

ภาคผนวกที่ 4

เอกสารสอบเทียบความถูกต้องของเครื่องมือ

ตรวจวัดคุณภาพสิ่งแวดล้อม

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**ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง
และเครื่องมือตรวจวิเคราะห์คุณภาพสิ่งแวดล้อม**

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
คุณภาพอากาศในบรรยากาศ Total Suspended Particulate	High Volume Air Sampler No. B11, B20, R04	Digital Balance
Particulate Matter less than 10 microns	High Volume PM-10 Air Sampler No. R12, R13, R14	Digital Balance
Nitrogen Dioxide	NO ₂ Analyzer No. B09, B17, R04	NO ₂ Analyzer No. B09, B17, R04
คุณภาพอากาศจากปล่องระบาย Total Suspended Particulate	Console No. R03 Pitot Tube No. B40	Digital Balance
Oxides of Nitrogen	Vacuum Gauge	Spectrophotometer
Hydrogen Chloride	Personal Pump SKC No. R42 Rotameter No. H-R02	IC
Hydrogen Fluoride	Personal Pump SKC No. R42 Rotameter No. H-R02	IC
คุณภาพอากาศในสถานประกอบการ Total Dust	Personal Pump SKC No. B12, B83, R03, R11, R22, R23, R25, R28, R32, R45 Rotameter No. H-R04, R05	Digital Balance
Respirable Dust	Personal Pump SKC No. B09, B10, R01, R17, R26, R33 Rotameter No. H-R04, R05	Digital Balance
Aluminum Fume	Personal Pump SKC No. R05, R10, R44 Rotameter No. H-R04	ICP
Hydrogen Chloride	Personal Pump SKC No. R39 Rotameter No. L- R04	IC
Hydrogen Fluoride	Personal Pump SKC No. R14 Rotameter No. L- R04	IC
Ammonia	Personal Pump SKC No. R39 Rotameter No. L- R04	IC
ระดับเสียงในบรรยากาศ L _{eq} 24 hr, L _{max} , L ₉₀ และเสียงรบกวน	Acoustic Calibrator Sound Level Meter : ACO-B05, R20, R21, R52 Sound Level Meter : CR-B07	-

ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง
และเครื่องมือตรวจวิเคราะห์คุณภาพสิ่งแวดล้อม (ต่อ)

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
ระดับเสียงในสถานประกอบการ L _{eq} 8 hr และ L _{max}	Acoustic Calibrator Sound Level Meter : ACO-R40, R42, R44, R47, R50, R54, R56	-
TWA	Sound Level Meter : NMD-B01, B02, B03, B05, B06, R35	
คุณภาพน้ำทิ้ง		
pH	-	pH Meter
Total Dissolved Solids	-	Digital Balance
Total Suspended Solids	-	Digital Balance
BOD ₅	-	BOD Analyzer
COD	-	COD Reactor
Grease & Oil	-	Digital Balance
Total Aluminum	-	ICP
ระดับความร้อนในสถานประกอบการ WBGT	Digital Thermometer Heat Meter No. R05, R06, R08	-

ภาคผนวกที่ 4-1
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

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peer Detudom
(Mr. Peera Detudom)



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High Volume Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard

Model : TE 5025A

S/N : 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

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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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

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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CALIBRATION REPORT

CHEMILUMINESCENT NO / NO₂ / NO_x ANALYZER

DATE : 30 November 2025

BRAND : API

MODEL : 200E

NO. NOX-B09

SERIAL NO. 4412

Calibrator (Dilution System)

Brand : Teledyne

Model : 700E

Last Cal. Date : 29 October 2025

Serial No. : 201-S

Reference Standard Gas

Standard Gas : Nitric Oxide (NO)

Cylinder No. : A006745V

Certified Date : 12 March 2025

Expired Date : 12 March 2028

Cylinder Conc. : 48.7 ppm

CALIBRATING CONDITION

Pressure 1011 mmbar

Temp. 24.6 °C

% RH 50

CALIBRATION SETTING

Span	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	399.9	-0.025	400.0	1.005
NO _x Span	400	400.2	0.050	400.0	1.009

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	507	cc/min	500 ± 50
OZONE FLOW	78	cc/min	80 ± 15
PMT	102.9	mV	-20 - 150
AZERO	93.8	mV	-20 - 150
HVPS	673	V	420 - 900 constant
RCELL TEMP	50.2	°C	50 ± 1
BOX TEMP	29.5	°C	8 - 48
PMT TEMP	7.1	°C	7 ± 2
MOLY TEMP	315.2	°C	315 ± 5
RCELL PRESS	8.4	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	1.005	-	1.0 ± 0.3
NO _x Slope	1.009	-	1.0 ± 0.3
NO Offset	0.9	mV	-20 to +150
NO _x Offset	0.5	mV	-20 to 150
Stability at Zero	0.1	PPB	< 0.2
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas

Calibrated by :

(Mr.Kaseam Simaphon)

Approved by :

(Mr.Yuthana Thanataranit)



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CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER					
DATE :	30 November 2025	BRAND :	API	MODEL :	200A
NO.	NOX-B17	SERIAL NO.	1977		
Calibrator (Dilution System)					
Brand	: Teledyne			Model	: 700E
Last Cal. Date	: 29 October 2025			Serial No.	: 201-S
Reference Standard Gas					
Standard Gas	: Nitric Oxide (NO)			Cylinder No.	: A006745V
Certified Date	: 12 March 2025	Expired Date	: 12 March 2028	Cylinder Conc.	: 48.7 ppm
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.6	°C
% RH	50				
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
NO Span	400	399.7	-0.075	400.0	1.004
NO _x Span	400	400.1	0.025	400.0	1.007
API Model 200A NO _x Analyzer Check List					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	500 standard		
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air		
SAMPLE FLOW	507	cc/min	500 ± 50		
OZONE FLOW	79	cc/min	80 ± 15		
PMT	103.5	mV	-20 - 150		
AZERO	94.2	mV	-20 - 150		
HVPS	673	V	420 - 900 constant		
RCELL TEMP	50.2	°C	50 ± 1		
BOX TEMP	29.2	°C	8 - 48		
PMT TEMP	7.1	°C	7 ± 2		
MOLY TEMP	315.2	°C	315 ± 5		
RCELL PRESS	8.3	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.5	IN-Hg-A	25 - 30 constant		
NO Span Conc	400	PPB	20 - 20,000		
NO _x Span Conc	400	PPB	20 - 20,000		
NO Slope	1.004	-	1.0 ± 0.3		
NO _x Slope	1.007	-	1.0 ± 0.3		
NO Offset	0.7	mV	-20 to +150		
NO _x Offset	0.3	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by :

(Mr.Kaseam Simaphon)

Approved by :

(Mr.Yuthana Thanataranit)



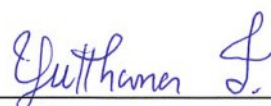
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CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER					
DATE :	30 November 2025	BRAND :	API	MODEL :	200E
NO.	NOX-R04	SERIAL NO.	4411		
Calibrator (Dilution System)					
Brand	: Teledyne			Model	: 700E
Last Cal. Date	: 29 October 2025			Serial No.	: 201-S
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	Slope
Zero	0	0.10	-	0	-
NO Span	400	399.7	-0.075	400.0	1.004
NO _x Span	400	400.1	0.025	400.0	1.007
API Model 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	504	cc/min	500 ± 50		
OZONE FLOW	79	cc/min	80 ± 15		
PMT	102.9	mV	-20 - 150		
AZERO	93.9	mV	-20 - 150		
HVPS	674	V	420 - 900 constant		
RCELL TEMP	50.2	°C	50 ± 1		
BOX TEMP	29.2	°C	8 - 48		
PMT TEMP	7.1	°C	7 ± 2		
MOLY TEMP	315.1	°C	315 ± 5		
RCELL PRESS	8.3	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.5	IN-Hg-A	25 - 30 constant		
NO Span Conc	400	PPB	20 - 20,000		
NO _x Span Conc	400	PPB	20 - 20,000		
NO Slope	1.004	-	1.0 ± 0.3		
NO _x Slope	1.007	-	1.0 ± 0.3		
NO Offset	1.0	mV	-20 to +150		
NO _x Offset	0.5	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by : 
(Mr.Kaseam Simaphon)

Approved by : 
(Mr.Yuthana Thanataranit)



CERTIFICATE No : 25M2254

REFERENCE No : 76365-1

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE

MANUFACTURER : METTLER TOLEDO

MODEL : XS105DU

SERIAL No : 1126422905

ID No : BA05/50

CONDITION AS RECEIVED : USED ITEM

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

CALIBRATED BY : ATSAWIN Y.

