

ภาคผนวก ก-2

สำเนาเอกสารสอบเทียบความถูกต้อง
ของเครื่องมือเก็บตัวอย่าง

Head Office	Office/Laboratory	Office
35 Mu 3 Tambon Wilom Na, Amphoe Phitong Luang, Changwat Phitong Luang 11210, Thailand Tel. (66) 0 2577 9000 Fax. (66) 0 2577 9009 E-mail: rumpalgit@r.th Website: www.tistr.or.th	Sol 1C, Bangpoo Industrial Estate, Sukhumvit Road, Amphoe Muang, Changwat Samutprakarn 10280, Thailand Tel. (66) 0 2323 1672 ext. 115, 116 Fax. (66) 0 2323 9165 E-mail: mtc@tistr.or.th	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



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Mechanical Engineering Standards Laboratory Soi 1, Bangpoo Industrial Estate, Muang, Samutprakarn 10280, Thailand.

Request No.23-65/0151

2/2

MTC.No.23-65/0151

Calibration point : (0.05, 0.1, 0.2, 1.0, 2.0, 3.0) l/min

Ambient condition : Temperature (23 ± 3) °C , Relative humidity (55 ± 15) %

Atmospheric pressure (1010 ± 13) hPa

Calibration method : The flowmeter (UUC) was calibrated by comparison method with standard flowmeter according to CP-370.01.

The reported value is the value that converted to value at reference condition within pressure and temperature of the actual gas entering the UUC

Measurement data :

UUC Value (l/min)	Standard Value (l/min)	Temperature (°C)	Pressure (hPa)	Deviation (%)	Uncertainty (%)
0.0538	0.052932	22.341	1009.53	+1.64	1.04
0.1035	0.10226	22.760	1013.89	+1.24	0.99
0.2021	0.20002	22.560	1013.78	+1.06	0.98
1.022	1.0146	22.289	1013.97	+0.72	0.85
2.007	1.9940	22.340	1014.53	+0.65	0.85
3.009	2.9912	22.438	1015.13	+0.58	0.85

The reported expanded uncertainties are based on standard uncertainties multiplied by a coverage factor $k=2$, which provides a level of confidence of approximately 95%.

The end of calibration certificate.

78.

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

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

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

Office/Laboratory
Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,
Amphoe Muang, Changwat Samutprakarn 10280, Thailand
Tel. (66) 0 2323 1672-80 ext. 115, 116
Fax. (66) 0 2323 9165
E-mail : mtg@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

FM.BLMTC.002 Rev.4



QUALITY CALIBRATION CO.,LTD.
235 Petchkasem 63/2 Road, Laksong, Banglae, Bangkok 10160
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584
www.qcalibration.com



CERTIFICATE No : 21M7483
REFERENCE No : 62011-1

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE
MANUFACTURER : METTLER TOLEDO
MODEL : DRAGON 204
SERIAL No : 1200500387
ID No : LAB-BL-002
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : PACIFIC LABORATORY CO., LTD.
14/5358 MOO. 14 TAMBOL BANGBUA THONG
AMPHOE BANG NUA THONG, NONTABURI
11110

CALIBRATED BY : ATSAWIN Y.
CALIBRATION DATE : 06-Aug-21

APPROVED BY :
PONGSAK J.

ISSUED DATE : 07-Aug-21

RECEIVED DATE : 06-Aug-21

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



CERTIFICATE No : 21M7483

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE : MODEL : DRAGON 204
MANUFACTURER : METTLER TOLEDO : S/N : 1200500387
ID No : LAB-BL-002 : RECEIVED DATE : 06-Aug-21
AIR PRESSURE : 1009mbar \pm 1mbar : CALIBRATION DATE : 06-Aug-21
AMBIENT TEMPERATURE : 24°C \pm 1°C : RELATIVE HUMIDITY : 49%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 ADJUSTED USING WEIGHT OF QUALITY CALIBRATION TO ADJUST. 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-4-151 : C02210415 : 09-Feb-23
3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON 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 0.000042 g

4. DEPARTURE FROM NOMINAL VALUE / LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (\pm g)
0.000	0.0000	0.0000	0.000073
0.001	0.0010	0.0000	0.000073
0.010	0.0100	0.0000	0.000074
0.050	0.0500	0.0000	0.000075
0.100	0.1000	0.0000	0.000074
1.000	1.0000	0.0000	0.000075
2.000	2.0000	0.0000	0.000075
5.000	5.0000	0.0000	0.000077
20.000	20.0000	0.0000	0.000085
50.000	50.0000	0.0000	0.00013
100.000	100.0001	-0.0001	0.00019
150.000	150.0001	-0.0001	0.00026
200.000	200.0000	0.0000	0.00032

5. OFF-CENTER LOADING ERROR



POINT	READING (g)
1	100.0000
2	99.9999
3	100.0001
4	99.9999
5	100.0000
OFF-CENTER LOADING	0.0001

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

F-G010 REV 02



Certificate of Calibration

Certificate Number : SPR2020152-2 Page : 1 of 3

Customer : Pacific Laboratory Co.,Ltd.

14/5358 Moo 14 Tambol Bang Bua Thong, Amphoe Bang Bua Thong,
Nonthaburi 11110

Equipment Name : Area Heat Stress Monitor

Manufacturer : 3M

Model : WB-300

Serial Number : WBR080020

ID. Number : No.17

Environmental Conditions

Ambient Temperature : 23 °C \pm 2 °C Received Date : 10 Feb 2022

Relative Humidity : 50 % \pm 15 % Calibration Date : 11 Feb 2022

Location of Calibration : In-Lab Recommend Due Date : 11 Feb 2023

Calibration Procedure : SP-CPT-04-13 Date of Issue : 12 Feb 2022

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 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.
All calibrations are performed within manufacture's specifications. The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by : Mr. Prayoon Topart

Approved by :

Calibration Officer

(Mr. Worapong Sinthusopa)

Authorized Signatory

Calibration Report

Certificate Number : SPR2020152-2

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due Date
Humidity Chamber	TH-80S	N/A	SPR21020224-9	04 Mar 2022
THERMO-HYGROMETER	5020A	A47046	PSL-H 302/63	30 Sep 2022

Traceability

This certification is traceable to the International System of Unit maintained at :
SP Metrology - SP Metrology system (Thailand) Co.Ltd.
TISTR - Thailand Institute of Scientific and Technological Research

Result of Calibration

Certificate No. : SPR2020152-2

Page : 3 of 3

Temperature Accuracy in the Measurement. (WET)

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.021	30.0	-0.021	0.50
32.0	32.018	32.0	-0.018	0.50
34.0	34.016	34.0	-0.016	0.50

Temperature Accuracy in the Measurement. (DRY)

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.021	29.9	-0.121	0.50
32.0	32.018	31.9	-0.118	0.50
34.0	34.016	33.9	-0.116	0.50

Temperature Accuracy in the Measurement. (GLOBE)

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.021	30.0	-0.021	0.50
32.0	32.018	32.0	-0.018	0.50
34.0	34.016	34.0	-0.016	0.50

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 -

Certificate of Calibration

Certificate Number : SPR22030094-1
Customer : Pacific Laboratory Co.,Ltd.
14/5358 Moo 14 Tambol Bang Bua Thong, Amphoe Bang Bua Thong,
Nonthaburi 11110

Equipment Name	: Area Heat Stress Monitor
Manufacturer	: Quest Technologies
Model	: QUESTemp 34
Serial Number	: TED060013
ID. Number	: N/A
Environmental Conditions	
Ambient Temperature	: 23 °C ± 2 °C Received Date : 07 Mar 2022
Relative Humidity	: 50 % ± 15 % Calibration Date : 15 Mar 2022
Location of Calibration	: In-Lab Recommend Due Date : 15 Mar 2023
Calibration Procedure	: SP-CPT-04-13 Date of Issue : 16 Mar 2022

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.
All calibrations are performed within manufacture's specifications.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.Worapong Sinthusopa)
Authorized Signatory

