
R32	SKC	224-PCXR8	671950	03/04/2026	1,000	1,500	2,000	1,001	1,500	2,001	0.999x + 2.272	1.000
R33	SKC	224-PCXR4	626254	05/04/2026	1,000	1,500	2,000	998	1,507	2,002	1.005x - 10.975	1.000
R34	SKC	224-PCXR4	626131	05/04/2026	1,000	1,500	2,000	997	1,496	2,000	1.007x - 14.230	1.000
R35	SKC	224-PCXR8	707460	05/04/2026	1,000	1,500	2,000	998	1,509	1,996	1.000x - 2.915	1.000
R36	SKC	224-PCXR8	707446	05/04/2026	1,000	1,500	2,000	1,003	1,492	2,003	1.007x - 16.135	0.999
R37	SKC	224-PCXR8	707432	03/04/2026	1,000	1,500	2,000	999	1,507	2,005	1.003x - 6.095	1.000
R38	SKC	224-PCXR8	707349	03/04/2026	1,000	1,500	2,000	1,003	1,499	1,999	0.997x + 2.141	1.000
R39	SKC	224-PCXR8	761095	05/04/2026	1,000	1,500	2,000	1,005	1,508	2,004	1.000x - 0.152	0.999

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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

7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900

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

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

Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

Environmental Conditions

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

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (mL/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R ²
R40	SKC	224-PCXR4	612753	05/04/2026	1,000	1,500	2,000	1,004	1,497	2,000	0.998x + 1.430	1.000
R41	SKC	224-PCXR4	626140	03/04/2026	1,000	1,500	2,000	998	1,498	1,997	0.999x + 0.943	1.000
R42	SKC	224-PCXR4	626463	05/04/2026	1,000	1,500	2,000	1,005	1,513	1,998	0.997x + 4.138	0.999
R43	SKC	224-PCXR4	626129	03/04/2026	1,000	1,500	2,000	1,003	1,498	2,000	0.998x + 2.029	1.000
R44	SKC	224-PCXR4	602753	03/04/2026	1,000	1,500	2,000	996	1,509	1,997	1.003x - 8.036	1.000
R45	SKC	224-PCXR4	626137	05/04/2026	1,000	1,500	2,000	1,011	1,514	2,005	0.995x + 8.367	0.999

Calibrated by :

Adul Dangklom

(Mr. Adul Dangklom)

Approved by :

Peer Detudom

(Mr. Peera Detudom)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
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 7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900
 7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900
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Rotameter Calibration Report (For Personal Pump Low Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

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
L-R01	Dwyer	VFA-21	01/04/2026	50	100	200	50.3	101.1	201.9	0.998x + 0.955	1.000
L-R02	Dwyer	VFA-21	01/04/2026	50	100	200	50.2	101.7	201.0	0.999x + 0.367	0.999
L-R03	Dwyer	VFA-21	03/04/2026	50	100	200	50.3	101.2	201.0	1.001x + 0.605	1.000
L-R04	Dwyer	VFA-21	05/04/2026	50	100	200	50.7	100.8	200.2	1.000x + 0.719	1.000
L-R05	Dwyer	VFA-21	05/04/2026	50	100	200	50.1	101.2	200.5	1.001x - 0.213	0.999
L-R06	Dwyer	VFA-21	03/04/2026	50	100	200	50.3	100.8	200.1	0.999x + 0.639	1.000

Calibrated by :

Adul Dangklom
 (Mr. Adul Dangklom)

Approved by :

Peera Detudom
 (Mr. Peera Detudom)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
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7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900
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Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com., www.spscon.com

Rotameter Calibration Report (For Personal Pump High Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

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	01/04/2026	500	1,000	2,000	499.7	1000.6	1996.7	1.000x - 0.544	1.000
H-R02	Dwyer	VFB-65	01/04/2026	500	1,000	2,000	501.2	992.4	1990.0	1.001x - 5.362	0.999
H-R03	Dwyer	VFB-65	03/04/2026	500	1,000	2,000	501.4	997.5	1997.3	0.998x + 2.606	1.000
H-R04	Dwyer	VFB-65	05/04/2026	500	1,000	2,000	502.5	993.6	1985.2	0.999x - 2.085	0.999
H-R05	Dwyer	VFB-65	05/04/2026	500	1,000	2,000	500.4	1001.3	1999.8	1.000x + 1.247	1.000
H-R06	Dwyer	VFB-65	03/04/2026	500	1,000	2,000	500.8	997.2	1994.6	0.999x - 0.348	1.000

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :


(Mr. Peera Detudom)



MAINTENANCE AND IPV TEST CERTIFICATE MODEL

Optima 5300

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

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

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.

☐ 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.