CALIBRATION DATE : 07-Mar-25

APPROVED BY : 
PONGSAK J.

ISSUED DATE : 13-Mar-25

RECEIVED DATE : 07-Mar-25

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





QUALITY CALIBRATION CO.,LTD.

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

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

www.qcalibration.com

CERTIFICATE No : 25M2254

PAGE : 2 OF 2

Calibration Report

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

CONDITION OF THIS RESULTS OF CALIBRATION

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

2. REFERENCE STANDARD INSTRUMENTS :-

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

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

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

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

- NATIONAL INSTITUTE OF METROLOGY (THAILAND)

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

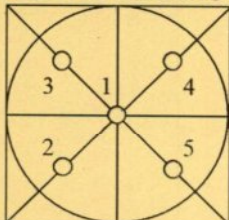
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 120 g WAS 0.000055 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

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

5. OFF CENTER LOADING ERROR



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

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

END OF CALIBRATION REPORT



ภาคผนวกที่ 4-2
คุณภาพอากาศจากปล่องระบาย



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

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

7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900

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

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

Console Calibration Report

Calibration Method

Critical Orifices

Calibration Data

Console Data		Calibration Data		
No.	Serial No.	Date	y	ΔH_{\oplus} (mmH ₂ O)
B01	1563	05/09/2025	1.004	49.67
B02	8002514	01/09/2025	1.002	49.85
B03	1503016	01/09/2025	1.005	49.77
B04	00006659	04/09/2025	0.997	49.93
B05	00007428	02/09/2025	1.003	49.51
R01	1561	01/09/2025	0.999	49.82
R02	8002513	01/09/2025	0.996	49.94
R03	1570	04/09/2025	0.998	50.02
R04	8002519	04/09/2025	1.002	49.89
R05	1503015	02/09/2025	0.996	50.10

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

Accept Value of ΔH_{\oplus} (test) is 46.7 ± 6.4 (mmH₂O)

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

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	03/11/2025	0.85	0.84
B37	S	0.99	03/11/2025	0.84	0.84
B38	S	0.99	03/11/2025	0.84	0.84
B39	S	0.99	06/11/2025	0.84	0.85
B40	S	0.99	06/11/2025	0.84	0.84
B41	S	0.99	04/11/2025	0.85	0.84
B44	S	0.99	03/11/2025	0.84	0.84
B45	S	0.99	03/11/2025	0.84	0.84
B46	S	0.99	03/11/2025	0.85	0.84
B47	S	0.99	04/11/2025	0.84	0.83
B48	S	0.99	04/11/2025	0.85	0.84
B49	S	0.99	04/11/2025	0.84	0.84
B54	S	0.99	05/11/2025	0.85	0.84
B56	S	0.99	05/11/2025	0.84	0.85
B57	S	0.99	05/11/2025	0.84	0.84
B58	S	0.99	04/11/2025	0.84	0.85

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

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

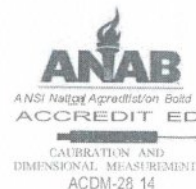
Approved by :

Peera Detudom
(Mr. Peera Detudom)



CALIBRATION LABORATORY Co.,LTD.

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



CERTIFICATE OF CALIBRATION FOR

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

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

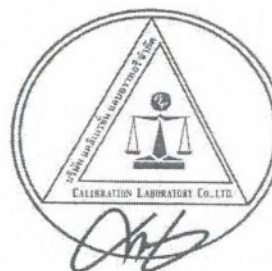
DATE OF RECEIVED : 19 July 2025

DATE OF ISSUED: 24 July 2025

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

Calibrated By : Sittipong Pimdee
Calibration Engineer

Approved By : Mongkol Yotsoontorn
Authorized Signatory
24 July 2025



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

Certificate No. Q24076549

F3-011-05/12-23

page 1 of 3



CALIBRATION LABORATORY Co., LTD.

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



CALIBRATION AND
DIMENSIONAL MEASUREMENT
ACDM-2814

REPORT OF CALIBRATION

FOR

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

ENVIRONMENT CONDITIONS

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

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

PROCEDURE USED :

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

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

REFERENCE STANDARD USED :

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

TRACEABILITY :

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

UNCERTAINTY :

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

Certificate No. Q24076549

F3-011-05/12-23

page 2 of 3

CONDITION OF CALIBRATION ITEM :RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS: (X) without adjustment () adjustment

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

CALIBRATION DATA

CORRECTION OF PRESSURE

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

Uncertainty of measurement ± 0.2 inHg

Transmitting fluid : Air.

Technical Note. Conversion factor 1 kPa ; 0.2953003 inHg

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

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

End of Certificate

Certificate No. Q24076549

F3-011-05/ 12-23



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 ± 3 °C
Pressure : 1010 ± 15 mmbar

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (mL/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R ²
R40	SKC	224-PCXR4	612753	03/10/2025	1,000	1,500	2,000	1,005	1,504	2,007	1.003x - 2.699	1.000
R41	SKC	224-PCXR4	626140	03/10/2025	1,000	1,500	2,000	998	1,498	2,000	1.001x - 1.631	1.000
R42	SKC	224-PCXR4	626463	03/10/2025	1,000	1,500	2,000	1,004	1,496	1,999	0.993x + 9.615	1.000
R43	SKC	224-PCXR4	626129	03/10/2025	1,000	1,500	2,000	1,002	1,505	2,003	1.008x - 13.761	0.999
R44	SKC	224-PCXR4	602753	01/10/2025	1,000	1,500	2,000	1,004	1,503	1,999	1.006x - 9.411	0.999
R45	SKC	224-PCXR4	626137	01/10/2025	1,000	1,500	2,000	997	1,504	1,998	1.002x - 3.862	1.000

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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

Rotameter Calibration Report (For Personal Pump High Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

Calibration Data

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	01/10/2025	500	1,000	2,000	501.1	997.7	1996.7	1.000x - 2.348	0.999
H-R02	Dwyer	VFB-65	01/10/2025	500	1,000	2,000	500.3	999.2	1997.5	1.001x - 2.181	1.000
H-R03	Dwyer	VFB-65	02/10/2025	500	1,000	2,000	500.9	1001.1	1999.3	0.999x + 0.708	0.999
H-R04	Dwyer	VFB-65	02/10/2025	500	1,000	2,000	501.4	999.4	1998.9	0.997x + 3.139	1.000
H-R05	Dwyer	VFB-65	01/10/2025	500	1,000	2,000	500.5	1000.7	1998.2	0.998x + 2.480	1.000
H-R06	Dwyer	VFB-65	03/10/2025	500	1,000	2,000	502.0	998.5	1994.8	1.000x - 1.968	0.999

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



CERTIFICATE No : 25M2254

REFERENCE No : 76365-1

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE

MANUFACTURER : METTLER TOLEDO

MODEL : XS105DU

SERIAL No : 1126422905

ID No : BA05/50

CONDITION AS RECEIVED : USED ITEM

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

CALIBRATED BY : ATSAWIN Y.

CALIBRATION DATE : 07-Mar-25

APPROVED BY : 
PONGSAK J.