Calibration Report

Certificate Number : SPR22030094-1

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Humidity Chamber	TH-80S	N/A	SPR22010401-8	05 Mar 2023
THERMO-HYGROMETER	5020A	A47046	QR22-0191	02 Feb 2023

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



Result of Calibration

Certificate No. : SPR22030094-1

Page : 3 of 3

Temperature Accuracy in the Measurement. (WET)

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.008	30.0	-0.008	0.50
32.0	32.011	32.0	-0.011	0.50
34.0	34.014	34.0	-0.014	0.50

Temperature Accuracy in the Measurement. (DRY)

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.008	29.9	-0.108	0.50
32.0	32.011	31.9	-0.111	0.50
34.0	34.014	33.9	-0.114	0.50

Temperature Accuracy in the Measurement. (GLOBE)

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.008	29.9	-0.108	0.50
32.0	32.011	31.9	-0.111	0.50
34.0	34.014	33.9	-0.114	0.50

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 -



Certificate of Calibration

Certificate No.: WK2111-070-1

Page 1 of 2

Customer : PACIFIC LABORATORY CO.,LTD.
14/5358 Moo 14, T.Bangbuathong,
A.Bangbuathong, Nonthaburi 11110

Instrument : Light Meter	Ambient Temperature : (23.0 ± 2) °C
Manufacturer : Digicon	Humidity : (60.0 ± 15) %RH
Model : LX-73	Received Date : 11-Nov-21
Serial No. : Q974264	Calibrated Date : 12-Nov-21
Identity No. : No.1	Issued Date : 12-Nov-21
Range : 0 lux to 5000 lux	Calibrated Location : In Lab
Resolution : See to Data	
Calibration Method : CP-WK-PR04	

Reference standard instruments :

Instrument	Serial No.	Certificate No.	Due Date	Traceability to
Standard Light Meter	S1102844	21PH422	2-Sep-22	TPA

TPA : Technology Promotion Association (Thailand-Japan)
This result calibrate was found accurate as shown on date place of calibrate only
This certificate is traceability to the International System of Unit (SI)

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%

Calibrated by : Ms. Siriwan Wongtabtim

Approved by :

Ms. Budsagorn Patcha
Authorized Signatory

This certificate may not be reproduced except in full unless permission for the reproduction has been obtained in writing from the laboratory.

Calibration Results

Certificate No. : WK2111-070-1

Page 2 of 2

Calibration Result of the Accuracy

Function : Light Measurement
Range : 0 lux to 5000 lux

Range	STD Setting	UUC Reading	Error	Uncertainty (± lux)	Unit : lux	
					Tolerance Limit Value (mm)	
40	0.00	0.00	0.00	0.058	-0.20 ~ 0.20	
400	100.0	102.8	2.8	1.6	95.0 ~ 105.0	
	200.0	203.2	3.2	3.2	192.0 ~ 208.0	
4000	400	425	25	6.4	368 ~ 432	
	500	526	26	8	465 ~ 535	
	1000	1033	33	16	950 ~ 1050	
	2000	2040	40	32	1920 ~ 2080	
	3000	3054	54	48	2890 ~ 3110	
40000	4000	4060	60	64	3680 ~ 4320	
	5000	5080	80	80	4650 ~ 5350	

(X) Without Adjustment () After Adjustment

This certificate may not be reproduced except in full unless permission for the reproduction has been obtained in writing from the laboratory.

**** End of Certificate****



**ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT**
975 Moo 4, Bangpoo Industrial Estate, Soi 8, Sukhumvit Road km 37,
Phraek Sa, Mueang Samut Prakan, Samut Prakan 10280
Tel: +66 2709 4860-8 Fax: +66 2324 0917-8



Certificate No.: 0166SV21
Operation No.: CP2021040002

Certificate of Calibration

Equipment: Sound Calibrator
Manufacturer: TENMARS
Model/Type: TM-100
Serial No.: 190301469
ID No.: -
Customer: Pacific Laboratory Co., Ltd.
Address: 14/5358 Moo 14 T. Bang Bua Thong
A. Bang Bua Thong, Nonthaburi 11110

Received Date: 2 April 2021
Calibrated Date: 5 April 2021
Issued Date: 9 April 2021
Calibrated by: Ms. Juntaporn Kunhakom

Approved by:


(Mr. Sittichai Swanson)
Group Manager

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor $k = 2.00$, providing a level of confidence of approximately 95%. This certificate may not be reproduced other than in full except with the prior written approval of the Electrical and Electronics Institute, Foundation for Industrial Development.



สถาบันพัฒนาอุตสาหกรรม
ELECTRICAL AND ELECTRONICS INSTITUTE

สถาบันพัฒนาอุตสาหกรรม
ELECTRICAL AND ELECTRONICS INSTITUTE

Certificate No.: 0166SV21

Calibration Report

Equipment: Sound Calibrator
Manufacturer: TENMARS
Model/Type: TM-100
Serial No.: 190301469
ID No.:
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Pressure: (101.3 ± 1.5) kPa
Method of Calibration :-
IEC 60942:2017

Condition of this result of calibration

1. Reference standards instrument :-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Standard microphone	4180	2661000	AA-1013-20	12 May 2021
2) Waveform Generator	33511B	MY52302264	0100RF20	17 June 2021
3) Audio Analyzing DMM	2015-P	000136E	E1U203927	16 November 2021
4) Pressure humidity and Temperature Transmitter	PTU301	F0640002	CL1-P200051	31 May 2021
			0305TE20	28 June 2021

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

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

Reference standards instrument for Acoustic function

- National Institute of Metrology (Thailand)

Reference standards instrument for Electrical function

- Electrical and Electronics Institute; ONSC Accredited Calibration No.0119

Result of Calibration:-

1. Function : Sound pressure level

Normal Frequency (Hz)	Specified Sound Pressure level (dB)	Measured value (dB)	Deviated value ^[1] (dB)	Acceptance limit ^[3] (dB)
1000	94	94.03	0.03	±0.40
1000	114	114.11	0.11	±0.40

2. Function : Frequency

Normal Sound Pressure level (dB)	Specified Frequency (Hz)	Measured value (Hz)	Deviated value ^[2] (%)	Acceptance limit ^[3] (%)
94	1000	970.7	-2.9	±1.7
114	1000	966.2	-3.4	±1.7

Certificate No.: 0166SV21

Calibration Report

3. Function : Total distortion + noise

Normal Sound Pressure level (dB)	Normal Frequency (Hz)	Measured value ^[4] (%)	Acceptance limit ^[5] (%)
94	1000	3.0	3.0
114	1000	2.0	3.0

Uncertainty of measurement

Function	Uncertainty	Maximum-permitted uncertainty of measurement
Sound pressure level	0.10 dB	0.35 dB
Frequency	0.10 %	0.20 %
Total distortion + noise	0.40 %	1.00 %

Note: [1] The deviated value is the absolute value of the difference between the measured value and the corresponding specified sound pressure level.

[2] The deviated value is the absolute value of the difference in percent between the measured value and the corresponding specified frequency.

[3] The acceptance limit is for the deviated value.

[4] The measured value is the total distortion + noise, measured over the frequency range from 20 Hz to 20 kHz.

[5] The acceptance limit is for the Measured value.

Remarks: 1. Acceptance limit was IEC 60942:2017 Class 2.

-- End of Report --



APTITECH CALIBRATION CO., LTD.
50/40 Moo 5 T. Lat Sai, A. Lamukha, Pathumthai 12150
Tel. +66 2103-6290 Fax. +66 2103-6291
Email. sales@aptitech-cal.com



CERTIFICATE OF CALIBRATION

Certificate Number : SC220036

Customer
Address

: Pacific Laboratory Co., Ltd.
: 14/5358 Moo 14 Tambol Bang Bua Thong,
Amphoe Bang Thong, Nonthaburi 11110

Description
Manufacturer
Model
Serial Number
ID. Number

: Sound Level Meter
: ACO
: 6236
: 222015
: -
W/O Number : SC220036
Calibration Location : Laboratory
Ambient Temperature : $22 \pm 2^\circ\text{C}$
Ambient Humidity : $55 \pm 15\% \text{RH}$
Received Date : 03-Jan-22

This certifies that the above instrument was calibrated in compliance with the Calibration Systems Requirement of ISO/IEC 17025:2017 in accordance with referenced procedures. Standards used to perform this calibration are certified by or traceable to National Institute of Metrology (Thailand) and/or other recognized national measurement institutes which realizes the units of measurement according to the International System of Units (SI Units).

