

ภาคผนวกที่ 5

เอกสารการสอบเทียบความถูกต้องเครื่องมือ

- เอกสาร 5-1 เอกสารสอบเทียบเครื่องมือตรวจวิเคราะห์คุณภาพอากาศในบรรยากาศ
- เอกสาร 5-2 เอกสารสอบเทียบเครื่องมือตรวจวิเคราะห์คุณภาพอากาศจากปล่อง
- เอกสาร 5-3 เอกสารสอบเทียบเครื่องมือตรวจวิเคราะห์คุณภาพน้ำเสีย
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**ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง
และเครื่องมือตรวจวิเคราะห์คุณภาพสิ่งแวดล้อม**

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
คุณภาพอากาศในบรรยากาศ		
- PM ₁₀	- High Volume PM ₁₀ Air Sampler No. R04, R07, R08	- Digital Balance
- Sulfur Dioxide	- SO ₂ Analyzer No. B01, R01, R04, R06	- SO ₂ Analyzer No. B01, R01, R04, R06
- Nitrogen Dioxide	- NO/NO ₂ /NO _x Analyzer No. R01, R07, R10	- NO/NO ₂ /NO _x Analyzer No. R01, R07, R10
คุณภาพอากาศจากปล่องระบาย		
- Total Suspended Particulate	- Console No. B05, R04, R05 - Pitot Tube No. B38, B45, B48, B57, B58	- Digital Balance
- Oxide of Nitrogen	- Vacuum Gauge	-
คุณภาพน้ำ		
- Temperature		- Thermometer
- pH		- pH Meter
- Total Suspended Solids		- Digital Balance
- Total Dissolved Solids		- Digital Balance
- BOD ₅		- BOD Analyzer
- Grease & Oil		- Digital Balance
- Fecal Coliform Bacteria		- Water bath
ระดับเสียงในบรรยากาศ		
- L _{eq} 24 hr	- Acoustic Calibrator - Sound Level Meter No. ACO-R11, R14, R15, R18, ACO-C1-B01	-
คุณภาพอากาศในสถานประกอบการ		
- Repairable Dust	- Personal Pump No. R31, R34	- Digital Balance
- PM ₁₀	- High Volume PM ₁₀ Air Sampler No. R05, R09	- Digital Balance
ระดับเสียงในสถานประกอบการ		
- L _{eq} 8 hr	- Acoustic Calibrator - Sound Level Meter No. ACO-R40, R41, R50, R51	-
- Noise Dose	- Acoustic Calibrator - Noise Dose Level Meter No. NMD-B01, B02, B03, B04	-
ระดับความร้อนในสถานประกอบการ		
- WBGT	- Digital Thermometer With Probe No. R04, R05, R06	-

เอกสาร 5-1

เอกสารสอบเทียบเครื่องมือตรวจวิเคราะห์คุณภาพอากาศในบรรยากาศ



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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	05/08/2024	y = 1.192x-5.434	0.998
R02	R02	07/08/2024	y = 1.182x-2.772	0.998
R03	R03	07/08/2024	y = 1.199x-4.793	1.000
R04	R04	07/08/2024	y = 1.189x-6.456	0.996
R05	R05	07/08/2024	y = 1.162x-3.444	1.000
R06	R06	07/08/2024	y = 1.194x-3.230	0.999
R07	R07	01/08/2024	y = 1.127x-0.967	0.998
R08	R08	01/08/2024	y = 1.181x-3.206	0.998
R09	R09	01/08/2024	y = 1.197x-3.914	0.999
R10	R10	01/08/2024	y = 1.133x-1.368	0.999
R11	R11	01/08/2024	y = 1.129x+0.473	0.999
R12	R12	06/08/2024	y = 1.194x-5.439	0.998
R13	R13	06/08/2024	y = 1.166x-1.899	1.000
R14	R14	06/08/2024	y = 1.181x-3.793	0.999
R15	R15	02/08/2024	y = 1.186x-3.195	0.997
R16	R16	02/08/2024	y = 1.174x-3.244	1.000
R17	R17	01/08/2024	y = 1.120x+0.523	0.999
R18	R18	07/08/2024	y = 1.146x-2.616	1.000
R19	R19	07/08/2024	y = 1.180x-1.421	1.000
R20	R20	07/08/2024	y = 1.123x-3.226	0.996

Calibrated by :

[Redacted Signature]

(Mr. Adut Dangtorn)

Approved by :

[Redacted Signature]

(Mr. Teera Detadorn)



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CALIBRATION REPORT					
SO ₂ FLUORESCENT ANALYZER					
DATE :	14 November 2024	BRAND :	API	MODEL :	100A
NO.	SO ₂ -B01	SERIAL NO.	1749		
Calibrator (Dilution System)					
Brand	: API			Model	: 700
Last Cal. Date	: 05 August 2024			Serial No.	: 911
Reference Standard Gas					
Standard Gas	: Sulphur Dioxide (SO ₂)			Cylinder No.	: A00814SK
Certified Date	: 21 June 2021	Expired Date	: 21 June 2029	Cylinder Conc.	: 49.8 ppm
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.5	°C
% RH	50				
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.10	-	0	-
SO ₂ Span	400.0	399.7	-0.075	400.0	1.008
API Model 100A SO ₂ Analyzer Check list					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	0-500		
SAMPLE PRESS	28.5	in-Hg	25-35		
SAMPLE FLOW	658	cc/min	650 ± 10%		
PMT	103.2	mV	20-150 with Zero Air		
UV LAMP	3028.3	mV	1000-4900		
STR. LGT	61.8	PPB	<100		
DRK PMT	63.3	mV	-50 - 200		
DRK LMP	58.0	mV	-50 - 200		
HVPS	671	V	550-900 constant		
DCPS	2518	mV	2500 ± 200		
RCELL TEMP	50.3	°C	50 ± 1		
BOX TEMP	29.2	°C	5-40		
PMT TEMP	7.0	°C	7 ± 2.0		
SO ₂ Span Conc	400	PPB	20-20,000		
SO ₂ Slope	1.008		1.0 ± 0.3		
SO ₂ Offset	21.9	mV	<250		
Stability at Zero	0.1	PPB	<0.2		
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)		

Calibrated by :

(Mr.Adul Dangklorn)

Approved by :

(Mr.Peera Detudom)



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CALIBRATION REPORT					
SO ₂ FLUORESCENT ANALYZER					
DATE :	14 November 2024	BRAND :	API	MODEL :	100E
NO.	SO ₂ -R01	SERIAL NO.	3415		
Calibrator (Dilution System)					
Brand	: API			Model	: 700
Last Cal. Date	: 05 August 2024			Serial No.	: 911
Reference Standard Gas					
Standard Gas	: Sulphur Dioxide (SO ₂)			Cylinder No.	: A00814SK
Certified Date	: 21 June 2021	Expired Date	: 21 June 2029	Cylinder Conc.	: 49.8 ppm
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.5	°C
			% RH	50	
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
SO ₂ Span	400.0	400.1	0.025	400.0	1.010
API Model 100E SO ₂ Analyzer Check list					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	0-500		
SAMPLE PRESS	28.6	in-Hg	25-35		
SAMPLE FLOW	660	cc/min	650 ± 10%		
PMT	103.3	mV	-20-150 with Zero Air		
UV LAMP	3033.7	mV	1000-4900		
STR. LGT	61.7	PPB	<100		
DRK PMT	63.2	mV	-50 - 200		
DRK LMP	57.9	mV	-50 - 200		
HVPS	674	V	550-900 constant		
DCPS	2526	mV	2500 ± 200		
RCELL TEMP	50.0	°C	50 ± 1		
BOX TEMP	28.8	°C	5-40		
PMT TEMP	7.2	°C	7 ± 2.0		
SO ₂ Span Conc	400	PPB	20-20,000		
SO ₂ Slope	1.010	-	1.0 ± 0.3		
SO ₂ Offset	22.2	mV	<250		
Stability at Zero	0.1	PPB	<0.2		
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)		