ISSUED DATE : 13-Mar-25

RECEIVED DATE : 07-Mar-25

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





CERTIFICATE No : 25M2254

PAGE : 2 OF 2

Calibration Report

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

CONDITION OF THIS RESULTS OF CALIBRATION

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

2. REFERENCE STANDARD INSTRUMENTS :-

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

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

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

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

- NATIONAL INSTITUTE OF METROLOGY (THAILAND)

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

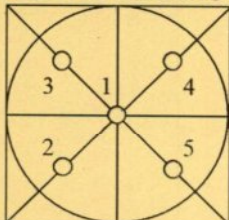
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 120 g WAS 0.000055 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

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

5. OFF CENTER LOADING ERROR



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

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

END OF CALIBRATION REPORT



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



Certificate of Calibration

Aquion : Anion (ID#894)

This certificate is to verify that instrument below are calibrated

by Archemica Lab Co.,Ltd.

AQUION S/N : 190840059

AS-DV S/N : 190915235

for

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



บริษัท อาร์เคมีกา แล็บ จำกัด
ARCHEMICA LAB CO.,LTD.

Operator Signature : Teerapat B

Date : Jun 6, 2025

(Mr. Teerapat Boonla)

Application Chemist

ภาคผนวกที่ 4-3
คุณภาพอากาศในสถานประกอบการ



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

Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Environmental Conditions

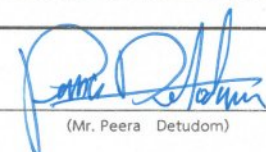
Temperature : 25 \pm 3 $^{\circ}$ C
Pressure : 1010 \pm 15 mmbar

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		
B01	SKC	224-PCXR4	262101	03/10/2025	1,000	1,500	2,000	998	1,490	1,997	1.000x - 7.191	1.000
B02	SKC	224-PCXR4	626166	03/10/2025	1,000	1,500	2,000	1,007	1,500	2,008	0.999x + 2.537	1.000
B03	SKC	224-PCXR4	612968	03/10/2025	1,000	1,500	2,000	1,003	1,503	2,001	0.997x + 0.810	0.999
B04	SKC	224-PCXR4	602804	02/10/2025	1,000	1,500	2,000	998	1,494	1,993	1.001x - 6.035	1.000
B05	SKC	224-PCXR4	612693	02/10/2025	1,000	1,500	2,000	999	1,495	2,001	0.999x - 2.481	1.000
B06	SKC	224-PCXR4	262188	02/10/2025	1,000	1,500	2,000	997	1,510	2,000	0.998x + 0.064	0.999
B07	SKC	224-PCXR4	626262	01/10/2025	1,000	1,500	2,000	1,004	1,492	2,007	1.002x - 4.778	1.000
B08	SKC	224-PCXR4	626100	02/10/2025	1,000	1,500	2,000	1,005	1,500	2,005	1.004x - 7.223	1.000
B09	SKC	224-PCXR4	626479	01/10/2025	1,000	1,500	2,000	1,001	1,501	1,986	0.996x + 3.462	0.999
B10	SKC	224-PCXR4	091950	01/10/2025	1,000	1,500	2,000	997	1,504	2,000	1.003x - 8.822	1.000
B11	SKC	224-PCXR8	564315	03/10/2025	1,000	1,500	2,000	1,001	1,503	1,995	0.995x + 2.449	1.000
B12	SKC	224-PCXR4	034656	03/10/2025	1,000	1,500	2,000	997	1,506	2,003	1.003x - 9.062	0.999
B13	SKC	224-PCXR4	602073	03/10/2025	1,000	1,500	2,000	1,003	1,497	2,006	1.002x - 5.013	1.000
B14	SKC	224-PCXR4	626313	03/10/2025	1,000	1,500	2,000	998	1,501	1,992	1.005x - 11.702	0.999
B15	SKC	224-PCXR4	626474	03/10/2025	1,000	1,500	2,000	1,001	1,502	2,004	1.006x - 11.694	1.000
B16	SKC	224-PCXR4	626477	03/10/2025	1,000	1,500	2,000	996	1,498	1,992	1.007x - 16.329	0.999
B17	SKC	224-PCXR4	626860	02/10/2025	1,000	1,500	2,000	1,001	1,503	1,998	1.001x - 4.838	1.000
B18	SKC	224-PCXR4	691484	01/10/2025	1,000	1,500	2,000	997	1,514	1,996	0.996x + 5.360	1.000
B19	SKC	224-PCXR4	691599	01/10/2025	1,000	1,500	2,000	998	1,499	2,003	0.998x + 0.399	1.000
B20	SKC	224-PCXR4	691587	01/10/2025	1,000	1,500	2,000	1,001	1,501	1,999	0.995x + 1.520	0.999
B21	SKC	224-PCXR4	691531	03/10/2025	1,000	1,500	2,000	996	1,502	2,001	1.003x - 7.151	1.000
B22	SKC	224-PCXR4	691654	03/10/2025	1,000	1,500	2,000	1,001	1,500	1,998	0.997x - 0.666	1.000
B23	SKC	224-PCXR4	798393	03/10/2025	1,000	1,500	2,000	993	1,507	1,999	1.007x - 17.505	0.999
B24	SKC	224-PCXR4	626363	03/10/2025	1,000	1,500	2,000	994	1,498	1,995	1.000x - 3.941	1.000
B25	SKC	224-PCXR4	798489	01/10/2025	1,000	1,500	2,000	1,003	1,490	2,001	0.997x + 1.703	1.000
B26	SKC	224-PCXR4	798479	01/10/2025	1,000	1,500	2,000	1,001	1,509	1,995	1.002x - 8.057	0.999
B27	SKC	224-PCXR4	691673	01/10/2025	1,000	1,500	2,000	998	1,510	2,002	1.005x - 9.656	1.000
B28	SKC	224-PCXR4	691570	01/10/2025	1,000	1,500	2,000	1,011	1,508	2,009	0.999x + 3.729	0.999
B29	SKC	224-PCXR4	626472	01/10/2025	1,000	1,500	2,000	1,002	1,503	1,998	1.002x - 6.066	1.000
B30	SKC	224-PCXR4	691489	01/10/2025	1,000	1,500	2,000	997	1,506	2,001	1.004x - 8.049	1.000
B31	SKC	224-PCXR4	691509	02/10/2025	1,000	1,500	2,000	995	1,497	1,992	0.998x - 2.293	1.000
B32	SKC	224-PCXR4	091567	01/10/2025	1,000	1,500	2,000	1,002	1,500	2,003	1.008x - 15.778	0.999
B33	SKC	224-PCXR4	091756	02/10/2025	1,000	1,500	2,000	1,003	1,501	1,997	1.003x - 6.509	1.000
B34	SKC	224-PCXR4	612962	01/10/2025	1,000	1,500	2,000	996	1,512	1,996	1.001x - 5.867	0.999
B35	SKC	224-PCXR4	602682	01/10/2025	1,000	1,500	2,000	1,008	1,494	1,999	0.993x + 6.992	1.000
B36	SKC	224-PCXR4	626164	01/10/2025	1,000	1,500	2,000	997	1,502	1,992	0.999x - 3.235	1.000
B37	SKC	224-PCXR4	626256	01/10/2025	1,000	1,500	2,000	1,003	1,490	1,997	0.994x + 5.093	1.000
B38	SKC	224-PCXR4	626167	02/10/2025	1,000	1,500	2,000	998	1,513	1,995	1.000x - 5.277	0.999
B39	SKC	224-PCXR4	034637	03/10/2025	1,000	1,500	2,000	1,007	1,504	2,004	0.996x + 8.240	1.000
B40	SKC	224-PCXR4	798349	03/10/2025	1,000	1,500	2,000	998	1,510	2,002	0.998x + 3.905	1.000

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :


(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

Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

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
B80	SKC	224-PCXR3	504569	01/10/2025	1,000	1,500	2,000	1,004	1,510	2,004	0.999x - 0.786	0.999
B81	SKC	224-PCXR3	503480	01/10/2025	1,000	1,500	2,000	1,004	1,509	2,002	1.000x - 1.340	0.999
B82	SKC	224-PCXR3	505673	01/10/2025	1,000	1,500	2,000	1,007	1,502	2,003	0.994x+ 9.425	1.000
B83	SKC	224-PCXR3	510785	01/10/2025	1,000	1,500	2,000	997	1,494	1,994	0.999x - 1.727	0.999
B84	SKC	224-PCXR3	508333	01/10/2025	1,000	1,500	2,000	1,000	1,505	2,005	1.002x - 5.217	1.000
B85	SKC	224-PCXR3	505757	03/10/2025	1,000	1,500	2,000	996	1,507	1,998	1.001x - 4.459	1.000
B86	SKC	224-PCXR3	512625	03/10/2025	1,000	1,500	2,000	998	1,506	1,993	0.997x - 4.180	0.999
B87	SKC	224-PCXR3	504324	03/10/2025	1,000	1,500	2,000	1,003	1,510	2,004	1.000x + 1.037	1.000
B88	SKC	224-PCXR3	508307	03/10/2025	1,000	1,500	2,000	995	1,505	1,999	1.007x - 17.485	0.999
B89	SKC	224-PCXR3	509860	03/10/2025	1,000	1,500	2,000	999	1,500	2,001	1.002x - 6.218	1.000
B90	SKC	224-PCXR3	508366	02/11/2025	1,000	1,500	2,000	996	1,505	2,004	1.008x - 15.379	1.000
B91	SKC	224-PCXR3	510919	01/10/2025	1,000	1,500	2,000	1,004	1,504	2,003	0.998x + 1.328	1.000
B92	SKC	224-PCXR3	510987	03/10/2025	1,000	1,500	2,000	997	1,505	2,005	1.009x - 17.601	0.999
B93	SKC	224-PCXR3	509845	03/10/2025	1,000	1,500	2,000	1,006	1,511	2,001	0.998x + 2.138	0.999

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 ± 3 °C
Pressure : 1010 ± 15 mmbar

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (ml/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R ²
R01	SKC	224-PCXR4	602467	01/10/2025	1,000	1,500	2,000	1,001	1,504	2,006	1.001x + 1.123	1.000
R02	SKC	224-PCXR4	626450	01/10/2025	1,000	2,000	3,000	997	1,511	1,997	1.000x - 2.215	1.000
R03	SKC	224-PCXR4	691592	01/10/2025	1,000	1,500	2,000	1,004	1,504	2,008	1.005x - 5.705	1.000
R04	SKC	224-PCXR4	691672	01/10/2025	1,000	1,500	2,000	1,013	1,505	2,007	0.996x + 7.748	0.999
R05	SKC	224-PCXR4	798470	01/10/2025	1,000	1,500	2,000	1,005	1,506	2,010	1.007x - 4.757	1.000
R06	SKC	224-PCXR4	798456	01/10/2025	1,000	1,500	2,000	996	1,503	1,999	1.003x - 5.913	1.000
R07	SKC	224-PCXR4	798480	03/10/2025	1,000	1,500	2,000	997	1,502	1,996	1.000x - 8.975	0.999
R08	SKC	224-PCXR4	883215	03/10/2025	1,000	1,500	2,000	1,005	1,504	1,995	0.999x - 0.068	1.000
R09	SKC	224-PCXR4	034650	03/10/2025	1,000	1,500	2,000	994	1,505	1,998	1.005x - 11.989	1.000
R10	SKC	224-PCXR4	091765	01/10/2025	1,000	1,500	2,000	1,005	1,508	2,006	1.008x - 11.738	0.999
R11	SKC	224-PCXR4	091763	01/10/2025	1,000	1,500	2,000	1,006	1,493	2,003	0.996x + 5.589	1.000
R12	SKC	224-PCXR4	091568	02/10/2025	1,000	1,500	2,000	995	1,496	1,999	1.002x - 5.717	1.000
R13	SKC	224-PCXR4	091638	01/10/2025	1,000	1,500	2,000	1,012	1,505	2,008	1.004x - 2.938	0.999
R14	SKC	224-PCXR4	091764	01/10/2025	1,000	1,500	2,000	996	1,494	2,004	1.008x - 18.690	1.000
R15	SKC	224-PCXR8	529457	01/10/2025	1,000	1,500	2,000	998	1,507	2,007	1.007x - 12.957	0.999
R16	SKC	224-PCXR8	529643	01/10/2025	1,000	1,500	2,000	997	1,496	1,994	0.999x - 1.395	1.000
R17	SKC	224-PCXR8	529645	01/10/2025	1,000	1,500	2,000	1,005	1,503	1,995	1.005x - 10.886	0.999
R18	SKC	224-PCXR8	566756	01/10/2025	1,000	1,500	2,000	997	1,505	1,993	1.000x - 4.450	1.000
R19	SKC	224-PCXR8	566802	01/10/2025	1,000	1,500	2,000	1,004	1,504	2,007	1.006x - 6.752	1.000
R20	SKC	224-PCXR8	529089	03/10/2025	1,000	1,500	2,000	1,008	1,497	2,001	1.002x - 6.225	0.999
R21	SKC	224-PCXR8	665728	03/10/2025	1,000	1,500	2,000	997	1,505	2,003	1.006x - 16.975	0.999
R22	SKC	224-PCXR8	707444	01/10/2025	1,000	1,500	2,000	1,005	1,494	2,001	0.995x + 6.369	1.000
R23	SKC	224-PCXR8	761067	01/10/2025	1,000	1,500	2,000	1,008	1,495	2,000	0.992x + 13.025	1.000
R24	SKC	224-PCXR8	707893	01/10/2025	1,000	1,500	2,000	1,005	1,504	1,997	1.004x - 8.140	0.999
R25	SKC	224-PCXR8	761052	01/10/2025	1,000	1,500	2,000	1,006	1,510	2,006	1.001x - 0.152	0.999
R26	SKC	224-PCXR8	707956	01/10/2025	1,000	1,500	2,000	1,000	1,513	2,008	1.008x - 10.714	1.000
R27	SKC	224-PCXR8	707398	02/10/2025	1,000	1,500	2,000	1,011	1,512	2,012	1.002x + 2.547	0.999
R28	SKC	224-PCXR8	707481	02/10/2025	1,000	1,500	2,000	999	1,498	2,000	1.000x + 0.144	1.000
R29	SKC	224-PCXR8	707402	02/10/2025	1,000	1,500	2,000	1,000	1,509	2,006	1.004x - 5.501	1.000
R30	SKC	224-PCXR8	093811	02/10/2025	1,000	1,500	2,000	998	1,514	2,005	1.009x - 10.222	1.000
R31	SKC	224-PCXR8	093183	01/10/2025	1,000	1,500	2,000	999	1,508	2,003	1.005x - 9.587	1.000
R32	SKC	224-PCXR8	671950	01/10/2025	1,000	1,500	2,000	1,000	1,494	1,996	0.994x + 5.137	1.000
R33	SKC	224-PCXR4	626254	01/10/2025	1,000	1,500	2,000	1,004	1,493	2,005	1.008x - 16.151	0.999
R34	SKC	224-PCXR4	626131	01/10/2025	1,000	1,500	2,000	998	1,508	1,994	0.998x - 0.764	1.000
R35	SKC	224-PCXR8	707460	01/10/2025	1,000	1,500	2,000	1,003	1,502	1,993	0.993x + 8.172	1.000
R36	SKC	224-PCXR8	707446	01/10/2025	1,000	1,500	2,000	997	1,510	1,999	1.004x - 8.044	1.000
R37	SKC	224-PCXR8	707432	01/10/2025	1,000	1,500	2,000	1,012	1,515	2,007	0.997x + 7.376	0.999
R38	SKC	224-PCXR8	707349	03/10/2025	1,000	1,500	2,000	999	1,511	1,998	1.001x - 2.918	1.000
R39	SKC	224-PCXR8	761095	03/10/2025	1,000	1,500	2,000	1,008	1,514	1,996	0.993x + 11.058	0.999