Measurement uncertainties at the time of test are given where applicable. They are calculated in accordance with the method described in The Expression of Uncertainty and Confidence in Measurement (M3003).

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by coverage factor $k=2$ such that the coverage probability corresponds to approximately 95%. This result of calibration was found accurate as shown on date and place of calibration only.

Standard Equipments

Description Sound Level Calibrator	Serial No. 141011576	Certificate No. 0175SV20	Traceability NIMT	Due Date 23-Apr-22
---------------------------------------	-------------------------	-----------------------------	----------------------	-----------------------

Authority of Calibration

Approved Signatory

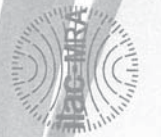
☐ Mr. Anuwat Simsirawat [Laboratory Manager]
☒ Mr. Aumnart Uppanan [Quality Manager]

Calibration Date : 05-Jan-2022
Issued Date : 12-Jan-2022
Calibrated By : Mr. Rattapong Junpunya

Calibration certificates without signatures are not valid. This certificate applied to only the item identified and shall not be reproduced other than in full, without the specific written approval by APTITECH CALIBRATION CO.,



APTITECH CALIBRATION CO., LTD.
50/40 Moo 5 T. Lat Sai, A. Lamukha, Pathumthai 12150
Tel. +66 2103-6290 Fax. +66 2103-6291
Email. sales@aptitech-cal.com



CALIBRATION REPORT

Certificate Number : SC220036

Calibration Method

The Unit Under Calibration (UUC) was calibrated by comparison measurement with sound level calibrator. The calibration has been accomplished in an ambient environment controlled, base on the in-house calibration procedure. The identification of the laboratory's calibration procedure employed are CP-7.2-01-107

Calibration Results

Appearance and function of use : Good
Results of Calibration : Without any adjustment

Sound Level Measurement (Slow Mode)

Function	UUC Range	Standard Value	UUC Reading	UUC Error	(\pm) Uncertainty
LA	40-130 dB	93.86 dB 113.87 dB	93.9 dB 113.9 dB	0.04 dB 0.03 dB	0.60 dB 0.60 dB
LC	40-130 dB	93.86 dB 113.87 dB	93.9 dB 113.9 dB	0.04 dB 0.03 dB	0.60 dB 0.60 dB

Sound Level Measurement (Fast Mode)

Function	UUC Range	Standard Value	UUC Reading	UUC Error	(\pm) Uncertainty
LA	40-130 dB	93.86 dB 113.87 dB	93.9 dB 113.9 dB	0.04 dB 0.03 dB	0.60 dB 0.60 dB
LC	40-130 dB	93.86 dB 113.87 dB	93.9 dB 113.9 dB	0.04 dB 0.03 dB	0.60 dB 0.60 dB

--- End of Certificate ---



APTITECH CALIBRATION CO., LTD.
50/40 Moo 5 T. Lat Sai, A. Lam Lukka, Pathumthai 12150
Tel. +66 2103-6290 Fax. +66 2103-6291
Email: sales@aptitech-cal.com



CERTIFICATE OF CALIBRATION

Certificate Number : SC220039

Customer
Address

: Pacific Laboratory Co., Ltd.
: 14/5358 Moo 14 Tambol Bang Bua Thong,
Amphoe Bang Thong, Nonthaburi 11110

Description
Manufacturer
Model
Serial Number
ID. Number

: Sound Level Meter
: ACO
: 6236
: 222018
: -
W/O Number : SC220039
Calibration Location : Laboratory
Ambient Temperature : $22 \pm 2^\circ\text{C}$
Ambient Humidity : $55 \pm 15\% \text{RH}$
Received Date : 03-Jan-22

This certifies that the above instrument was calibrated in compliance with the Calibration Systems Requirement of ISO/IEC 17025:2017 in accordance with referenced procedures. Standards used to perform this calibration are certified by or traceable to National Institute of Metrology (Thailand) and/or other recognized national measurement institutes which realizes the units of measurement according to the International System of Units (SI Units).

Measurement uncertainties at the time of test are given where applicable. They are calculated in accordance with the method described in The Expression of Uncertainty and Confidence in Measurement (M3003).

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by coverage factor $k=2$ such that the coverage probability corresponds to approximately 95%. This result of calibration was found accurate as shown on date and place of calibration only.

Standard Equipments

Description	Serial No.	Certificate No.	Traceability	Due Date
Sound Level Calibrator	141011576	0175SV20	NIMT	23-Apr-22

Authority of Calibration

Approved Signatory

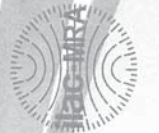
Calibration Date : 05-Jan-2022
Issued Date : 12-Jan-2022
Calibrated By : Mr. Rattapong Jumphunya

☐ Mr. Anuwat Simsirwat | Laboratory Manager |
☒ Mr. Aumnart Uppanun | Quality Manager |

Calibration certificates without signatures are not valid. This certificate applied to only the item identified and shall not be reproduced other than in full, without the specific written approval by APTITECH CALIBRATION CO.,



APTITECH CALIBRATION CO., LTD.
50/40 Moo 5 T. Lat Sai, A. Lam Lukka, Pathumthai 12150
Tel. +66 2103-6290 Fax. +66 2103-6291
Email: sales@aptitech-cal.com



CALIBRATION REPORT

Certificate Number : SC220039

Calibration Method

The Unit Under Calibration (UUC) was calibrated by comparison measurement with sound level calibrator. The calibration has been accomplished in an ambient environment controlled, base on the in-house calibration procedure. The identification of the laboratory's calibration procedure employed are CP-7.2-01-107

Calibration Results

Appearance and function of use : Good
Results of Calibration : Without any adjustment

Sound Level Measurement (Slow Mode)

Function	UUC Range	Standard Value	UUC Reading	UUC Error	(±) Uncertainty
LA	40-130 dB	93.86 dB	93.9 dB	0.04 dB	0.60 dB
		113.87 dB	113.9 dB	0.03 dB	0.60 dB
LC	40-130 dB	93.86 dB	93.9 dB	0.04 dB	0.60 dB
		113.87 dB	113.9 dB	0.03 dB	0.60 dB

Sound Level Measurement (Fast Mode)

Function	UUC Range	Standard Value	UUC Reading	UUC Error	(±) Uncertainty
LA	40-130 dB	93.86 dB	93.9 dB	0.04 dB	0.60 dB
		113.87 dB	113.9 dB	0.03 dB	0.60 dB
LC	40-130 dB	93.86 dB	93.9 dB	0.04 dB	0.60 dB
		113.87 dB	113.9 dB	0.03 dB	0.60 dB

--- End of Certificate ---

CERTIFICATE OF CALIBRATION

Certificate Number : SC220041

Customer

Address

: Pacific Laboratory Co., Ltd.

: 14/5358 Moo 14 Tambol Bang Bua Thong,

Amphoe Bang Thong, Nonthaburi 11110

Description

Manufacturer

Model

Serial Number

ID, Number

: Sound Level Meter

: ACO

: 6236

: 222020

: -

W/O Number

Calibration Location

Ambient Temperature

Ambient Humidity

Received Date

: SC220041

: Laboratory

: 22 ± 2 °C

: 55 ± 15 %RH

: 03-Jan-22

This certifies that the above instrument was calibrated in compliance with the Calibration Systems Requirement of ISO/IEC 17025:2017 in accordance with referenced procedures. Standards used to perform this calibration are certified by or traceable to National Institute of Metrology (Thailand) and/or other recognized national measurement institutes which realizes the units of measurement according to the International System of Units (SI Unit).

Measurement uncertainties at the time of test are given where applicable. They are calculated in accordance with the method described in The Expression of Uncertainty and Confidence in Measurement (M3003).