Calibrated by :

(Mr.Adul Dangklom)

Approved by :

(Mr.Peera Detudom)



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CALIBRATION REPORT					
SO ₂ FLUORESCENT ANALYZER					
DATE :	14 November 2024	BRAND :	API	MODEL :	100E
NO.	SO ₂ -R04	SERIAL NO.	3489		
Calibrator (Dilution System)					
Brand : API		Model : 700			
Last Cal. Date : 05 August 2024		Serial No. : 911			
Reference Standard Gas					
Standard Gas : Sulphur Dioxide (SO ₂)		Cylinder No. : A00814SK			
Certified Date : 21 June 2021		Expired Date : 21 June 2029		Cylinder Conc. : 49.8 ppm	
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.5	°C
			% RH	50	
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.10	-	0	-
SO ₂ Span	400.0	399.6	-0.100	400.0	1.007
API Model 100E SO ₂ Analyzer Check list					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	0-500		
SAMPLE PRESS	28.4	in-Hg	25-35		
SAMPLE FLOW	657	cc/min	650 ± 10%		
PMT	103.0	mV	-20-150 with Zero Air		
UV LAMP	3017.1	mV	1000-4900		
STR. LGT	61.5	PPB	<100		
DRK PMT	63.0	mV	-50 - 200		
DRK LMP	57.8	mV	-50 - 200		
HVPS	673	V	550-900 constant		
DCPS	2521	mV	2500 ± 200		
RCELL TEMP	50.1	°C	50 ± 1		
BOX TEMP	29.3	°C	5-40		
PMT TEMP	7.4	°C	7 ± 2.0		
SO ₂ Span Conc	400	PPB	20-20,000		
SO ₂ Slope	1.007	-	1.0 ± 0.3		
SO ₂ Offset	22.0	mV	<250		
Stability at Zero	0.1	PPB	<0.2		
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)		

Calibrated by :

(Mr.Adul Dangklom)

Approved by :

(Mr.Peera Detudom)



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CALIBRATION REPORT					
SO ₂ FLUORESCENT ANALYZER					
DATE :	14 November 2024	BRAND :	API	MODEL :	100E
NO.	SO ₂ -R06	SERIAL NO.	066		
Calibrator (Dilution System)					
Brand	: API			Model	: 700
Last Cal. Date	: 05 August 2024			Serial No.	: 911
Reference Standard Gas					
Standard Gas	: Sulphur Dioxide (SO ₂)			Cylinder No.	: A00814SK
Certified Date	: 21 June 2021	Expired Date	: 21 June 2029	Cylinder Conc.	: 49.8 ppm
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.5	°C
% RH	50				
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.11	-	0	-
SO ₂ Span	400.0	400.2	0.050	400.0	1.012
API Model 100E SO ₂ Analyzer Check list					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	0-500		
SAMPLE PRESS	28.7	in-Hg	25-35		
SAMPLE FLOW	654	cc/min	650 ± 10%		
PMT	103.1	mV	-20-150 with Zero Air		
UV LAMP	3022.5	mV	1000-4900		
STR. LGT	61.9	PPB	<100		
DRK PMT	63.4	mV	-50 - 200		
DRK LMP	58.1	mV	-50 - 200		
HVPS	670	V	550-900 constant		
DCPS	2517	mV	2500 ± 200		
RCELL TEMP	50.2	°C	50 ± 1		
BOX TEMP	29.1	°C	5-40		
PMT TEMP	7.3	°C	7 ± 2.0		
SO ₂ Span Conc	400	PPB	20-20,000		
SO ₂ Slope	1.012	-	1.0 ± 0.3		
SO ₂ Offset	21.8	mV	<250		
Stability at Zero	0.1	PPB	<0.2		
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)		

Calibrated by :

(Mr.Adul Dangklom)

Approved by :

(Mr.Peera Detudorn)



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CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER					
DATE :	14 November 2024	BRAND :	API	MODEL :	200E
NO.	NOX-R01	SERIAL NO.	769		
Calibrator (Dilution System)					
Brand	: API		Model	: 700	
Last Cal. Date	: 05 August 2024		Serial No.	: 911	
Reference Standard Gas					
Standard Gas	: Nitric Oxide (NO)		Cylinder No.	: A00726SV	
Certified Date	: 05 January 2023		Expired Date	: 05 January 2026	
			Cylinder Conc.	: 48.8 ppm	
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.5	°C
			% RH	50	
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.11	-	0	-
NO Span	400	400.1	0.025	400.0	1.009
NO _x Span	400	400.2	0.050	400.0	1.013
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	509	cc/min	500 ± 50		
OZONE FLOW	79	cc/min	80 ± 15		
PMT	103.4	mV	-20 - 150		
AZERO	94.1	mV	-20 - 150		
HVPS	673	V	420 - 900 constant		
RCELL TEMP	50.0	°C	50 ± 1		
BOX TEMP	28.8	°C	8 - 48		
PMT TEMP	7.1	°C	7 ± 2		
MOLY TEMP	315.2	°C	315 ± 5		
RCELL PRESS	8.5	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.7	IN-Hg-A	25 - 30 constant		
NO Span Conc	400	PPB	20 - 20,000		
NO _x Span Conc	400	PPB	20 - 20,000		
NO Slope	1.009	-	1.0 ± 0.3		
NO _x Slope	1.013	-	1.0 ± 0.3		
NO Offset	1.5	mV	-20 to +150		
NO _x Offset	0.9	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by :

(Mr.Adul Dangklom)

Approved by :

(Mr.Peera Detudom)



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CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER					
DATE :	14 November 2024	BRAND :	API	MODEL :	200E
NO.	NOX-R07	SERIAL NO.	4468		
Calibrator (Dilution System)					
Brand	: API		Model	: 700	
Last Cal. Date	: 05 August 2024		Serial No.	: 911	
Reference Standard Gas					
Standard Gas	: Nitric Oxide (NO)		Cylinder No.	: A00726SV	
Certified Date	: 05 January 2023		Expired Date	: 05 January 2026	
			Cylinder Conc.	: 48.8 ppm	
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.5	°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	1.005
NO _x Span	400	399.9	-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	511	cc/min	500 ± 50		
OZONE FLOW	79	cc/min	80 ± 15		
PMT	103.2	mV	-20 - 150		
AZERO	94.0	mV	-20 - 150		
HVPS	669	V	420 - 900 constant		
RCELL TEMP	50.1	°C	50 ± 1		
BOX TEMP	29.4	°C	8 - 48		
PMT TEMP	7.2	°C	7 ± 2		
MOLY TEMP	314.7	°C	315 ± 5		
RCELL PRESS	8.3	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.6	IN-Hg-A	25 - 30 constant		
NO Span Conc	400	PPB	20 - 20,000		
NO _x Span Conc	400	PPB	20 - 20,000		
NO Slope	1.005	-	1.0 ± 0.3		
NO _x Slope	1.007	-	1.0 ± 0.3		
NO Offset	1.1	mV	-20 to +150		
NO _x Offset	0.7	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.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., Jompoi, Chatuchak, Bangkok 10900
Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscn.com, www.spscn.com

CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER					
DATE :	14 November 2024	BRAND :	API	MODEL :	200E
NO.	NOX-R10	SERIAL NO.	1991		
Calibrator (Dilution System)					
Brand	: API		Model	: 700	
Last Cal. Date	: 05 August 2024		Serial No.	: 911	
Reference Standard Gas					
Standard Gas	: Nitric Oxide (NO)		Cylinder No.	: A00726SV	
Certified Date	: 05 January 2023		Expired Date	: 05 January 2026	
			Cylinder Conc.	: 48.8 ppm	
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.5	°C
			% RH	50	
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.10	-	0	-
NO Span	400	399.9	-0.025	400.0	1.008
NO _x Span	400	400.1	0.025	400.0	1.011
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	78	cc/min	80 ± 15		
PMT	103.0	mV	-20 - 150		
AZERO	93.8	mV	-20 - 150		
HVPS	671	V	420 - 900 constant		
RCELL TEMP	50.3	°C	50 ± 1		
BOX TEMP	29.1	°C	8 - 48		
PMT TEMP	7.0	°C	7 ± 2		
MOLY TEMP	315.4	°C	315 ± 5		
RCELL PRESS	8.2	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.4	IN-Hg-A	25 - 30 constant		
NO Span Conc	400	PPB	20 - 20,000		
NO _x Span Conc	400	PPB	20 - 20,000		
NO Slope	1.008	-	1.0 ± 0.3		
NO _x Slope	1.011	-	1.0 ± 0.3		
NO Offset	1.3	mV	-20 to +150		
NO _x Offset	0.9	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by :

(Mr.Adul Dangklom)

Approved by :

(Mr.Peera Detudom)



CERTIFICATE No : 24M2227

REFERENCE No : 72448-1

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 : 08-Mar-24

APPROVED BY : [REDACTED]
PONGSAK J.

ISSUED DATE : 14-Mar-24

RECEIVED DATE : 08-Mar-24



CERTIFICATE No : 24M2227

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : XS105DU
MANUFACTURER : METTLER TOLEDO S/N : 1126422905
ID No : BA05/50 RECEIVED DATE : 08-Mar-24
AIR PRESSURE : 1010mbar \pm 1mbar CALIBRATION DATE : 08-Mar-24
AMBIENT TEMPERATURE : 25°C \pm 1°C RELATIVE HUMIDITY : 53 %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	M2302013S	02-Feb-25
2) STANDARD WEIGHT	E2	15843	M2302014S	02-Feb-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 CENTRAL BUREAU OF WEIGHTS&MEASURES

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

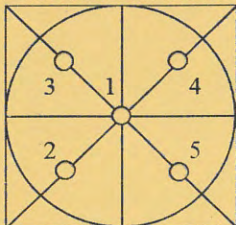
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0.000055 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (\pm g)
0.00	0.00000	0.00000	0.000065
0.02	0.02001	-0.00001	0.000065
0.10	0.10002	-0.00002	0.000066
0.20	0.20001	-0.00001	0.000066
0.50	0.50001	-0.00001	0.000065
1.00	1.00003	-0.00003	0.000066
2.00	2.00001	-0.00001	0.000067
5.00	5.00001	-0.00001	0.000068
10.00	9.99994	0.00006	0.000070
20.00	20.00008	-0.00008	0.000078
50.00	50.0000	0.0000	0.00013
100.00	100.0001	-0.0001	0.00019
120.00	120.0001	-0.0001	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

เอกสาร 5-2

เอกสารสอบเทียบเครื่องมือตรวจวิเคราะห์คุณภาพอากาศจากปล่อง



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@spscn.com, www.spscn.com

Console Calibration Report

Calibration Method

Critical Orifices

Calibration Data

Console Data		Calibration Data		
No.	Serial No.	Date	y	ΔH_{g} (mmH ₂ O)
B01	1563	02/09/2024	0.998	50.16
B02	8002514	04/09/2024	1.002	50.08
B03	1503016	02/09/2024	1.005	50.02
B04	00006659	03/09/2024	0.997	49.84
B05	00007428	02/09/2024	1.003	49.95
R01	1561	03/09/2024	0.998	50.11
R02	8002513	04/09/2024	0.997	49.97
R03	1570	03/09/2024	1.004	49.82
R04	8002519	02/09/2024	0.996	49.74
R05	1503015	04/09/2024	0.999	49.88

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

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

Calibrated by :

(Mr. Adul Dangklom)

Approved by :

(Mr. Peera Detudom)



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

Pitot Tube Calibration Report

Calibration Method

Standard Pitot Tube

Calibration Data

Pitot Tube Data			Calibration Data		
No.	Type of Pitot	Coefficient of Standard Pitot	Date	Avg. of Cp (test)	
				Side A	Side B
B03	S	0.99	02/08/2024	0.84	0.83
B04	S	0.99	02/08/2024	0.85	0.84
B05	S	0.99	05/08/2024	0.84	0.84
B07	S	0.99	05/08/2024	0.84	0.83
B08	S	0.99	02/08/2024	0.84	0.84
B09	S	0.99	02/08/2024	0.84	0.85
B11	S	0.99	02/08/2024	0.84	0.84
B16	S	0.99	01/08/2024	0.83	0.84
B18	S	0.99	01/08/2024	0.84	0.84
B19	S	0.99	05/08/2024	0.84	0.84
B21	S	0.99	07/08/2024	0.84	0.85
B24	S	0.99	05/08/2024	0.83	0.84
B27	S	0.99	05/08/2024	0.84	0.83
B30	S	0.99	07/08/2024	0.85	0.84
B31	S	0.99	02/08/2024	0.84	0.85
B33	S	0.99	01/08/2024	0.84	0.84
B35	S	0.99	02/08/2024	0.84	0.85

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

Calibrated by :

(Mr. Add Dangdom)

Approved by :

(Mr. Peera Detudom)



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

Pitot Tube Calibration Report

Calibration Method

Standard Pitot Tube

Calibration Data

Pitot Tube Data			Calibration Data		
No.	Type of Pitot	Coefficient of Standard Pitot	Date	Avg. of Cp (test)	
				Side A	Side B
B36	S	0.99	02/08/2024	0.83	0.84
B37	S	0.99	02/08/2024	0.84	0.84
B38	S	0.99	01/08/2024	0.84	0.83
B39	S	0.99	05/08/2024	0.84	0.85
B40	S	0.99	08/08/2024	0.84	0.84
B41	S	0.99	05/08/2024	0.84	0.85
B44	S	0.99	05/08/2024	0.84	0.85
B45	S	0.99	05/08/2024	0.85	0.84
B46	S	0.99	02/08/2024	0.84	0.85
B47	S	0.99	05/08/2024	0.84	0.85
B48	S	0.99	07/08/2024	0.83	0.84
B49	S	0.99	07/08/2024	0.84	0.85
B54	S	0.99	07/08/2024	0.83	0.84
B56	S	0.99	02/08/2024	0.84	0.84
B57	S	0.99	06/08/2024	0.85	0.84
B58	S	0.99	02/08/2024	0.84	0.84

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

Calibrated by :

(Mr. Adul Dangklom)

Approved by :

(Mr. Peera Detudom)



CALIBRATION LABORATORY Co., LTD.