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

(Mr. Peera Detudom)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

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

7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900

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

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

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	03/10/2025	1,000	1,500	2,000	1,005	1,504	2,007	1.003x - 2.699	1.000
R41	SKC	224-PCXR4	626140	03/10/2025	1,000	1,500	2,000	998	1,498	2,000	1.001x - 1.631	1.000
R42	SKC	224-PCXR4	626463	03/10/2025	1,000	1,500	2,000	1,004	1,496	1,999	0.993x + 9.615	1.000
R43	SKC	224-PCXR4	626129	03/10/2025	1,000	1,500	2,000	1,002	1,505	2,003	1.008x - 13.761	0.999
R44	SKC	224-PCXR4	602753	01/10/2025	1,000	1,500	2,000	1,004	1,503	1,999	1.006x - 9.411	0.999
R45	SKC	224-PCXR4	626137	01/10/2025	1,000	1,500	2,000	997	1,504	1,998	1.002x - 3.862	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
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

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	01/10/2025	500	1,000	2,000	501.1	997.7	1996.7	1.000x - 2.348	0.999
H-R02	Dwyer	VFB-65	01/10/2025	500	1,000	2,000	500.3	999.2	1997.5	1.001x - 2.181	1.000
H-R03	Dwyer	VFB-65	02/10/2025	500	1,000	2,000	500.9	1001.1	1999.3	0.999x + 0.708	0.999
H-R04	Dwyer	VFB-65	02/10/2025	500	1,000	2,000	501.4	999.4	1998.9	0.997x + 3.139	1.000
H-R05	Dwyer	VFB-65	01/10/2025	500	1,000	2,000	500.5	1000.7	1998.2	0.998x + 2.480	1.000
H-R06	Dwyer	VFB-65	03/10/2025	500	1,000	2,000	502.0	998.5	1994.8	1.000x - 1.968	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 Low Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

Calibration Data

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	01/10/2025	50	100	200	50.3	101.0	200.7	0.997x + 0.613	1.000
L-R02	Dwyer	VFA-21	01/10/2025	50	100	200	50.1	101.2	200.1	1.001x - 0.303	0.999
L-R03	Dwyer	VFA-21	02/10/2025	50	100	200	49.7	99.8	199.9	1.002x - 0.371	1.000
L-R04	Dwyer	VFA-21	02/10/2025	50	100	200	50.2	100.9	200.6	1.000x - 0.110	0.999
L-R05	Dwyer	VFA-21	01/10/2025	50	100	200	50.7	100.8	200.3	0.999x + 0.555	1.000
L-R06	Dwyer	VFA-21	03/10/2025	50	100	200	50.5	99.7	201.1	0.998x + 0.476	1.000

Calibrated by :

Adul Dangklom
(Mr.Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



CERTIFICATE No : 25M2254

REFERENCE No : 76365-1

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE

MANUFACTURER : METTLER TOLEDO

MODEL : XS105DU

SERIAL No : 1126422905

ID No : BA05/50

CONDITION AS RECEIVED : USED ITEM

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

CALIBRATED BY : ATSAWIN Y.

CALIBRATION DATE : 07-Mar-25

APPROVED BY : 
PONGSAK J.

ISSUED DATE : 13-Mar-25

RECEIVED DATE : 07-Mar-25

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





CERTIFICATE No : 25M2254

PAGE : 2 OF 2

Calibration Report

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

CONDITION OF THIS RESULTS OF CALIBRATION

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

2. REFERENCE STANDARD INSTRUMENTS :-

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

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

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

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

- NATIONAL INSTITUTE OF METROLOGY (THAILAND)

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

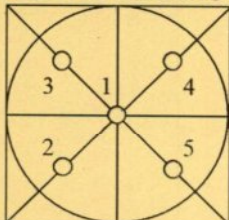
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 120 g WAS 0.000055 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

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

5. OFF CENTER LOADING ERROR



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

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

END OF CALIBRATION REPORT





MAINTENANCE AND TEST CERTIFICATE MODEL

OPTIMA 5300DV

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

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



MAINTENANCE AND TEST CERTIFICATE MODEL

OPTIMA 5300DV

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

A. Inspect and clean all fans and filters.

☐ OK

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

☐ OK

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

☐ OK

D. Adjust water and gas pressure regulator settings.

☐ OK

E. Inspect and leak check pneumatics drawers.

☐ OK

F. Clean the exterior of the instrument.

☐ OK

2. OPTICAL CHECKS

A. Inspect and clean all optical components.

☐ OK

B. As required, check and replace all purgefilters.

☐ OK

C. Recheck optical alignment.

☐ OK

3. COOLING SYSTEM CHECKS

A. Perform preventive maintenance on chiller.

☐ OK

B. Flush out the chiller every year.

☐ N/A

4. PERFORMANCE CHECKS

A. Torch View Alignment.

☐ OK

B. Wavelength Calibration.

☐ OK



MAINTENANCE AND TEST CERTIFICATE MODEL

OPTIMA 5300DV

SERIAL NUMBER : 077C7042401DATE TESTED : July 1, 2025

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



MAINTENANCE AND TEST CERTIFICATE MODEL
OPTIMA 5300DV

SERIAL NUMBER 077C7042401

DATE TESTED July 1, 2025

Remarks :

Commissioning follow as commissioning performance sheets.

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



meets



does not meet

the PerkinElmer Specifications listed on this certificate.

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

Service Department PerkinElmer Ltd.

Authorized Representative:



(Wiphan Promlumda)

Service Engineer



Certificate of Calibration

Aquion : Anion (ID#894)

This certificate is to verify that instrument below are calibrated

by Archemica Lab Co.,Ltd.

AQUION S/N : 190840059

AS-DV S/N : 190915235

for

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



บริษัท อาร์เคมีกา แล็บ จำกัด
ARCHEMICA LAB CO.,LTD.

Operator Signature : Teerapat B

Date : Jun 6, 2025

(Mr. Teerapat Boonla)

Application Chemist

ภาคผนวกที่ 4-4
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 : $(23 \pm 3) ^\circ\text{C}$

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

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

- Standards used :
1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
 2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.
 3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.
 4. Digital Multimeter Agilent 34401A S/N MY44005560.
 5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.
 6. Audio Analyzer Panasonic VP-7722A S/N 041477D122.
 7. Condenser Microphone B&K 4180 S/N 2889871.

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

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

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

Date of Receipt : 19 Feb. 2025

Date of Calibration : 21 Feb. 2025

1 / 2
W

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

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

FM.BL.MTC.002 Rev.5

Head Office

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

Office/Laboratory

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

Office

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

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0220

MTC No. EEL. BP. 44/0268

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

Nominal Output of Unit Under Test = 94 dB re 20 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	93.81	-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	$\pm 1.0\%$

3. Total Distortion

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

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :


(Mr. Weerachai Deechaiyae)

Approved by :



(Mr. Prawate Kluaypa)
Director

Date of Calibration : 21 Feb. 2025

Date of Issue : 24 Feb. 2025

Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Ref : 2011268021900739001

End of Certificate

2 / 2

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

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FM.BL.MTC.002 Rev.5

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(66) 08 1889 6827



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

Noise R_701/25

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-B05	ACO	6236	00142002	30 November 2025	93.9	93.9
ACO-R20	ACO	6236	00182003	30 November 2025	93.9	93.9
ACO-R21	ACO	6236	00182004	30 November 2025	93.1	93.9
ACO-R52	ACO	6236	00192064	30 November 2025	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.81 ± 0.10 dB	

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0220

MTC No. EEL. BP. 45/0268

CALIBRATION CERTIFICATE

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

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

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

Instrument Calibrated :

Description : Acoustic Calibrator

Manufacturer : Cirrus Research plc

Model : CR:515

Serial No. : 92002

Ambient Environment

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

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

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

- Standards used :
1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
 2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.
 3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.
 4. Digital Multimeter Agilent 34401A S/N MY44005560.
 5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.
 6. Audio Analyzer Panasonic VP-7722A S/N 041477D122.
 7. Condenser Microphone B&K 4180 S/N 2889871.