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by coverage factor k=2 such that the coverage probability corresponds to approximately 95%. This result of calibration was found accurate as shown on date and place of calibration only.

Standard Equipments			
Description	Serial No.	Certificate No.	Due Date
Sound Level Calibrator	141011576	0175SV20	23-Apr-22
		Traceability	
		NIMT	

Authority of Calibration

Approved Signatory

Signature

Calibration Date :

Issued Date :

Calibrated By :

05-Jan-2022

12-Jan-2022

Mr.Suchou Lardsa-ard

Mr. Anuwat Simsiwat | Laboratory Manager |

Mr. Aumnart Uppanan | Quality Manager |

CALIBRATION REPORT

Certificate Number : SC220041

Calibration Method

The Unit Under Calibration (UUC) was calibrated by comparison measurement with sound level calibrator. The calibration has been accomplished in an ambient environment controlled, base on the in-house calibration procedure. The identification of the laboratory's calibration procedure employed are CP-7.2-01-107

Calibration Results

Appearance and function of use

Results of Calibration

: Good

: Without any adjustment

Sound Level Measurement (Slow Mode)

Function	UUC Range	Standard Value	UUC Reading	UUC Error	(±) Uncertainty
LA	40-130 dB	93.86 dB	93.9 dB	0.04 dB	0.60 dB
		113.87 dB	113.9 dB	0.03 dB	0.60 dB
LC	40-130 dB	93.86 dB	93.8 dB	-0.06 dB	0.60 dB
		113.87 dB	113.9 dB	0.03 dB	0.60 dB

Sound Level Measurement (Fast Mode)

Function	UUC Range	Standard Value	UUC Reading	UUC Error	(±) Uncertainty
LA	40-130 dB	93.86 dB	93.9 dB	0.04 dB	0.60 dB
		113.87 dB	113.9 dB	0.03 dB	0.60 dB
LC	40-130 dB	93.86 dB	93.8 dB	-0.06 dB	0.60 dB
		113.87 dB	113.9 dB	0.03 dB	0.60 dB

--- End of Certificate ---

CERTIFICATE OF CALIBRATION

Certificate Number : SC220105

Customer Address : Pacific Laboratory Co., Ltd.
: 14/5358 Moo 14 Tambol Bang Bua Thong,
Amphoe Bang Thong, Nonthaburi 11110

Description	: Noise Dose Meter	W/O Number	: SC220105
Manufacturer	: Soundtek	Calibration Location	: Laboratory
Model	: ST-130	Ambient Temperature	: $22 \pm 2^\circ\text{C}$
Serial Number	: 220100150	Ambient Humidity	: $55 \pm 15\% \text{RH}$
Number	:	Received Date	: 24-Feb-2022

This certifies that the above instrument was calibrated in compliance with the Calibration Systems Requirement of ISO/IEC 17025:2017 in accordance with referenced procedures. Standards used to perform this calibration are certified by or traceable to National Institute of Metrology (Thailand) and/or other recognized national measurement institutes which realizes the units of measurement according to the International System of Units (SI Unit).

Measurement uncertainties at the time of test are given where applicable. They are calculated in accordance with the method described in The Expression of Uncertainty and Confidence in Measurement (M3003).

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by coverage factor $k=2$ such that the coverage probability corresponds to approximately 95%. This result of calibration was found accurate as shown on date and place of calibration only.

Standard Equipments

Description	Serial No.	Certificate No.	Traceability	Due Date
Sound Level Calibrator	141011576	0175SV20	NIMT	23-Apr-22

Authority of Calibration

Approved Signatory _____

Calibration Date : 24-Feb-2022
 Issued Date : 25-Feb-2022
 Calibrated By : Mr.Suchou Lardsa-ard

☐ Mr. Anuwat Simsiriwat | Laboratory Manager |

Calibration certificates without signatures are not valid. This certificate applied to only the item identified and shall not be reproduced other than in full, without the specific written approval by APTITECH CALIBRATION CO., LTD.

CALIBRATION REPORT

Certificate Number : SC220105

Calibration Method

The Unit Under Calibration (UUC) was calibrated by comparison measurement with sound level calibrator. The calibration has been accomplished in an ambient environment controlled, based on the in-house calibration procedure. The identification of the laboratory's calibration procedure employed are CP-7.2-01-1-17

Calibration Results

Appearance and function of use	: Good
Results of Calibration	: Without any adjustment

Sound Level Measurement (Slow Mode)

Function	UUC Range	Standard Value	UUC Reading	UUC Error	(\pm) Uncertainty
A	30-140 dB	93.9 dB 113.9 dB	93.8 dB 113.9 dB	-0.1 dB 0.0 dB	0.60 dB 0.60 dB
C	30-140 dB	93.9 dB 113.9 dB	93.8 dB 113.8 dB	-0.1 dB -0.1 dB	0.60 dB 0.60 dB

Sound Level Measurement (Fast Mode)

Function	UUC Range	Standard Value	UUC Reading	UUC Error	(±) Uncertainty
A	30-140 dB	93.9 dB 113.9 dB	93.8 dB 113.9 dB	-0.1 dB 0.0 dB	0.60 dB 0.60 dB
C	30-140 dB	93.9 dB 113.9 dB	93.8 dB 113.8 dB	-0.1 dB -0.1 dB	0.60 dB 0.60 dB

--- End of Certificate ---

--- End of Certificate ---



APPTITECH CALIBRATION CO., LTD.
50/40 Moo 5 T. Lat Sawai, A. Lamukha, Pathumthai 12150
Tel. +66 2103-6290 Fax. +66 2103-6291
Email. sales@apptitech-cal.com



CERTIFICATE OF CALIBRATION

Certificate Number : SC220101

Customer : Pacific Laboratory Co. Ltd.
Address : 14/5358 Moo 14 Tambol Bang Bua Thong,
Amphoe Bang Thong, Nonthaburi 11110

Description : Noise Dose Meter
Manufacturer : Soundtek
Model : ST-130
Serial Number : 220100154
ID. Number : -
W/O Number : SC220101
Calibration Location : Laboratory
Ambient Temperature : 22 ± 2 °C
Ambient Humidity : 55 ± 15 %RH
Received Date : 24-Feb-2022

This certifies that the above instrument was calibrated in compliance with the Calibration Systems Requirement of ISO/IEC 17025:2017 in accordance with referenced procedures. Standards used to perform this calibration are certified by or traceable to National Institute of Metrology (Thailand) and/or other recognized national measurement institutes which realizes the units of measurement according to the International System of Units (SI Unit).

Measurement uncertainties at the time of test are given where applicable. They are calculated in accordance with the method described in The Expression of Uncertainty and Confidence in Measurement (M3003). The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by coverage factor $k=2$ such that the coverage probability corresponds to approximately 95%. This result of calibration was found accurate as shown on date and place of calibration only.

Description	Serial No.	Certificate No.	Traceability	Due Date
Sound Level Calibrator	141011576	0175SV20	NIMT	23-Apr-22

Authority of Calibration

Approved Signatory 
Calibration Date : 24-Feb-2022
Issued Date : 25-Feb-2022
Calibrated By : Mr. Suchou Lardsu-ard

☐ Mr. Anuwat Simsiriwat | Laboratory Manager |
☒ Mr. Aumnart Uppanan | Quality Manager |

Calibration certificates without signatures are not valid. This certificate applied to only the item identified and shall not be reproduced other than in full, without the specific written approval by APPTITECH CALIBRATION CO., LTD.