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



CERTIFICATE OF CALIBRATION FOR

NOMENCLATURE : VACUUM GAUGE
MANUFACTURER : HI-LIGHT
MODEL / TYPE : N/A
SERIAL NO. : N/A[64-220066-2]
CLID. NO. : 212201113
JOB CONTROL NO. : 240730078440
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

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

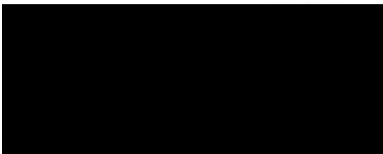
7 SOI PHAHOLYOTHIN 24 ROAD., JOMPOL,
CHATUCHAK, BANGKOK 10900

DATE OF RECEIVED : 30 July 2024

DATE OF ISSUED : 02 August 2024

The report of 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
02 August 2024



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. Q24078440

F3-011-05/12-23

page 1 of 3



@clccalibration

REPORT OF CALIBRATION

FOR

NOMENCLATURE	:	VACUUM GAUGE
MANUFACTURER	:	HI-LIGHT
MODEL / TYPE	:	N/A
SERIAL NO.	:	N/A[64-220066-2]
DATE OF CALIBRATION	:	31 July 2024
DUE DATE OF CALIBRATION	:	31 July 2025

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 741B S/N. 8295020 with Pressure Module Model 700PD5 S/N. 89404505.

TRACEABILITY :

The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand).
Certificate No. MP-0040-24, Due Date 08 February 2025.

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. Q24078440

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	0.000	0.000	0.0	0.0	0.0	0.0
-5	-16.591	-16.930	-4.9	-5.0	+0.1	0.0
-10	-33.521	-33.521	-9.9	-9.9	+0.1	+0.1
-15	-50.113	-50.113	-14.8	-14.8	+0.2	+0.2
-20	-66.704	-67.043	-19.7	-19.8	+0.3	+0.2
-25	-83.634	-83.973	-24.7	-24.8	+0.3	+0.2
-30	-100.564	-100.564	-29.7	-29.7	+0.3	+0.3

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. Q24078440

F3-011-05/12-23

page 3 of 3





CERTIFICATE No : 24M2227

REFERENCE No : 72448-1

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 : 08-Mar-24

APPROVED BY : [REDACTED]
FONGSAK J.

ISSUED DATE : 14-Mar-24

RECEIVED DATE : 08-Mar-24



CERTIFICATE No : 24M2227

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : XS105DU
MANUFACTURER : METTLER TOLEDO S/N : 1126422905
ID No : BA05/50 RECEIVED DATE : 08-Mar-24
AIR PRESSURE : 1010mbar \pm 1mbar CALIBRATION DATE : 08-Mar-24
AMBIENT TEMPERATURE : 25°C \pm 1°C RELATIVE HUMIDITY : 53 %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	M2302013S	02-Feb-25
2) STANDARD WEIGHT	E2	15843	M2302014S	02-Feb-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 CENTRAL BUREAU OF WEIGHTS&MEASURES

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

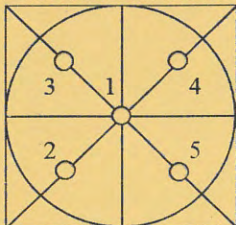
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0.000055 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (\pm g)
0.00	0.00000	0.00000	0.000065
0.02	0.02001	-0.00001	0.000065
0.10	0.10002	-0.00002	0.000066
0.20	0.20001	-0.00001	0.000066
0.50	0.50001	-0.00001	0.000065
1.00	1.00003	-0.00003	0.000066
2.00	2.00001	-0.00001	0.000067
5.00	5.00001	-0.00001	0.000068
10.00	9.99994	0.00006	0.000070
20.00	20.00008	-0.00008	0.000078
50.00	50.0000	0.0000	0.00013
100.00	100.0001	-0.0001	0.00019
120.00	120.0001	-0.0001	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

เอกสาร 5-3

เอกสารสอบเทียบเครื่องมือตรวจวิเคราะห์คุณภาพน้ำเสีย

Certificate of Calibration

Certificate No. : 67-400037-2

Page : 1 of 2

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

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

Equipment : Liquid in Glass Thermometer

Manufacturer : SK

Model : N/A

Range : 0 °C to 100 °C

Resolution : 1 °C

Serial No. : N/A

Immersion : Total

ID No. : TM21/59

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

Relative Humidity : (50 ± 15) %

Line Voltage : (220 ± 22) VAC

Date of Received : 23 January 2024

Date of Calibration : 03 February 2024

Date of Issue : 03 February 2024

Calibrated by : Chortip Samchusri

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

The temperature scale used was based on ITS-90

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

1. Platinum Resistance Thermometer (PRT)

ID No.	Cert. No.	Due Date	Traceability
400001	TT-0016-22	07 Feb 2024	National Institute of Metrology Thailand (NIMT)

2. Standard Digital Thermometer

ID No.	Cert. No.	Due Date	Traceability
400003	23E1866	01 Jun 2025	National Institute of Metrology Thailand (NIMT)
400004	23E1866	01 Jun 2025	National Institute of Metrology Thailand (NIMT)

Approved by

(Surachai Promthong)

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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



Certificate of Calibration

Certificate No. : 67-400037-2

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

Ice point check : UUC* reading 0 °C Standard reading 0.4336 °C

Standard Reading (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (± °C)
20.5609	20	0.6	0.31

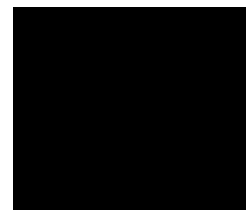
Remark

UUC : Unit Under Calibration

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

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

- oOo -



**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 : 24E6416

REFERENCE No : 73694-1

PAGE : 1 OF 3

Certificate of Calibration

EQUIPMENT : pH METER

MANUFACTURER : HANNA

MODEL : HI 3512

SERIAL No : TH118035

ID No : pH 04/56

CONDITION AS RECEIVED : USED ITEM

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

CALIBRATED BY : ATSAWIN Y.

CALIBRATION DATE : 27-Jun-24

APPROVED BY : 
PONGSAK J.

ISSUED DATE : 27-Jun-24

RECEIVED DATE : 24-Jun-24

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



QUALITY CALIBRATION CO., LTD.

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

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

CERTIFICATE No : 24E6416

PAGE : 2 OF 3

Calibration Report

EQUIPMENT : pH METER
MANUFACTURER : HANNA
ID No : pH 04/56
RECEIVED DATE : 24-Jun-24
AMBIENT TEMPERATURE : 23 ° C ± 3 ° C
MODEL : HI 3512
SERIAL NUMBER : TH118035
CALIBRATION DATE : 27-Jun-24
RELATIVE HUMIDITY : 50 % RH ± 10% RH

CONDITION OF THIS RESULTS OF CALIBRATION

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

INSTRUMENT	MODEL	SERIAL No/ LOT No	CERTIFICATE No	DUE DATE
1) pH STANDARD SOLUTION	00651-06	CC784945	4880-14413915	24-Aug-25
2) pH STANDARD SOLUTION	00651-08	CC785578	4881-14430633	31-Aug-25
3) pH STANDARD SOLUTION	00651-10	CC787086	4882-14483317	21-Sep-25
4) PROCESS CALIBRATOR	CA150	91S6079	24E1251	09-Apr-25
5) BATH	260014	1247 48074	23T9014	13-Sep-24
6) THERMOMETER WITH PROBE	421504	55000379	23T9623	13-Sep-24