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

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

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

Date of Receipt : 19 Feb. 2025

Date of Calibration : 21 Feb. 2025

1 / 2
W

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FM.BL.MTC.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. 45/0268

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

Nominal Output of Unit Under Test = 94 dB re 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	93.98	-0.02	± 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	1000.1	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	0.65	± 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 :



.....
f (Mr. Prawate Kluaypa)
Director

Date of Calibration : 21 Feb. 2025

Date of Issue : 24 Feb. 2025

Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Ref : 2011268021900739002

End of Certificate

2 / 2

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(66) 08 1889 6827



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Noise R_701/25

Sound Level Meter Calibration Report

Acoustic Calibrator Data

Brand	CIRRUS	Number	AC-CR01/63
Model	CR515	Serial No.	92002
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
CR-B07	Cirrus	CR161B	G301167	30 November 2025	94.0	94.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.98 ± 0.10 dB	

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)

ภาคผนวกที่ 4-5
ระดับเสียงในสถานประกอบการ



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0220

MTC No. EEL. BP. 44/0268

CALIBRATION CERTIFICATE

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

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

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

Instrument Calibrated :

Description : Sound Calibrator

Manufacturer : ACO

Model : 2127

Serial No. : 130006

Ambient Environment

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

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

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

- Standards used :
1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
 2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.
 3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.
 4. Digital Multimeter Agilent 34401A S/N MY44005560.
 5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.
 6. Audio Analyzer Panasonic VP-7722A S/N 041477D122.
 7. Condenser Microphone B&K 4180 S/N 2889871.

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

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

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

Date of Receipt : 19 Feb. 2025

Date of Calibration : 21 Feb. 2025

1 / 2
W

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FM.BL.MTC.002 Rev.5

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0220

MTC No. EEL. BP. 44/0268

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

Nominal Output of Unit Under Test = 94 dB re 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	93.81	-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	$\pm 1.0\%$

3. Total Distortion

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

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :


(Mr. Weerachai Deechaiyae)

Approved by :



(Mr. Prawate Kluaypa)
Director

Date of Calibration : 21 Feb. 2025

Date of Issue : 24 Feb. 2025

Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Ref : 2011268021900739001

End of Certificate

2 / 2

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

Noise R_704/25

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-R40	ACO	6236	00192052	02 December 2025	93.9	93.9
ACO-R42	ACO	6236	00192054	02 December 2025	93.9	93.9
ACO-R44	ACO	6236	00192056	02 December 2025	93.9	93.9
ACO-R45	ACO	6236	00192057	02 December 2025	93.9	93.9
ACO-R46	ACO	6236	00192058	02 December 2025	94.0	93.9
ACO-R47	ACO	6236	00192059	02 December 2025	94.0	93.9
ACO-R48	ACO	6236	00192060	02 December 2025	93.9	93.9
ACO-R49	ACO	6236	00192061	02 December 2025	93.9	93.9
ACO-R50	ACO	6236	00192062	02 December 2025	93.9	93.9
ACO-R51	ACO	6236	00192063	02 December 2025	94.0	93.9
ACO-R54	ACO	6236	00222307	02 December 2025	93.9	93.9
ACO-R56	ACO	6236	00222310	02 December 2025	93.9	93.9

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

93.81 ± 0.10 dB

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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

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FM.BL.MTC.002 Rev.5

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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)
Director

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

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

Noise Dose R_709/25

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-B01	SVANTEK	SV-104IS	80840	03 December 2025	114.0	114.0
NMD-B02	SVANTEK	SV-104IS	80842	03 December 2025	114.0	114.0
NMD-B03	SVANTEK	SV-104IS	80852	03 December 2025	114.1	114.0
NMD-B04	SVANTEK	SV-104IS	80854	03 December 2025	114.0	114.0
NMD-B05	SVANTEK	SV-104IS	80856	03 December 2025	114.0	114.0
NMD-B06	SVANTEK	SV-104IS	80816	03 December 2025	114.1	114.0
NMD-B07	SVANTEK	SV-104IS	80817	03 December 2025	114.0	114.0
NMD-B08	SVANTEK	SV-104IS	80818	03 December 2025	114.0	114.0

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

114.02± 0.10 dB

Calibrated by :

Adul Dangklom

(Mr. Adul Dangklom)

Approved by :

Peera Detudom

(Mr. Peera Detudom)

ภาคผนวกที่ 4-6
คุณภาพน้ำทิ้ง

CERTIFICATE OF CALIBRATION FOR

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

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

DATE OF RECEIVED : 17 June 2025

DATE OF ISSUED : 20 June 2025

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

Calibrated By : Sukgasem Seehanart
Wenick Inchaisri
Calibration Engineer



Approved By : Mongkol Yotsoontorn
Authorized Signatory
20 June 2025



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

Certificate No. Q25070523

F3-011-05/12-23

page 1 of 4





CLC
Accredited
ISO/IEC 17025

CALIBRATION LABORATORY Co., LTD.

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



REPORT OF CALIBRATION

FOR

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

ENVIRONMENT CONDITIONS :

Temperature : $(25 \pm 2.5) ^\circ\text{C}$

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

PROCEDURE USED :

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

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

REFERENCE STANDARD USED :

1. pH Standard Solution, NIMT TRM CODE TRM-S-2003, TRM CODE TRM-S-2007.
2. pH Standard Solution, Control Company Catalog Number 06664260,11754256, Lot Number CC787362.
3. Calibration Bath, Kambic Model OB-22/2 ULT S/N. 17115653.
4. Precision Thermometer, ASL Model F250 S/N. 1334023800.
5. IPRT, Wika Model CTP5000-250-D S/N. PO00043543-1-10-1.

Certificate No. **Q25070523**

F3-011-05/12-23

page 2 of 4



@clccalibration



CLC
Accredited
ISO/IEC 17025

CALIBRATION LABORATORY CO., LTD.

2/10-11, 14, 55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230

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



TRACEABILITY :

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

UNCERTAINTY :

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

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

Certificate No. Q25070523

F3-011-05/12-23

page 3 of 4



@clccalibration

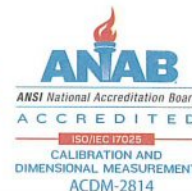


CLC
Accredited
ISO/IEC 17025

CALIBRATION LABORATORY Co., LTD.

2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230

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



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

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

CALIBRATION DATA

1. pH METER RESULT @ 25 °C

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

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

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

2. TEMPERATURE RESULT

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

Technical Note. Type of sensor : Thermistor

Probe \varnothing 3 mm

Materials : Metal Sheath.

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

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

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

End of Certificate

Certificate No. Q25070523

F3-011-05/12-23

page 4 of 4



@clccalibration



CERTIFICATE No : 25M2256
REFERENCE No : 76365-3

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE

MANUFACTURER : SARTORIUS

MODEL : BSA224S-CW

SERIAL No : 36591843


ID No : BA09/61

CONDITION AS RECEIVED : USED ITEM

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

CALIBRATED BY : ATSAWIN Y.

CALIBRATION DATE : 07-Mar-25

APPROVED BY : 
PONGSAK J.

ISSUED DATE : 13-Mar-25

RECEIVED DATE : 07-Mar-25

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





CERTIFICATE No : 25M2256

PAGE : 2 OF 2

Calibration Report

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

CONDITION OF THIS RESULTS OF CALIBRATION

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

2. REFERENCE STANDARD INSTRUMENTS :-

<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

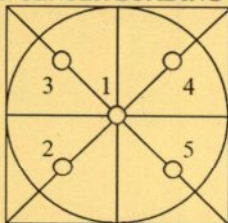
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0.000071 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

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

5. OFF CENTER LOADING ERROR



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

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

END OF CALIBRATION REPORT



CERT.No.: HS-W015C

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

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

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

Calibration Details

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

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

Overall Status (PASS)

Manufacturer Specification

Accuracy = +/- 0.02 mg/l

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



Technician Signature
(Kittipong Maekwong)



Laboratory Manager
(Natenapha Pisatkunchon)



QUALITY CALIBRATION CO., LTD.