APPTITECH CALIBRATION CO., LTD.
50/40 Moo 5 T. Lat Sawai, A. Lamukha, Pathumthai 12150
Tel. +66 2103-6290 Fax. +66 2103-6291
Email. sales@apptitech-cal.com



CALIBRATION REPORT

Certificate Number : SC220101

Calibration Method

The Unit Under Calibration (UUC) was calibrated by comparison measurement with sound level calibrator. The calibration has been accomplished in an ambient environment controlled, base on the in-house calibration procedure. The identification of the laboratory's calibration procedure employed are CP-7.2-01-107

Calibration Results

Appearance and function of use : Good
Results of Calibration : Without any adjustment

Sound Level Measurement (Slow Mode)

Function	UUC Range	Standard Value	UUC Reading	UUC Error	(±) Uncertainty
A	30-140 dB	93.9 dB	94.2 dB	0.3 dB	0.60 dB
		113.9 dB	114.2 dB	0.3 dB	0.60 dB
C	30-140 dB	93.9 dB	94.2 dB	0.3 dB	0.60 dB
		113.9 dB	114.3 dB	0.4 dB	0.60 dB

Sound Level Measurement (Fast Mode)

Function	UUC Range	Standard Value	UUC Reading	UUC Error	(±) Uncertainty
A	30-140 dB	93.9 dB	94.2 dB	0.3 dB	0.60 dB
		113.9 dB	114.2 dB	0.3 dB	0.60 dB
C	30-140 dB	93.9 dB	94.2 dB	0.3 dB	0.60 dB
		113.9 dB	114.2 dB	0.3 dB	0.60 dB

--- End of Certificate ---

Industrial Calibration Co., Ltd.

38/41 Moo. 3, Lum Luk Ka Road., Khu Khot Subdistrict,
Lam Luk Ka District, Phatthum Thani 12130 Thailand.

Tel : +66 (02) 991 0440

Fax : +66 (02) 531 6294

Email : info@industrial.co.th

dB bar
%RH VA
m/s kg



CERTIFICATE No. CAL12022-21 PAGE 1 OF 4

Certificate of Calibration

Equipment : NOISE DOSIMETER
Manufacture : EXTECH
Model / Type : SL400
Serial No. : 210100146
ID No. : N/A
Customer : Pacific Laboratory Co., Ltd.
14/5358 Moo.14 T.Bang Bua Thong A.Bang Bua Thong Nonthaburi 11110

Environment: 25 +/- 3°C (IN-HOUSE); 50 +/- 20%RH

Date Of Receipt : DECEMBER 15, 2021

Date Of Calibration : DECEMBER 16, 2021

Calibration By : CHICHAWADEE CHAIYAKHAD

Approved By : 
(CHINNAWAT DUMPUTI)

Date of Issue : DECEMBER 16, 2021

MEASUREMENT UNCERTAINTY :

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR $k = 2$, WHICH EFFECTIVE DEGREE OF FREEDOM $\nu_{eff} > 100$ CORRESPONDS A LEVEL OF CONFIDENCE OF APPROXIMATELY 95 %

This certificate may not be reproduced other than in full except with the prior written approval of industrial calibration laboratory.

Industrial Calibration Co., Ltd.

38/41 Moo. 3, Lum Luk Ka Road., Khu Khot Subdistrict,
Lam Luk Ka District, Phatthum Thani 12130 Thailand.

Tel : +66 (02) 991 0440

Fax : +66 (02) 531 6294

Email : info@industrial.co.th

dB bar
%RH VA
m/s kg



CERTIFICATE No. CAL12022-21 PAGE 2 OF 4

Calibration Report

ORDER No. : 2008-472 RECEIVED DATE : DECEMBER 15, 2021 CALIBRATION DATE : DECEMBER 16, 2021

DESCRIPTION:		MANUFACTURER:	
NOISE DOSIMETER		EXTECH	
MODEL:	SERIAL No.	IDENTIFICATION No:	MADE IN :
SL400	210100146	N/A	N/A
CALIBRATION METHOD : CALIBRATION WAS CONDUCTED USING IN-HOUSE METHOD BASED ON COMPARISON TECHNIQUE BY USING SOUND LEVEL CALIBRATOR. REFERENCE STANDARD :			
DESCRIPTION :		MODEL	SIN No.
SOUND CALIBRATOR		TM-100	160100550
		CERTIFICATE No. EEL BP. 89/0283	

TRACEABILITY:

THIS CERTIFICATION IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:
- NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY, NIST.

Industrial Calibration Co., Ltd.

38/41 Moo. 3, Lum Luk Ka Road., Khu Khot Subdistrict,
Lam Luk Ka District, Phatum Thani 12130 Thailand.

Tel : +66 (02) 991 0440
Fax : +66 (02) 531 6294
Email : info@industrial.co.th

dB bar
%RH VA
m/s kg



CERTIFICATE No. CAL12022-21 PAGE 3 OF 4

Calibration Report

FUNCTION : SOUND LEVEL MEASUREMENT

RANGE : dBA at 1 kHz

RESOLUTION : 0.1 dB

MODE: FAST

STANDARD SETTING (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY (dB)
94	94.0	0	0.23
MODE: SLOW			
STANDARD SETTING (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY (dB)
94	94.0	0	0.20

REMARK : UUC- UNIT UNDER CALIBRATION
: WITHOUT ADJUSTMENT

- END OF CERTIFICATE -

Industrial Calibration Co., Ltd.

38/41 Moo. 3, Lum Luk Ka Road., Khu Khot Subdistrict,
Lam Luk Ka District, Phatum Thani 12130 Thailand.

Tel : +66 (02) 991 0440
Fax : +66 (02) 531 6294
Email : info@industrial.co.th

dB bar
%RH VA
m/s kg



CERTIFICATE No. CAL12022-21 PAGE 4 OF 4

Calibration Report

MODE: FAST

STANDARD SETTING (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY (dB)
114	114.0	0	0.23
MODE: SLOW			
STANDARD SETTING (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY (dB)
114	114.0	0	0.20

REMARK : UUC- UNIT UNDER CALIBRATION
: WITHOUT ADJUSTMENT

- END OF CERTIFICATE -



APTITECH CALIBRATION CO., LTD.
50/40 Moo 5 T. Lat Sai, A. Lamukha, Pathumthai 12150
Tel. +66 2103-6290 Fax. +66 2103-6291
Email. sales@aptitech-cal.com



CERTIFICATE OF CALIBRATION

Certificate Number : SC220110

Customer
Address

: Pacific Laboratory Co., Ltd.
: 14/5358 Moo 14 Tambol Bang Bua Thong,
Anphoe Bang Thong, Nonthaburi 11110

Description
Manufacturer
Model
Serial Number
ID. Number

: Noise Dose Meter
: Soundtek
: ST-130
: 220100161
: -
: W/O Number : SC220110
: Calibration Location : Laboratory
: Ambient Temperature : $22 \pm 2^\circ\text{C}$
: Ambient Humidity : $55 \pm 15\% \text{RH}$
: Received Date : 24-Feb-2022

This certifies that the above instrument was calibrated in compliance with the Calibration Systems Requirement of ISO/IEC 17025:2017 in accordance with referenced procedures. Standards used to perform this calibration are certified by or traceable to National Institute of Metrology (Thailand) and/or other recognized national measurement institutes which realizes the units of measurement according to the International System of Units (SI Units).

Measurement uncertainties at the time of test are given where applicable. They are calculated in accordance with the method described in The Expression of Uncertainty and Confidence in Measurement (M3003).

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by coverage factor $k=2$ such that the coverage probability corresponds to approximately 95%. This result of calibration was found accurate as shown on date and place of calibration only.

Standard Equipments

Description Sound Level Calibrator	Serial No. 141011576	Certificate No. 0175SV20	Traceability NIMT	Due Date 23-Apr-22
---------------------------------------	-------------------------	-----------------------------	----------------------	-----------------------

Authority of Calibration

Approved Signatory

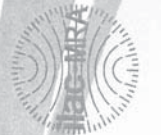
Calibration Date : 24-Feb-2022
Issued Date : 25-Feb-2022
Calibrated By : Mr. Suchou Lardsa-ard

☐ Mr. Anuwat Simsirwat [Laboratory Manager]
☒ Mr. Aumnart Uppanan [Quality Manager]

Calibration certificates without signatures are not valid. This certificate applied to only the item identified and shall not be reproduced other than in full, without the specific written approval by APTITECH CALIBRATION CO., LTD.