☐ OK**4. PERFORMANCE CHECKS**

A. Torch View Alignment.

☐ OK

B. Wavelength Calibration.

☐ OK

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

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 ✱

(Chayanan Kanan)

Sr. Customer Support Engineer

เอกสารสอบเทียบเครื่องมือการตรวจวัดระดับความร้อนในสถานประกอบการ



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 R082

Heat Stress WBGT Meter Verification Report			
Verification Data			
Heat Stress WBGT Meter No.	: R04	Verification Date	: 12 June 2026
Brand	: Quest Technologies	Ambient Temp.	: 24.5 °C
Model	: QUESTemp ^o 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	12.5	0.0	± 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	69.4	-0.1	± 0.5
UUC* = UNIT UNDER CALIBRATION			

Verified by :

Heeson L.
(Mr. Heeson Lormae)

Approved by :

Yutthana J.
(Mr. Yutthana Tanatharanit)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

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

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

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

Heat R082

Heat Stress WBGT Meter Verification Report			
Verification Data			
Heat Stress WBGT Meter No.	: R05	Verification Date	: 12 June 2026
Brand	: METROSONICS	Ambient Temp.	: 24.5 °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	12.3	0.2	± 0.5
Dry Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
47.1	47.1	0.0	± 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)

เอกสารสอบเทียบเครื่องมือการตรวจวัดระดับเสียงในสถานประกอบการ



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 :

Description : Sound Calibrator

Manufacturer : ACO

Model : 2127

Serial No. : 130006

Ambient Environment

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

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

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

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

FM.BL.MTC.002 Rev.5

Head Office

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

Office/Laboratory

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

Office

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

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-69/0204

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 20 μ Pa at 1000 Hz

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

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	93.89	-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	$\pm 1.0\%$

3. Total Distortion

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

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :


(Mr. Weerachai Deechaiyae)

Approved by :


(Mr. Prawate Kluaypa)
Director

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

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FM.BL.MTC.002 Rev.5

Head Office

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

Office/Laboratory

668 Mu 2 Tambon Bangpoomai, Amphoe Muang Samutprakan, Changwat Samutprakan 10280, Thailand
Tel. (66) 0 2323 1672-80 ext. 115, 116
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Office

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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_362/26

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-B04	ACO	6236	00222298	12 June 2026	93.9	93.9
ACO-B05	ACO	6236	00222311	12 June 2026	93.8	93.9
ACO-B37	ACO	6236	00192028	12 June 2026	93.9	93.9
ACO-B44	ACO	6236	00222302	12 June 2026	93.8	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)

เอกสารสอบเทียบเครื่องมือการตรวจวัดระดับเสียงสะสมแบบติดตัวบุคคล



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0514

MTC No. EEL. BP. 34/0868

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 : SVANTEK

Model : SV34

Serial No. : 83820

Ambient Environment

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

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

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

Standards used : 1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.
3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.
4. Digital Multimeter Agilent 34401A S/N MY44005560.
5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.
6. Audio Analyzer Panasonic VP-7722A S/N 041477D122.
7. Condenser Microphone B&K 4180 S/N 2633526.

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 : 14 Aug. 2025

Date of Calibration : 22 Aug. 2025

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.

FM.BL.MTC.002 Rev.5

Head Office

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

Office/Laboratory

668 Mu 2 Tambon Bangpoomai, Amphoe Muang Samutprakan,
Changwat Samutprakan 10280, Thailand
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Office

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

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0514

MTC No. EEL. BP. 34/0868

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 = 114 dB re 20 μ Pa at 1000 Hz

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

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	114.02	0.02	± 0.10	± 0.75 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	1000.0	0.0	± 1.5	$\pm 2.0\%$

3. Total Distortion

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	0.21	± 0.50	$\pm 4.0\%$

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :


(Mr. Weerachai Deechaiyae)

Approved by :


(Mr. Prawate Kluaypa)



Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 22 Aug. 2025

Date of Issue : 25 Aug. 2025

Ref : 2011268081403169011

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.

FM.BL.MTC.002 Rev.5

Head Office

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

Office/Laboratory

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Noise Dose R_362/26

Noise Dose Meter Calibration Report

Acoustic Calibrator Data

Brand	SVANTEK	Number	SV 03/60
Model	SV34	Serial No.	83820
Calibration Range	114 dB, 1000 Hz	Last Calibration	25 August 2025
		Due Date	25 August 2026

Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
NMD-R02	SVANTEK	SV-104IS	60152	12 June 2026	114.0	114.0
NMD-R03	SVANTEK	SV-104IS	60153	12 June 2026	114.0	114.0
NMD-R06	SVANTEK	SV-104IS	60146	12 June 2026	114.0	114.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					114.02± 0.10 dB	

Calibrated by :

Heeson L.
(Mr. Heeson Lormae)

Approved by :

Yutthana J.
(Mr. Yutthana Tanatharanit)