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

RESULT OF CALIBRATION : ADJUSTMENT

1. DISPLAY UNIT ONLY

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

mV APPLIED	UUC READING (mV)	CORRECTION (mV)	UUC READING (pH)	UNCERTAINTY OF MEASUREMENT (± mV)	COVERAGE FACTOR k
414.11	414.8	-0.69	-0.115	0.15	2.00
354.95	355.5	-0.55	0.884	0.15	2.00
295.80	296.4	-0.60	1.885	0.15	2.00
236.64	237.1	-0.46	2.886	0.15	2.00
177.48	178.0	-0.52	3.887	0.15	2.00
118.32	118.8	-0.48	4.887	0.15	2.00
59.16	59.6	-0.44	5.887	0.15	2.00
0.00	0.4	-0.40	6.888	0.15	2.00
-59.16	-58.7	-0.46	8.101	0.15	2.00
-118.32	-117.9	-0.42	9.345	0.15	2.00
-177.48	-177.4	-0.08	10.589	0.15	2.00
-236.64	-236.4	-0.24	11.834	0.15	2.00
-295.80	-294.5	-1.30	13.077	0.15	2.00
-354.95	-354.7	-0.25	14.322	0.15	2.00
-414.11	-413.9	-0.21	15.565	0.15	2.00

END OF CALIBRATION REPORT PAGE 2 OF 3



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 : 24E6416

PAGE : 3 OF 3

Calibration Report

RESULT OF CALIBRATION (CONTINUE):

2. DISPLAY UNIT WITH pH ELECTRODE S/N: 09081C6M

STANDARD pH BUFFER SOLUTION (pH)	UUC READING (pH)	CORRECTION (pH)	VALUE BEFORE ADJUSTMENT	UNCERTAINTY OF MEASUREMENT (\pm pH)	COVERAGE FACTOR k
4.015	4.011	0.004	3.905	0.012	2.00
7.003	7.003	0.000	6.972	0.012	2.00
10.009	10.014	-0.005	9.570	0.014	2.00

3. DISPLAY UNIT WITH TEMPERATURE

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

4. PERCENT SLOPE 100%

UUC : UNIT UNDER CALIBRATION

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

END OF CALIBRATION REPORT



CERTIFICATE No : 24M2229
REFERENCE No : 72448-3

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE

MANUFACTURER : SARTORIUS

MODEL : BSA224S-CW

SERIAL No : 36591843

ID No : BA 09/61

CONDITION AS RECEIVED : USED ITEM

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

CALIBRATED BY : ATSAWIN Y.

CALIBRATION DATE : 08-Mar-24

APPROVED BY : 
PONGSAK J.

ISSUED DATE : 14-Mar-24

RECEIVED DATE : 08-Mar-24



CERTIFICATE No : 24M2229

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE **MODEL** : BSA224S-CW
MANUFACTURER : SARTORIUS **S/N** : 36591843
ID No : BA 09/61 **RECEIVED DATE** : 08-Mar-24
AIR PRESSURE : 1010mbar \pm 1mbar **CALIBRATION DATE** : 08-Mar-24
AMBIENT TEMPERATURE : 25° C \pm 1° C **RELATIVE HUMIDITY** : 55 %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	M2302013S	02-Feb-25
2) STANDARD WEIGHT	E2	15843	M2302014S	02-Feb-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 CENTRAL BUREAU OF WEIGHTS&MEASURES

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

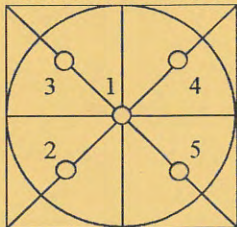
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (\pm g)
0.0	0.0000	0.0000	0.000082
0.1	0.1000	0.0000	0.000083
0.2	0.2000	0.0000	0.000083
0.5	0.5000	0.0000	0.000083
1.0	1.0000	0.0000	0.000084
2.0	2.0000	0.0000	0.000084
5.0	5.0000	0.0000	0.000086
10.0	10.0000	0.0000	0.000089
20.0	20.0001	-0.0001	0.000094
50.0	50.0000	0.0000	0.00012
100.0	100.0001	-0.0001	0.00019
200.0	200.0000	0.0000	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-V015C

Calibration Date : 20 Mar 24
 Submitted by : ASIA LAB @ CONSULTANT CO.,LTD
 184 Soi Phutthamonthon Sai 2 Soi 12,
 Bangphai, Bangkae, Bangkok 10160

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 : S/N. 11430
 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)	9.08	(PASS)	-
Measurement 5 (mg/l)	9.08	(PASS)	-
Measurement 6 (mg/l)	9.08	(PASS)	-
Measurement 7 (mg/l)	9.08	(PASS)	-
Measurement 8 (mg/l)	9.08	(PASS)	-
Measurement 9 (mg/l)	9.08	(PASS)	-
Measurement 10 (mg/l)	9.08	(PASS)	-
Mean Measurement	9.08	mg/l	-
Inaccuracy	0.01	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
 (Supreecha Sumaritam)



CERTIFICATE No : 24T2234

REFERENCE No : 72448-8

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : WATER BATH

MANUFACTURER : MEMMERT

MODEL : WNB29

SERIAL No : L614.0123

ID No : WB-05/58

CONDITION AS RECEIVED : USED ITEM

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

CALIBRATED BY : CHAICHARN CH.

CALIBRATION DATE : 08-Mar-24

APPROVED BY : [REDACTED]
PONGSAK J.

ISSUED DATE : 14-Mar-24

RECEIVED DATE : 08-Mar-24



CERTIFICATE No : 24T2234

PAGE : 2 OF 2

Calibration Report

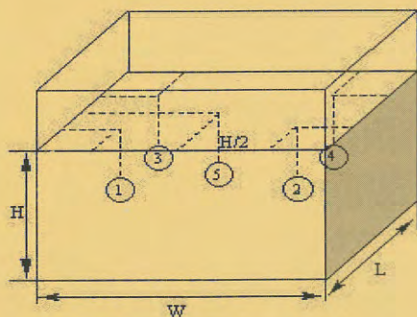
EQUIPMENT : WATER BATH
MANUFACTURER : MEMMERT
ID NUMBER : WB-05/58
RECEIVED DATE : 08-Mar-24
AMBIENT TEMPERATURE : 25 °C ± 1 °C
MODEL : WNB29
SERIAL NUMBER : L614.0123
CALIBRATION DATE : 08-Mar-24
RELATIVE HUMIDITY : 56 %RH ± 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

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

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) DATA LOGGER WITH RTD	2635A	7286308	23T6641	14-Jul-24
3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.				
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.				
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:- - NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO.,LTD.				

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



PROBE INSTALLATION
POSITION IN THE BATH

GENERAL INFORMATION

Overall Variation of Ambient Temperature around the Bath (°C) : 2.1
Overall Variation of Line Voltage (V) : 14
Instrument Condition : Normal
Bath Inner Size (W*L*H) : 60*40*6 cm

BATH PERFORMANCE

Controller Temperature (°C)	Temperature Stability (±°C)	Radius Uniformity (°C)	Axial Uniformity (°C)	Overall Variation (°C)
50.0	0.05	0.06	0.04	0.11
60.0	0.07	0.19	0.03	0.30

TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Indicating Temp (°C)	Measured Temperature (°C) at Spread Locations					Uncertainty (± °C)
		#1	#2	#3	#4	Ref. 5	
50.0	50.0	49.61	49.62	49.63	49.67	49.65	0.15
60.0	60.0	59.48	59.67	59.52	59.60	59.59	0.16

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

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

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

END OF CALIBRATION REPORT

เอกสาร 5-4

เอกสารสอบเทียบเครื่องมือตรวจวัดระดับเสียงในบรรยากาศ



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0304

MTC No. EEL. BP. 109/0267

CALIBRATION CERTIFICATE

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

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

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

Instrument Calibrated :

Description : Sound Calibrator

Manufacturer : ACO

Model : 2127

Serial No. : 130006

Ambient Environment

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

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

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

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

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

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

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

5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.