APTITECH CALIBRATION CO., LTD.
50/40 Moo 5 T. Lat Sai, A. Lamukha, Pathumthai 12150
Tel. +66 2103-6290 Fax. +66 2103-6291
Email. sales@aptitech-cal.com



CALIBRATION REPORT

Certificate Number : SC220110

Calibration Method

The Unit Under Calibration (UUC) was calibrated by comparison measurement with sound level calibrator. The calibration has been accomplished in an ambient environment controlled, base on the in-house calibration procedure. The identification of the laboratory's calibration procedure employed are CP-7.2-01-107

Calibration Results

Appearance and function of use : Good
Results of Calibration : Without any adjustment

Sound Level Measurement (Slow Mode)

Function	UUC Range	Standard Value	UUC Reading	UUC Error	(\pm) Uncertainty
A	30-140 dB	93.9 dB	93.8 dB	-0.1 dB	0.60 dB
		113.9 dB	113.7 dB	-0.2 dB	0.60 dB
C	30-140 dB	93.9 dB	93.8 dB	-0.1 dB	0.60 dB
		113.9 dB	113.8 dB	-0.1 dB	0.60 dB

Sound Level Measurement (Fast Mode)

Function	UUC Range	Standard Value	UUC Reading	UUC Error	(\pm) Uncertainty
A	30-140 dB	93.9 dB	93.8 dB	-0.1 dB	0.60 dB
		113.9 dB	113.8 dB	-0.1 dB	0.60 dB
C	30-140 dB	93.9 dB	93.8 dB	-0.1 dB	0.60 dB
		113.9 dB	113.7 dB	-0.2 dB	0.60 dB

--- End of Certificate ---

CERTIFICATE OF CALIBRATION

Certificate Number : SC220104

Customer : Pacific Laboratory Co., Ltd.
 Address : 14/5358 Moo 14 Tambol Bang Bua Thong,
 Amphoe Bang Thong, Nonthaburi 11110

Description : Noise Dose Meter
 Manufacturer : Soundtek
 Model : ST-130
 Serial Number : 220100151
 ID. Number : -

W/O Number : SC220104
 Calibration Location : Laboratory
 Ambient Temperature : $22 \pm 2^\circ\text{C}$
 Ambient Humidity : $55 \pm 15\%\text{RH}$
 Received Date : 24-Feb-2022

This certifies that the above instrument was calibrated in compliance with the Calibration Systems Requirement of ISO/IEC 17025:2017 in accordance with referenced procedures. Standards used to perform this calibration are certified by or traceable to National Institute of Metrology (Thailand) and/or other recognized national measurement institutes which realizes the units of measurement according to the International System of Units (SI Unit).

Measurement uncertainties at the time of test are given where applicable. They are calculated in accordance with the method described in The Expression of Uncertainty and Confidence in Measurement (M3003).
 The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by coverage factor $k=2$ such that the coverage probability corresponds to approximately 95%. This result of calibration was found accurate as shown on date and place of calibration only.

Standard Equipments

Description : Sound Level Calibrator
 Serial No. : 141011576
 Certificate No. : 0175SV20
 Due Date : 23-Apr-22
 Traceability : NIMT

Authority of Calibration

Approved Signatory : 
 Calibration Date : 24-Feb-2022
 Issued Date : 25-Feb-2022
 Calibrated By : Mr. Suchou Lardsa-ard

☐ Mr. Anuwat Simsirawat | Laboratory Manager |
☒ Mr. Aumnart Uppanan | Quality Manager |

Calibration certificates without signatures are not valid. This certificate applied to only the item identified and shall not be reproduced other than in full, without the specific written approval by APTECH CALIBRATION CO., LTD.

CALIBRATION REPORT

Certificate Number : SC220104

Calibration Method

The Unit Under Calibration (UUC) was calibrated by comparison measurement with sound level calibrator. The calibration has been accomplished in an ambient environment controlled, base on the in-house calibration procedure. The identification of the laboratory's calibration procedure employed are CP-7.2-01-107

Calibration Results

Appearance and function of use : Good
 Results of Calibration : Without any adjustment

Sound Level Measurement (Slow Mode)

Function	UUC Range	Standard Value	UUC Reading	UUC Error	(\pm) Uncertainty
A	30-140 dB	93.9 dB	94.0 dB	0.1 dB	0.60 dB
		113.9 dB	113.9 dB	0.0 dB	0.60 dB
C	30-140 dB	93.9 dB	93.9 dB	0.0 dB	0.60 dB
		113.9 dB	113.9 dB	0.0 dB	0.60 dB

Sound Level Measurement (Fast Mode)

Function	UUC Range	Standard Value	UUC Reading	UUC Error	(\pm) Uncertainty
A	30-140 dB	93.9 dB	94.0 dB	0.1 dB	0.60 dB
		113.9 dB	113.9 dB	0.0 dB	0.60 dB
C	30-140 dB	93.9 dB	94.0 dB	0.1 dB	0.60 dB
		113.9 dB	113.9 dB	0.0 dB	0.60 dB

--- End of Certificate ---

CERTIFICATE OF CALIBRATION

Certificate Number : SC220107

Customer Address
: Pacific Laboratory Co., Ltd.
: 14/5358 Moo 14 Tambol Bang Bua Thong,
Amphoe Bang Thong, Nonthaburi 11110

Description : Noise Dose Meter
Manufacturer : Soundtek
Model : ST-130
Serial Number : 220100164
ID. Number : -

W/O Number : SC220107
Calibration Location : Laboratory
Ambient Temperature : $22 \pm 2^\circ\text{C}$
Ambient Humidity : $55 \pm 15\%\text{RH}$
Received Date : 24-Feb-2022

This certifies that the above instrument was calibrated in compliance with the Calibration Systems Requirement of ISO/IEC 17025:2017 in accordance with referenced procedures. Standards used to perform this calibration are certified by or traceable to National Institute of Metrology (Thailand) and/or other recognized national measurement institutes which realizes the units of measurement according to the International System of Units (SI Unit).

Measurement uncertainties at the time of test are given where applicable. They are calculated in accordance with the method described in The Expression of Uncertainty and Confidence in Measurement (M3003).
The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by coverage factor $k=2$ such that the coverage probability corresponds to approximately 95%. This result of calibration was found accurate as shown on date and place of calibration only.

Standard Equipments

Description : Sound Level Calibrator
Serial No. : 141011576
Certificate No. : 0175SV20
Traceability : NIMT
Due Date : 23-Apr-22

Authority of Calibration

Approved Signatory

Calibration Date : 24-Feb-2022
Issued Date : 25-Feb-2022
Calibrated By : Mr. Suchou Lardsa-ard

☐ Mr. Anuwat Simsiriwat | Laboratory Manager |
☒ Mr. Aumnart Uppanan | Quality Manager |

Calibration certificates without signatures are not valid. This certificate applied to only the item identified and shall not be reproduced other than in full, without the specific written approval by APTITECH CALIBRATION CO., LTD.

CALIBRATION REPORT

Certificate Number : SC220107

Calibration Method

The Unit Under Calibration (UUC) was calibrated by comparison measurement with sound level calibrator. The calibration has been accomplished in an ambient environment controlled, base on the in-house calibration procedure. The identification of the laboratory's calibration procedure employed are CP-7.2-01-107

Calibration Results

Appearance and function of use : Good
Results of Calibration : Without any adjustment

Sound Level Measurement (Slow Mode)

Function	UUC Range	Standard Value	UUC Reading	UUC Error	(\pm) Uncertainty
A	30-140 dB	93.9 dB	94.1 dB	0.2 dB	0.60 dB
		113.9 dB	114.1 dB	0.2 dB	0.60 dB
C	30-140 dB	93.9 dB	94.1 dB	0.2 dB	0.60 dB
		113.9 dB	114.2 dB	0.3 dB	0.60 dB

Sound Level Measurement (Fast Mode)

Function	UUC Range	Standard Value	UUC Reading	UUC Error	(\pm) Uncertainty
A	30-140 dB	93.9 dB	94.1 dB	0.2 dB	0.60 dB
		113.9 dB	114.2 dB	0.3 dB	0.60 dB
C	30-140 dB	93.9 dB	94.1 dB	0.2 dB	0.60 dB
		113.9 dB	114.2 dB	0.3 dB	0.60 dB

--- End of Certificate ---

Envi Equipment Service Co., Ltd.