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

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

www.qcalibration.com

CERTIFICATE No : 25T0521

REFERENCE No : 75853-2

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : COD REACTOR

MANUFACTURER : HACH

MODEL : DRB 200

SERIAL No : 15110C0498

ID No : CRB 06/59

CONDITION AS RECEIVED : USED ITEM

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

CALIBRATED BY : CHAICHARN CH.

CALIBRATION DATE : 03-Feb-25

APPROVED BY : 
PONGSAK J.

ISSUED DATE : 03-Feb-25

RECEIVED DATE : 15-Jan-25





QUALITY CALIBRATION CO., LTD.

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

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

CERTIFICATE No : 25T0521

PAGE : 2 OF 2

Calibration Report

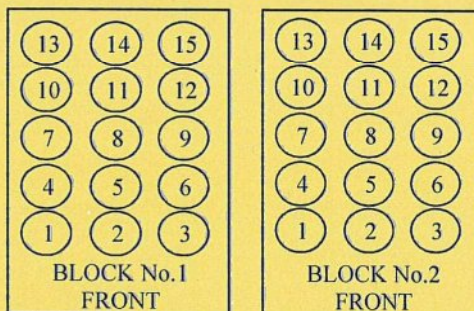
EQUIPMENT : COD REACTOR
MANUFACTURER : HACH
ID NUMBER : CRB 06/59
RECEIVED DATE : 15-Jan-25
AMBIENT TEMPERATURE : 23° C ± 1° C
MODEL : DRB 200
SERIAL NUMBER : 15110C0498
CALIBRATION DATE : 03-Feb-25
RELATIVE HUMIDITY : 53 %RH ± 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

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	7301307	24T6467	26-Jun-25
3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO., LTD.

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



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

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

NOTE 2 : LOCATION 10 WAS REFERENCE LOCATION.

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

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

END OF CALIBRATION REPORT





MAINTENANCE AND TEST CERTIFICATE MODEL

OPTIMA 5300DV

Customer : <u>S.P.S.Consulting Service Co.,Ltd</u>	Date Tested: <u>January 6, 2025</u>	
	Recommendation Recertification	
Address : <u>7 Soi Phaholyothin 24</u>	Period <u>6</u> Months	
<u>Paholyothin Road</u>	Recertification Due: <u>July 6, 2025</u>	
<u>Jompol Chatuchak, Bangkok 1090</u>	Date Last Certified: <u>July 4, 2024</u>	
User Name: <u>K.Phenpha Vipasthawatt</u>	Visit Number: <u>2 of 2</u>	
Phone: <u>083-9269252</u>	PerkinElmer Phone: <u>02-719-6420 ext 206</u>	
Fax: <u>02-513-4221</u>	PerkinElmer Fax: <u>02-318-5597</u>	

CONFIGURATION TESTED		ACCESSORIES/COMPONENT NOT INCLUDED
MODEL	SERIAL NUMBER	
<u>OPTIMA 5300DV</u>	<u>077C7042401</u>	
TESTED EQUIPMENT	CALIBRATION NUMBER	EXPIRATION
<u>IPV Methods</u>		
TEST STANDARD USED	PART NUMBER	EXPIRATION DATE
<u>Multielement Standard</u>	<u>N069-1579</u>	<u>December 30, 2025</u>
<u>Wavecal Solution</u>	<u>N058-2152</u>	<u>April 30, 2025</u>
<u>VIS Wavecal solution</u>	<u>N930-2946</u>	<u>December 30, 2025</u>
<u>Instrument Cal. STD4</u>	<u>N930-0221</u>	<u>August 30, 2025</u>
CUSTOMER SUPPLIED	COMMENTS	CUSTOMER INITIALS
<u>2 % HNO3</u>		
<u>10 % HNO3</u>		



MAINTENANCE AND TEST CERTIFICATE MODEL

OPTIMA 5300DV

SERIAL NUMBER 077C7042401
DATE TESTED January 6, 2025
1. MECHANICAL CHECKS

A. Inspect and clean all fans and filters.

☐ OK

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

☐ OK

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

☐ OK

D. Adjust water and gas pressure regulator settings.

☐ OK

E. Inspect and leak check pneumatics drawers.

☐ OK

F. Clean the exterior of the instrument.

☐ OK

2. OPTICAL CHECKS

A. Inspect and clean all optical components.

☐ OK

B. As required, check and replace all purgefilters.

☐ OK

C. Recheck optical alignment.

☐ OK

3. COOLING SYSTEM CHECKS

A. Perform preventive maintenance on chiller.

☐ OK

B. Flush out the chiller every year.

☐ N/A

4. PERFORMANCE CHECKS

A. Torch View Alignment.

☐ OK

B. Wavelength Calibration.

☐ OK



MAINTENANCE AND TEST CERTIFICATE MODEL

OPTIMA 5300DV

SERIAL NUMBER : 077C7042401
DATE TESTED : January 6, 2025

PARAMETER		SPECIFICATION		FINAL VALUE	
Spectral Resolution : UV	As	193.696 nm	≤ 0.007	<u>0.00519</u>	
	Ni	231.604 nm	≤ 0.008	<u>0.00667</u>	
	Ni	341.476 nm	≤ 0.012	<u>0.00757</u>	
Spectral Resolution : VIS	La	408.672 nm	≤ 0.020	<u>0.01621</u>	
	Ba	455.403 nm	≤ 0.025	<u>0.02183</u>	
Precision					
	As	193.656 nm	% RSD < 1.0	<u>0.51</u>	%
	Zn	213.856 nm	% RSD < 1.0	<u>0.48</u>	%
	Mn	257.610 nm	% RSD < 1.0	<u>0.03</u>	%
	La	379.478 nm	% RSD < 1.0	<u>0.05</u>	%
	Ba	455.403 nm	% RSD < 1.0	<u>0.07</u>	%
	Ba	493.408 nm	% RSD < 1.0	<u>0.04</u>	%
Detection Limits : Axial	Tl	190.080 nm	3(sd)	<u>10.65</u>	ppb
	As	193.696 nm	3(sd)	<u>2.48</u>	ppb
	Pb	220.353 nm	3(sd)	<u>3.09</u>	ppb
Detection Limits : Radial	As	193.696 nm	3(sd)	<u>12.41</u>	ppb
	Zn	213.856 nm	3(sd)	<u>0.91</u>	ppb
	Mn	257.610 nm	3(sd)	<u>0.13</u>	ppb
	La	379.478 nm	3(sd)	<u>4.74</u>	ppb
	Ba	455.403 nm	3(sd)	<u>0.10</u>	ppb
	Ba	493.408 nm	3(sd)	<u>0.18</u>	ppb
BEC : Axial (IB X 500)/(IS-IB)	Cd	226.502 nm	≤ 150 ppb	<u>14.22</u>	
BEC : Radial (IB X 1000)/(IS-IB)	Mn	257.610 nm	≤ 45 ppb	<u>6.14</u>	



MAINTENANCE AND TEST CERTIFICATE MODEL

OPTIMA 5300DV

SERIAL NUMBER 077C7042401DATE TESTED January 6, 2025**Remarks :**

Commissioning follow as commissioning performance sheets.

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



meets



does not meet

the PerkinElmer Specifications listed on this certificate.