6. Audio Analyzer Keithley 2015-P S/N4106495.

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 : 22 Feb. 2024

Date of Calibration : 4 Mar. 2024

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.4

Head Office

35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,
Changwat Pathumthani 12120, Thailand

Tel. (66) 0 2577 9000

Fax. (66) 0 2577 9009

E-mail : rumpai@tistr.or.th Website:www.tistr.or.th

Office/Laboratory

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,
Amphoe Muang, Changwat Samutprakan 10280, Thailand

Tel. (66) 0 2323 1672-80 ext. 115, 116

Fax. (66) 0 2323 9165

E-mail : mtc@tistr.or.th

Office

196 Phahonyothin Road, Chatuchak, Bangkok 10900,
Thailand

Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217

Fax. (66) 0 2579 8592

E-mail : sumalee@tistr.or.th

Request No. 21-67/0304

MTC No. EEL. BP. 109/0267

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 2
1/2 inch Bruel&Kjaer 4180	93.85	-0.15	± 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	999.9	-0.1	± 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	1.65	± 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 : 4 Mar. 2024

Date of Issue : 5 Mar. 2024

Ref : 2011267022200795001

End of Certificate

2 / 2

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

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

Head Office

35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,
Changwat Pathumthani 12120, Thailand
Tel. (66) 0 2577 9000
Fax. (66) 0 2577 9009
E-mail : rumpai@tistr.or.th Website:www.tistr.or.th

Office/Laboratory

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,
Amphoe Muang, Changwat Samutprakan 10280, Thailand
Tel. (66) 0 2323 1672-80 ext. 115, 116
Fax. (66) 0 2323 9165
E-mail : mtc@tistr.or.th

Office

196 Phahonyothin Road, Chatuchak, Bangkok 10900,
Thailand
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217
Fax. (66) 0 2579 8592
E-mail : sumalee@tistr.or.th



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

Noise R_686/24

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	04 March 2024
		Due Date	04 March 2025

Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-R11	ACO	6236	00172038	14 November 2024	93.9	93.9
ACO-R14	ACO	6236	00172061	14 November 2024	93.9	93.9
ACO-R15	ACO	6236	00172062	14 November 2024	94.0	93.9
ACO-R18	ACO	6236	00172065	14 November 2024	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.85 ± 0.10 dB	

Calibrated by :

(Mr. Add Dangkom)

Approved by :

(Mr. Peera Detadom)



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

Noise R_686-1/24

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	04 March 2024
		Due Date	04 March 2025

Calibration Data

Sound Level Meter Data				Calibration Data	
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]
					Before Adjustment After Adjustment
ACO-C1-B01	ACO	6238	00223038	14 November 2024	93.9 93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.85 ± 0.10 dB

Calibrated by :

(Mr. Adul Dangklom)

Approved by :

(Mr. Peera Detudom)

เอกสาร 5-5

เอกสารสอบเทียบเครื่องมือตรวจวิเคราะห์คุณภาพอากาศ
ในสถานประกอบการ



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

Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 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
R01	SKC	224-PCXR4	602467	03/10/2024	1,000	1,500	2,000	1,005	1,505	2,008	1.006x - 6.472	1.000
R02	SKC	224-PCXR4	626450	04/10/2024	1,000	2,000	3,000	1,003	1,503	2,006	1.009x - 16.691	0.999
R03	SKC	224-PCXR4	691592	03/10/2024	1,000	1,500	2,000	996	1,506	2,006	1.008x - 13.145	1.000
R04	SKC	224-PCXR4	691672	02/10/2024	1,000	1,500	2,000	1,003	1,502	2,000	0.995x + 7.476	1.000
R05	SKC	224-PCXR4	798470	02/10/2024	1,000	1,500	2,000	1,004	1,505	2,008	1.005x - 7.440	1.000
R06	SKC	224-PCXR4	798456	04/10/2024	1,000	1,500	2,000	1,003	1,506	2,001	1.003x - 1.855	1.000
R07	SKC	224-PCXR4	798480	03/10/2024	1,000	1,500	2,000	995	1,501	1,997	1.002x - 6.149	1.000
R08	SKC	224-PCXR4	883215	04/10/2024	1,000	1,500	2,000	995	1,509	2,004	1.011x - 20.001	0.999
R09	SKC	224-PCXR4	034650	02/10/2024	1,000	1,500	2,000	996	1,500	1,997	1.000x - 1.051	1.000
R10	SKC	224-PCXR4	091765	03/10/2024	1,000	1,500	2,000	1,002	1,503	2,006	1.007x - 9.531	1.000
R11	SKC	224-PCXR4	091763	03/10/2024	1,000	1,500	2,000	999	1,506	2,001	1.010x - 20.761	0.999
R12	SKC	224-PCXR4	091568	03/10/2024	1,000	1,500	2,000	1,012	1,504	2,001	0.990x + 19.294	1.000
R13	SKC	224-PCXR4	091638	04/10/2024	1,000	1,500	2,000	1,004	1,505	2,008	1.008x - 10.210	1.000
R14	SKC	224-PCXR4	091764	03/10/2024	1,000	1,500	2,000	998	1,498	1,997	0.999x + 0.148	1.000
R15	SKC	224-PCXR8	529457	03/10/2024	1,000	1,500	2,000	1,003	1,497	2,000	0.996x + 5.377	1.000
R16	SKC	224-PCXR8	529643	04/10/2024	1,000	1,500	2,000	996	1,505	2,006	1.012x - 19.118	1.000
R17	SKC	224-PCXR8	529645	04/10/2024	1,000	1,500	2,000	1,004	1,503	2,006	1.002x - 3.334	1.000
R18	SKC	224-PCXR8	566756	04/10/2024	1,000	1,500	2,000	997	1,504	1,998	1.001x - 3.462	1.000
R19	SKC	224-PCXR8	566802	03/10/2024	1,000	1,500	2,000	1,005	1,504	2,007	1.004x - 4.118	1.000
R20	SKC	224-PCXR8	529089	01/10/2024	1,000	1,500	2,000	999	1,493	2,006	1.005x - 8.571	1.000
R21	SKC	224-PCXR8	665728	03/10/2024	1,000	1,500	2,000	1,004	1,503	1,996	0.993x + 9.763	1.000
R22	SKC	224-PCXR8	707444	04/10/2024	1,000	1,500	2,000	999	1,504	2,000	1.001x - 0.963	1.000
R23	SKC	224-PCXR8	761067	04/10/2024	1,000	1,500	2,000	1,004	1,498	2,002	0.996x + 5.501	1.000
R24	SKC	224-PCXR8	707893	04/10/2024	1,000	1,500	2,000	997	1,495	2,003	1.006x - 11.110	1.000
R25	SKC	224-PCXR8	761052	04/10/2024	1,000	1,500	2,000	1,016	1,507	2,003	0.992x + 15.204	1.000
R26	SKC	224-PCXR8	707956	04/10/2024	1,000	1,500	2,000	1,002	1,499	2,002	1.001x - 0.028	1.000
R27	SKC	224-PCXR8	707398	01/10/2024	1,000	1,500	2,000	1,008	1,505	2,008	1.006x - 6.261	1.000
R28	SKC	224-PCXR8	707481	03/10/2024	1,000	1,500	2,000	1,005	1,505	2,004	0.999x + 1.175	1.000
R29	SKC	224-PCXR8	707402	01/10/2024	1,000	1,500	2,000	1,001	1,500	1,996	1.001x - 4.617	1.000
R30	SKC	224-PCXR8	093811	03/10/2024	1,000	1,500	2,000	1,000	1,506	1,998	0.998x + 6.228	1.000
R31	SKC	224-PCXR8	093183	04/10/2024	1,000	1,500	2,000	1,005	1,502	1,999	1.006x - 13.357	0.999
R32	SKC	224-PCXR8	671950	03/10/2024	1,000	1,500	2,000	996	1,504	2,004	1.008x - 14.572	1.000
R33	SKC	224-PCXR4	626254	03/10/2024	1,000	1,500	2,000	1,005	1,503	2,008	1.007x - 9.639	1.000
R34	SKC	224-PCXR4	626131	04/10/2024	1,000	1,500	2,000	996	1,495	2,001	1.002x - 5.649	1.000
R35	SKC	224-PCXR8	707460	03/10/2024	1,000	1,500	2,000	999	1,498	1,999	0.997x + 2.375	1.000
R36	SKC	224-PCXR8	707446	04/10/2024	1,000	1,500	2,000	1,000	1,495	1,997	0.995x + 4.558	1.000
R37	SKC	224-PCXR8	707432	04/10/2024	1,000	1,500	2,000	994	1,502	1,996	1.000x - 2.818	1.000
R38	SKC	224-PCXR8	707349	04/10/2024	1,000	1,500	2,000	997	1,507	2,004	1.005x - 6.648	1.000
R39	SKC	224-PCXR8	761095	04/10/2024	1,000	1,500	2,000	1,000	1,496	1,997	0.999x + 0.856	1.000