110/254 Moo 3, Tambon Bang Rak Phatthana, Amphur Bang Bua Thong, Nonthaburi 11110

Tel. 098 362 9152, 089 478 7885

E-mail: sales@envi-ees.com

Certificate No. :E22-01001

Page :1 of 6

CERTIFICATE OF CALIBRATION

Customer : Pacific Laboratory Co., Ltd.

Address : 14/5358 Moo 14, Tambon Bang Bua Thong, Amphoe Bang Bua Thong, Nonthaburi 11110

Description of Equipment : Console meter

Manufacturer : Apex Instrument

Model Number : XC-572-OV

Serial Number : 1306033

ID./Control No. : -

Environment Conditions : Temperature (25 ± 2) °C

: Humidity (50 ± 15) % RH

Cal. Date : 06/01/2022

Issue Date : 06/01/2022

Calibration Method or Calibration Procedure Used

US EPA Method (United State Environmental Protection Agency)

This certificate is traceable to national standard, which realize the units of measurement according to the International System of Units (SI).

Result of Calibration

This certificate may not be reproduced other than in full except with prior Written approval of the Technical Manager, Envi Equipment Service Company Limited.

These reported uncertainties of measurement are expanded by a coverage factor of k=2, providing a 95% confidence level

Calibrated by : Mr. Sanya Sangnil

Approved by :

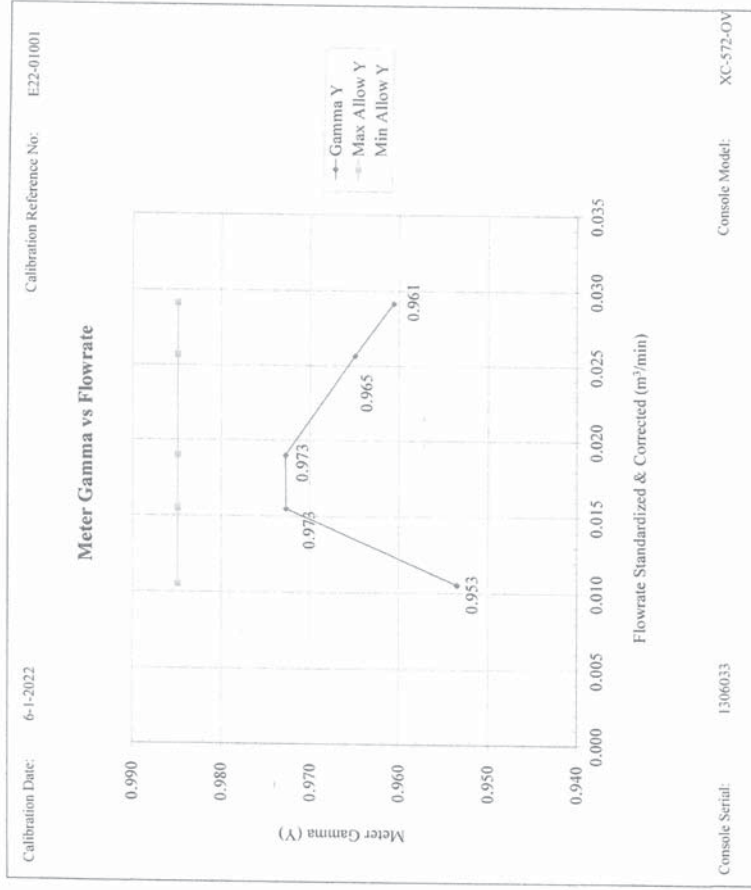
(Mr. Mana Fuekhud)
Technical ManagerCertificate No. :E22-01001
Page : 2 of 6

METHOD 5 CONSOLE CALIBRATION
USING REFERENCE WET GAS METER W-NK-2.5-B-Z No.547425
5-POINT METRIC UNIT

Meter Console Information			Calibration Conditions			Factors/Conversions		
Console Model Number	XC-572-OV		Date	Time	06/01/2022 10:30 AM	Std Temp	293	K
Console Serial Number	1306033		Calibration Reference No.		E22-01001	Std Press	760	mm Hg
DGM Model Number	SK25EX		Barometric Pressure		761.24 mm Hg	K _i		0.386
DGM Serial Number	00003603		Calibration Meter Gamma		0.999	Console Leak Check		PASS

Calibration Data											
Run Time				Metering Console				Calibration Meter			
Elapsed (Q)	DGM Orifice DH	Volume Initial	Volume Final	Outlet Temp Initial	Outlet Temp Final	Volume Initial	Volume Final	Outlet Temp Initial	Outlet Temp Final	Volume Initial	Volume Final
min	(P _m) mm H ₂ O	(V _m) m ³	(V _{mf}) m ³	(t _m) °C	(t _{mf}) °C	(V _{wi}) m ³	(V _{wf}) m ³	(t _{wi}) °C	(t _{wf}) °C	(V _{wi}) m ³	(V _{wf}) m ³
12.33	13.0	1336.648	1336.788	26	26	52.91720	53.05030	26	26	53.05030	53.18486
12.50	13.0	1336.788	1336.928	26	26	53.05030	53.18486	26	26	53.18486	53.32866
8.65	26.0	1336.935	1337.075	27	27	53.19182	53.32866	26	26	53.32866	53.46514
8.58	26.0	1337.075	1337.215	27	27	53.32866	53.46514	26	26	53.46514	53.60162
14.12	40.0	1337.224	1337.504	29	29	53.47394	53.60162	26	26	53.60162	53.73810
14.05	40.0	1337.504	1337.784	29	29	53.74824	54.02134	26	26	54.02134	54.29444
10.40	70.0	1337.791	1338.071	29	29	54.02794	54.30046	26	26	54.30046	54.57250
10.40	70.0	1338.071	1338.351	30	30	54.30046	54.57250	25	25	54.57250	54.84510
9.17	90.0	1338.358	1338.638	30	30	54.57908	54.85102	25	25	54.85102	55.12224
9.15	90.0	1338.638	1338.918	30	30	54.85102	55.12224	25	25	55.12224	55.39438





**METHOD 5 CONSOLE CALIBRATION
USING REFERENCE WET GAS METER W-NK-2.5-B-Z No.547425
5-POINT METRIC UNIT**

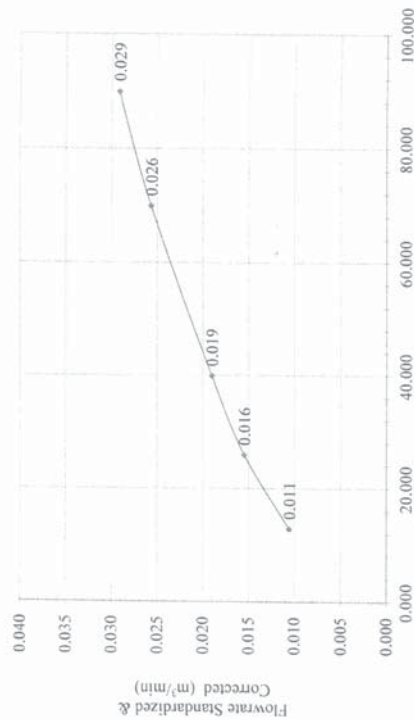
Calibration Data									
Standardized Data					Results				
Dry Gas Meter			Calibration Meter			Dry Gas Meter			
						Flowrate		Variation	
(V _{meas})	(Q _{meas})	(V _{w(gas)})	(V _{w(gas)})	(Q _{w(gas)})	(ΔH _g)	Value	Std & Corr	Value	(ΔH _g)
m³	m³/min	m³	m³	m³/min	mm H ₂ O	(Y)	(Q _{meas/corr})	(ΔY)	(ΔH _g)
0.138	0.011	0.130	0.011	0.011	51.572	0.948	0.011	-0.017	2.780
0.138	0.011	0.132	0.011	0.011	51.770	0.959	0.011	-0.006	2.978
0.138	0.016	0.134	0.016	0.016	48.063	0.974	0.016	0.009	-0.729
0.138	0.016	0.134	0.016	0.016	47.575	0.971	0.016	0.007	-1.217
0.276	0.020	0.269	0.019	0.019	49.145	0.975	0.019	0.010	0.353
0.276	0.020	0.268	0.019	0.019	49.111	0.971	0.019	0.006	0.318
0.277	0.027	0.267	0.026	0.026	47.564	0.966	0.026	0.001	-1.228
0.278	0.027	0.268	0.026	0.026	47.572	0.964	0.026	-0.001	-1.220
0.278	0.030	0.268	0.029	0.029	47.735	0.962	0.029	-0.003	-1.057
0.278	0.030	0.267	0.029	0.029	47.815	0.959	0.029	-0.006	-0.978
						0.965	Y Average	DH _g Average	
								48.792	