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

Service Department PerkinElmer Ltd.**Authorized Representative:**

(Wiphan Promlumda)

Service Engineer

ภาคผนวกที่ 4-7
ระดับความร้อนในสถานประกอบการ



ID LINE : IEC17025



Certificate of Calibration

Certificate Number : SPR25030358-4

Page : 1 of 3

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

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

Equipment Name : Area Heat Stress Monitor

Manufacturer : Metrosonics

Model : hs-32

Serial Number : MCD070035

ID. Number : R05

Environmental Conditions

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

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

Location of Calibration : In-Lab

Calibration Procedure : SP-CPT-04-13

Received Date : 19 Mar 2025

Calibration Date : 27 Mar 2025

Recommend Due Date : 27 Mar 2026

Date of Issue : 28 Mar 2025

Method of Calibration

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

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

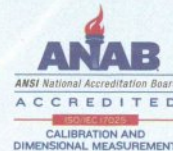
Calibrated by : Mr.Surasak Ritthikaew

Calibration Officer

Approved by :

(Mr.Prayoon Topart)

Authorized Signatory



Calibration Report

Certificate Number : SPR25030358-4

Page : 2 of 3

Reference Standards

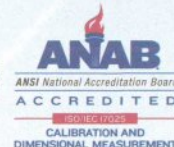
Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Humidity Chamber	TH-80S	N/A	SPR25010173-14	30 Jan 2026
THERMO-HYGROMETER	5020A	A47046	TMU2500342	29 Jan 2026

Traceability

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

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

NA - NA Caltechnologies Co., Ltd.



Result of Calibration

Certificate Number : SPR25030358-4

Page : 3 of 3

Temperature Accuracy in the Measurement. (WET)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	29.987	29.8	-0.187	0.20
35.0	34.982	34.8	-0.182	0.20
40.0	39.990	39.8	-0.190	0.20

Temperature Accuracy in the Measurement. (DRY)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	29.987	29.8	-0.187	0.20
35.0	34.982	34.8	-0.182	0.20
40.0	39.990	39.8	-0.190	0.20

Temperature Accuracy in the Measurement. (GLOBE)

Unit : °C

Humidity Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	29.987	29.7	-0.287	0.20
35.0	34.982	34.8	-0.182	0.20
40.0	39.990	39.8	-0.190	0.20

Note :

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

Measurement Uncertainty

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

- End of Certificate -



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

Heat R116

Heat Stress WBGT Meter Verification Report			
Verification Data			
Heat Stress WBGT Meter No.	: R05	Verification Date	: 02 December 2025
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	12.6	-0.1	± 0.5
Dry Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
47.1	47.2	-0.1	± 0.5
Globe Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
69.3	69.2	0.1	± 0.5
UUC* = UNIT UNDER CALIBRATION			

Verified by : Adul Dangklom
(Mr.Adul Dangklom)

Approved by : Peera Detudom
(Mr. Peera Detudom)



Certificate of Calibration

Certificate Number : SPR25100063-3

Page : 1 of 3

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

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

Equipment Name : Area Heat Stress Monitor

Manufacturer : Metrosonics

Model : hs-32

Serial Number : MCD070028

ID. Number : R06

Environmental Conditions

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

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

Location of Calibration : In-Lab

Calibration Procedure : SP-CPT-04-13

Received Date : 06 Oct 2025

Calibration Date : 08 Oct 2025

Recommend Due Date : 08 Oct 2026

Date of Issue : 09 Oct 2025

Method of Calibration

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

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

Calibrated by : Mr. Navaporn Uengseng

Approved by

Calibration Officer



(Mr. Pootthipong A.)

Authorized Signatory

SP-FM-04-15 rev.0



Calibration Report

Certificate Number : SPR25100063-3

Page : 2 of 3

Reference Standards

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

Traceability

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

NA - NA Caltechnologies Co., Ltd.

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



Result of Calibration

Certificate Number : SPR25100063-3

Page : 3 of 3

Temperature Accuracy in the Measurement. (WET)

Unit : °C

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

Temperature Accuracy in the Measurement. (DRY)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.014	29.9	-0.114	0.20
35.0	35.012	34.9	-0.112	0.20
40.0	40.018	39.9	-0.118	0.20

Temperature Accuracy in the Measurement. (GLOVE)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.014	29.9	-0.114	0.20
35.0	35.012	34.9	-0.112	0.20
40.0	40.018	39.9	-0.118	0.20

Note :

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

Measurement Uncertainty

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

- End of Certificate -



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

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

7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900

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

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

Heat R116

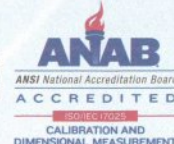
Heat Stress WBGT Meter Verification Report			
Verification Data			
Heat Stress WBGT Meter No.	: R06	Verification Date	: 02 December 2025
Brand	: METROSONICS	Ambient Temp.	: 24.5 °C
Model	: hs-32	Barometric Pressure	: 1011 mmbar
Serial No.	: MCD070028	Relative Humidity	: 49 %
Verification Module (Electronic 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	12.7	-0.2	± 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 :

Adul Dangklom
(Mr.Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



Certificate of Calibration

Certificate Number : SPR25030358-5

Page : 1 of 3

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

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

Equipment Name : Area Heat Stress Monitor

Manufacturer : Quest Technologies

Model : QUESTemp 34

Serial Number : TEH090208

ID. Number : R08

Environmental Conditions

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

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

Location of Calibration : In-Lab

Calibration Procedure : SP-CPT-04-13

Received Date : 19 Mar 2025

Calibration Date : 27 Mar 2025

Recommend Due Date : 27 Mar 2026

Date of Issue : 28 Mar 2025

Method of Calibration

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

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

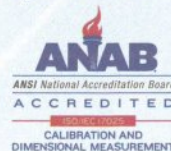
Calibrated by : Mr.Surasak Ritthikaew

Calibration Officer

Approved by :

(Mr.Prayoon Topart)

Authorized Signatory



Calibration Report

Certificate Number : SPR25030358-5

Page : 2 of 3

Reference Standards

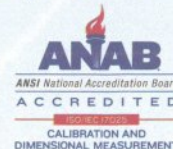
Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Humidity Chamber	TH-80S	N/A	SPR25010173-14	30 Jan 2026
THERMO-HYGROMETER	5020A	A47046	TMU2500342	29 Jan 2026

Traceability

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

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

NA - NA Caltechnologies Co., Ltd.



Result of Calibration

Certificate Number : SPR25030358-5

Page : 3 of 3

Temperature Accuracy in the Measurement. (WET)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	29.995	29.8	-0.195	0.20
35.0	34.990	34.8	-0.190	0.20
40.0	39.985	39.8	-0.185	0.20

Temperature Accuracy in the Measurement. (DRY)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	29.995	29.7	-0.295	0.20
35.0	34.990	34.7	-0.290	0.20
40.0	39.985	39.7	-0.285	0.20

Temperature Accuracy in the Measurement. (GLOBE)

Unit : °C

Humidity Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	29.995	29.8	-0.195	0.20
35.0	34.990	34.8	-0.190	0.20
40.0	39.985	39.8	-0.185	0.20

Note :

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

Measurement Uncertainty

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

- End of Certificate -



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

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

7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900

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

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

Heat R116

Heat Stress WBGT Meter Verification Report			
Verification Data			
Heat Stress WBGT Meter No.	: R08	Verification Date	: 02 December 2025
Brand	: Quest Technologies	Ambient Temp.	: 24.5 °C
Model	: QUESTemp 34	Barometric Pressure	: 1011 mmbar
Serial No.	: TEH090208	Relative Humidity	: 49 %
Verification Module (Electronic Sensor Check) :			
Verification Module No. : 21 WB = 12.5 °C, DB = 47.1 °C, G = 69.3 °C			
Result of Verification : Without Adjustment			
Wet Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
12.5	12.4	0.1	± 0.5
Dry Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
47.1	47.0	0.1	± 0.5
Globe Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
69.3	69.3	0.0	± 0.5
UUC* = UNIT UNDER CALIBRATION			

Verified by : Adul Dangklom
(Mr.Adul Dangklom)

Approved by : Peera Detudom
(Mr. Peera Detudom)