Calibrated by :

(Mr. Abul Bangkorn)

Approved by :



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

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	05/08/2024	y = 1.192x-5.434	0.998
R02	R02	07/08/2024	y = 1.182x-2.772	0.998
R03	R03	07/08/2024	y = 1.199x-4.793	1.000
R04	R04	07/08/2024	y = 1.189x-6.456	0.996
R05	R05	07/08/2024	y = 1.162x-3.444	1.000
R06	R06	07/08/2024	y = 1.194x-3.230	0.999
R07	R07	01/08/2024	y = 1.127x-0.967	0.998
R08	R08	01/08/2024	y = 1.181x-3.206	0.998
R09	R09	01/08/2024	y = 1.197x-3.914	0.999
R10	R10	01/08/2024	y = 1.133x-1.368	0.999
R11	R11	01/08/2024	y = 1.129x+0.473	0.999
R12	R12	06/08/2024	y = 1.194x-5.439	0.998
R13	R13	06/08/2024	y = 1.166x-1.899	1.000
R14	R14	06/08/2024	y = 1.181x-3.793	0.999
R15	R15	02/08/2024	y = 1.186x-3.195	0.997
R16	R16	02/08/2024	y = 1.174x-3.244	1.000
R17	R17	01/08/2024	y = 1.120x+0.523	0.999
R18	R18	07/08/2024	y = 1.146x-2.616	1.000
R19	R19	07/08/2024	y = 1.180x-1.421	1.000
R20	R20	07/08/2024	y = 1.123x-3.226	0.996

Calibrated by :

(Mr.Adul Dangklom)

Approved by :



CERTIFICATE No : 24M2227

REFERENCE No : 72448-1

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 : 08-Mar-24

APPROVED BY : 
PONGSAK J.

ISSUED DATE : 14-Mar-24

RECEIVED DATE : 08-Mar-24



CERTIFICATE No : 24M2227

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : XS105DU
MANUFACTURER : METTLER TOLEDO S/N : 1126422905
ID No : BA05/50 RECEIVED DATE : 08-Mar-24
AIR PRESSURE : 1010mbar \pm 1mbar CALIBRATION DATE : 08-Mar-24
AMBIENT TEMPERATURE : 25°C \pm 1°C RELATIVE HUMIDITY : 53 %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	M2302013S	02-Feb-25
2) STANDARD WEIGHT	E2	15843	M2302014S	02-Feb-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 CENTRAL BUREAU OF WEIGHTS&MEASURES

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

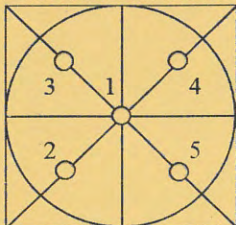
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0.000055 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (\pm g)
0.00	0.00000	0.00000	0.000065
0.02	0.02001	-0.00001	0.000065
0.10	0.10002	-0.00002	0.000066
0.20	0.20001	-0.00001	0.000066
0.50	0.50001	-0.00001	0.000065
1.00	1.00003	-0.00003	0.000066
2.00	2.00001	-0.00001	0.000067
5.00	5.00001	-0.00001	0.000068
10.00	9.99994	0.00006	0.000070
20.00	20.00008	-0.00008	0.000078
50.00	50.0000	0.0000	0.00013
100.00	100.0001	-0.0001	0.00019
120.00	120.0001	-0.0001	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

เอกสาร 5-6

เอกสารสอบเทียบเครื่องมือตรวจวัดระดับเสียงในสถานประกอบการ

Request No. 21-67/0304

MTC No. EEL. BP. 109/0267

CALIBRATION CERTIFICATE

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

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

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

Instrument Calibrated :

Description : Sound Calibrator

Manufacturer : ACO

Model : 2127

Serial No. : 130006

Ambient Environment

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

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

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

Standards used :

1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.
3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.
4. Digital Multimeter Agilent 34401A S/N MY44005560.
5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.
6. Audio Analyzer Keithley 2015-P S/N4106495.
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 : 22 Feb. 2024

Date of Calibration : 4 Mar. 2024

1 /

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.4

Head Office

35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,
Changwat Pathumthani 12120, Thailand

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Fax. (66) 0 2577 9009

E-mail : rumpai@tistr.or.th Website:www.tistr.or.th

Office/Laboratory

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,
Amphoe Muang, Changwat Samutprakan 10280, Thailand

Tel. (66) 0 2323 1672-80 ext. 115, 116

Fax. (66) 0 2323 9165

E-mail : mtc@tistr.or.th

Office

196 Phahonyothin Road, Chatuchak, Bangkok 10900,
Thailand

Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217

Fax. (66) 0 2579 8592

E-mail : sumalee@tistr.or.th

Request No. 21-67/0304

MTC No. EEL. BP. 109/0267

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 2
1/2 inch Bruel&Kjaer 4180	93.85	-0.15	± 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	999.9	-0.1	± 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	1.65	± 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 : 4 Mar. 2024

Date of Issue : 5 Mar. 2024

Ref : 2011267022200795001

End of Certificate

2 / 2

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

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

Head Office

35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,
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Amphoe Muang, Changwat Samutprakan 10280, Thailand
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E-mail : mtc@tistr.or.th

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Fax. (66) 0 2579 8592
E-mail : sumalee@tistr.or.th



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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_762/24

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	04 March 2024
		Due Date	04 March 2025

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	03 November 2024	93.9	93.9
ACO-R41	ACO	6236	00192053	03 November 2024	93.9	93.9
ACO-R50	ACO	6236	00192062	03 November 2024	94.0	93.9
ACO-R51	ACO	6236	00192063	03 November 2024	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.85 ± 0.10 dB	

Calibrated by :

(Mr. Adul Dangtorn)

Approved by :

(Mr. Peera Detudom)



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0647

MTC No. EEL. BP. 41/0967

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. : 33139

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 : 17 Sep. 2024

Date of Calibration : 25 Sep. 2024

1 /

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
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Office/Laboratory

668 Mu 2 Tambon Bangpoomai, Amphoe Muang Samutprakan,
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(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. 21-67/0647

MTC No. EEL. BP. 41/0967

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	113.56	-0.44	± 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	0.27	± 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 : 25 Sep. 2024

Date of Issue : 26 Sep. 2024

Ref : 2011267091703412007

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

Noise Dose R_693/24

Noise Dose Meter Calibration Report

Acoustic Calibrator Data

Brand	SVANTEK	Number	SV 01/60
Model	SV34	Serial No.	33137
Calibration Range	114 dB, 1000 Hz	Last Calibration	06 August 2024
		Due Date	06 August 2025

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	15 November 2024	113.5	113.5
NMD-B02	SVANTEK	SV-104IS	80842	15 November 2024	113.5	113.5
NMD-B03	SVANTEK	SV-104IS	80852	15 November 2024	113.6	113.5
NMD-B04	SVANTEK	SV-104IS	80854	15 November 2024	113.5	113.5

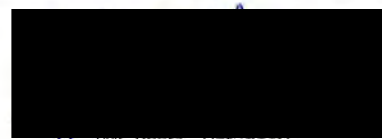
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)

113.50± 0.10 dB

Calibrated by :



Approved by :



(Mr. Peera Detudom)

เอกสาร 5-7

เอกสารสอบเทียบเครื่องมือตรวจวัดระดับความร้อนในสถานประกอบการ



ID LINE : IEC17025



Certificate of Calibration

Certificate Number : SPR24080586-1

Page : 1 of 3

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

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

Equipment Name : Area Heat Stress Monitor

Manufacturer : Quest Technologies

Model : QUESTemp 34

Serial Number : TEN040005

ID. Number : R04

Environmental Conditions

Ambient Temperature : 23 °C \pm 2 °C

Received Date : 30 Aug 2024

Relative Humidity : 50 % \pm 15 %

Calibration Date : 30 Aug 2024

Location of Calibration : In-Lab

Recommend Due Date : 30 Aug 2025

Calibration Procedure : SP-CPT-04-13

Date of Issue : 31 Aug 2024

Method of Calibration

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

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

Calibrated by : Ms. Apinya Pinyo

Calibration Officer

Approved by :

(Mr. Prayoon Topart)

Authorized Signatory



ID LINE : IEC17025



Calibration Report

Certificate Number : SPR24080586-1

Page : 2 of 3

Reference Standards

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

Traceability

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

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

Quality Reborn Co., Ltd



ID LINE : IEC17025



Result of Calibration

Certificate No. : SPR24080586-1

Page : 3 of 3

Temperature Accuracy in the Measurement. (WET)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.025	30.1	0.075	0.20
35.0	35.020	35.1	0.080	0.20
40.0	40.018	40.1	0.082	0.20

Temperature Accuracy in the Measurement. (DRY)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.025	30.0	-0.025	0.20
35.0	35.020	35.0	-0.020	0.20
40.0	40.018	40.0	-0.018	0.20

Temperature Accuracy in the Measurement. (GLOBE)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.025	30.2	0.175	0.20
35.0	35.020	35.2	0.180	0.20
40.0	40.018	40.2	0.182	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 -



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

Heat R157

Heat Stress WBGT Meter Verification Report			
Verification Data			
Heat Stress WBGT Meter No.	: R04	Verification Date	: 15 November 2024
Brand	: Quest Technologies	Ambient Temp.	: 24.5 °C
Model	: QUESTemp ^o 36	Barometric Pressure	: 1011 mmbar
Serial No.	: TEN040005	Relative Humidity	: 49 %
Verification Module (Electronic Sensor Check) :			
Verification Module No. : 21 WB = 12.5 °C, DB = 47.1 °C, G = 69.3 °C			
Result of Verification : Without Adjustment			
Wet Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
12.5	12.7	-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	69.1	0.2	± 0.5
UUC* = UNIT UNDER CALIBRATION			

Verified by :

(Mr. Adul Dangklom)

Approved by :

(Mr. Peera Detudom)



ID LINE : IEC17025



Certificate of Calibration

Certificate Number : SPR24030285-6

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 2024

Calibration Date : 20 Mar 2024

Recommend Due Date : 20 Mar 2025

Date of Issue : 21 Mar 2024

Method of Calibration

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

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

Calibrated by : Mr. Navaporn Uengseng

Calibration Officer

Approved by :

(Ms. Bussakorn Chaikaew)

Authorized Signatory



ID LINE : IEC17025



Calibration Report

Certificate Number : SPR24030285-6

Page : 2 of 3

Reference Standards

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

Traceability

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

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

Quality Reborn Co., Ltd



ID LINE : IEC17025



Result of Calibration

Certificate No. : SPR24030285-6

Page : 3 of 3

Temperature Accuracy in the Measurement. (WET)

Unit : °C

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

Temperature Accuracy in the Measurement. (DRY)

Unit : °C

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

Temperature Accuracy in the Measurement. (GLOBE)

Unit : °C

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

Note :

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

Measurement Uncertainty

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

- End of Certificate -



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

Heat R157

Heat Stress WBGT Meter Verification Report			
Verification Data			
Heat Stress WBGT Meter No.	: R05	Verification Date	: 15 November 2024
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 :

(Mr.Adul Dangklom)

Approved by :

(Mr. Peera Detudom)



ID LINE : IEC17025



Certificate of Calibration

Certificate Number : SPR24080586-2

Page : 1 of 3

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

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

Equipment Name : Area Heat Stress Monitor

Manufacturer : Metrosonics

Model : hs-32

Serial Number : MCD070028

ID. Number : R06

Environmental Conditions

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

Received Date : 30 Aug 2024

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

Calibration Date : 30 Aug 2024

Location of Calibration : In-Lab

Recommend Due Date : 30 Aug 2025

Calibration Procedure : SP-CPT-04-13

Date of Issue : 31 Aug 2024

Method of Calibration

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

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

Calibrated by : Ms. Apinya Pinyo

Calibration Officer

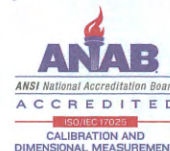
Approved by :

(Mr. Prayoon Topart)

Authorized Signatory



ID LINE : IEC17025



Calibration Report

Certificate Number : SPR24080586-2

Page : 2 of 3

Reference Standards

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

Traceability

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

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

Quality Reborn Co., Ltd



ID LINE : IEC17025



Result of Calibration

Certificate No. : SPR24080586-2

Page : 3 of 3

Temperature Accuracy in the Measurement. (WET)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.018	30.0	-0.018	0.20
35.0	35.012	35.0	-0.012	0.20
40.0	40.022	40.0	-0.022	0.20

Temperature Accuracy in the Measurement. (DRY)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.018	30.0	-0.018	0.20
35.0	35.012	35.0	-0.012	0.20
40.0	40.022	40.0	-0.022	0.20

Temperature Accuracy in the Measurement. (GLOBE)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.018	30.1	0.082	0.20
35.0	35.012	35.1	0.088	0.20
40.0	40.022	40.1	0.078	0.20

Note:

The result of calibration was found accurate as show on date and place of calibration only.
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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 -



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

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

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

Heat R157

Heat Stress WBGT Meter Verification Report			
Verification Data			
Heat Stress WBGT Meter No.	: R06	Verification Date	: 15 November 2024
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	12.5	0.0	± 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 :

(Mr. Adda Dangtorn)

Approved by :

(Mr. Peera Detudom)