Note: For Calibration Factor Y, the ratio of the readings of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is ± 0.02 .
For ΔH_{g0} , orifice pressure differential that equates to 0.75 cfm (0.0212 m³/min) at standard temperature and pressure, acceptable tolerance of individual values from the average is ± 0.2 inches (5.1mm) H₂O.



Calibration Date: 6-1-2022 Calibration Reference No: E22-01001

Meter Pressure vs Flowrate



DGM Orifice ΔH (mm H₂O)

Console Serial: 1306033 Console Model: XC-572-OV



THERMOCOUPLES SYSTEM CALIBRATION

Sampling System Equipment Information	
Console Model Number	XC-572-OV
Console Serial Number	1306033
DGM Model Number	SK25EX
DGM Serial Number	00003603
Meter Box Model Number	JENCO 765 KF
Meter Box Serial Number	JC 13335

Calibration Conditions	
Date	06/01/2022 01:00 PM
Calibration Reference No.	E22-01001
Reference Thermometer	DIGICON
Serial Number	183169105

Results												
Console Thermocouple Simulator												
Channel and test point	Meter Box Channel Temperature Reading (°C)											
	-18.0	25.0	38.0	93.0	149.0	260.0	371.0	482.0	593.0	816.0	1038.0	
Stack	-16.0	26.0	39.0	95.0	151.0	262.0	373.0	484.0	595.0	818.0	1040.0	
Aux	-16.0	26.0	39.0	95.0	151.0							
Probe	-	-	-	-	-							
Filter	-16.0	26.0	39.0	95.0	151.0							
Oven	-	-	-	-	-							
Exit	N/D	N/D	N/D	N/D	N/D							

Stack $\pm 1.50\%$ Absolute
 Probe $\pm 3.0^\circ\text{C}$
 Filter $\pm 3.0^\circ\text{C}$

Tolerance Range
 Meter $\pm 3.0^\circ\text{C}$
 Exit $\pm 2.0^\circ\text{C}$



Envi Equipment Service Co., Ltd.

110/254 Moo 3, Tambon Bang Rak Phatthana, Amphur Bang Bua Thong, Nonthaburi 11110

Tel. 098 362 9152, 089 478 7885

E-mail: sales@envi-ees.com

Certificate No. :E22-01002

Page :1 of 2

CERTIFICATE OF CALIBRATION

Customer : Pacific Laboratory Co., Ltd.
Address : 14/5358 Moo 14, Tambon Bang Bua Thong, Amphoe Bang Bua Thong, Nonthaburi 11110

Description of Equipment : Nozzle
Manufacturer : Apex Instrument
Model Number : NS SET
Serial Number : -
ID/Control No. : -
Environment Conditions : Temperature (25 ± 2) °C
: Humidity (50 ± 15) % RH
Cal. Date : 05/01/2022
Issue Date : 05/01/2022

Calibration Method or Calibration Procedure Used

US EPA Method (United State Environmental Protection Agency)

This certificate is traceable to national standard, which realize the units of measurement according to the International System of Units (SI).

Result of Calibration

This certificate may not be reproduced other than in full except with prior Written approval of the Technical Manager, Envi Equipment Service Company Limited.

These reported uncertainties of measurement are expanded by a coverage factor of k=2, providing a 95% confidence level

Calibrated by : Mr. Sanya Sangnil
Approved by : (Mr. Mana Fuekhud)
Technical Manager



Certificate No. :E22-01002
Page : 2 of 2

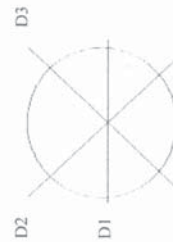
CALIBRATION RESULTS

Sampling System Equipment Information
Nozzle Model : NS SET
Nozzle Number : -
Nozzle Type : Stainless Steel
Calibration Condition
Date : 5 January 2022
Barometric Pressure : 758.99 mm Hg
Calibration Device : Vernier, 0-150 mm
Method Reference : US EPA Method

Nozzle ID	Nozzle Diameter			Different		(D1 + D2 + D3) / 3
	Size	mm	mm	mm	mm	mm
NS-5	3.97	3.78	3.88	0.051		3.837
NS-7	5.56	5.35	5.34	0.006		5.343
NS-9	7.14	6.88	6.81	0.036		6.850
NS-11	8.73	8.44	8.45	0.006		8.447
NS-13	10.32	10.18	10.18	0.006		10.177
NS-15	11.91	11.64	11.64	0.000		11.640
NS-17	13.49	13.30	13.30	0.000		13.300

Remark:

D1, D2, D3 = There difference nozzle diameters, mm; diameter must be within 0.025 mm
 ΔD = Maximum difference between any two diameters, must be ≤ 0.100 mm
 $Dayg = (D_1 + D_2 + D_3) / 3$



Envi Equipment Service Co., Ltd.

110/254 Moo 3, Tambon Bang Rak Phatthana, Amphur Bang Bua Thong, Nonthaburi 11110

Tel. 098 362 9152, 089 478 7885

E-mail: sales@envi-ees.com

Certificate No. :E22-01003

Page :1 of 3

CERTIFICATE OF CALIBRATION

Customer : Pacific Laboratory Co., Ltd.
Address : 14/5358 Moo 14, Tambon Bang Bua Thong, Amphoe Bang Bua Thong, Nonthaburi 11110
Description of Equipment : Standard Probe Method 5
Manufacturer : Apex Instrument
Model Number : PS-4HV
Serial Number : -
ID./Control No. : -
Environment Conditions : Temperature (25 ± 2) °C
Humidity (50 ± 15) % RH
Cal. Date : 05/01/2022
Issue Date : 05/01/2022

Calibration Method or Calibration Procedure Used

US EPA Method (United State Environmental Protection Agency)

This certificate is traceable to national standard, which realize the units of measurement according to the International System of Units (SI).

Result of Calibration

This certificate may not be reproduced other than in full except with prior Written approval of the Technical Manager, Envi Equipment Service Company Limited.

These reported uncertainties of measurement are expanded by a coverage factor of k=2, providing a 95% confidence level

Calibrated by : Mr. Sanya Sangnil

Approved by :

(Mr. Mana Fuckhud)
Technical Manager



Certificate No. : E22-01003
Page : 2 of 3

CALIBRATION RESULTS

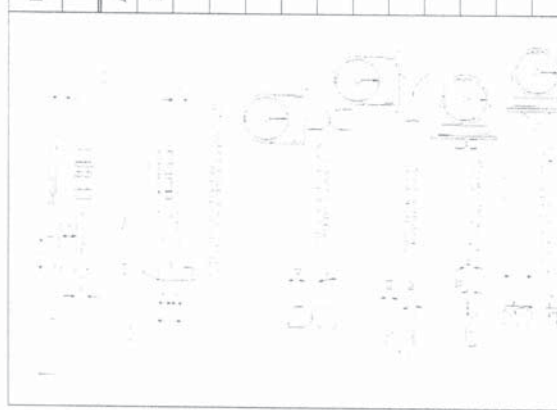
S-Type Geometric Pitot Tube Calibration

Sampling System Equipment Information

Probe Model : PS-4HV
Probe Number : -
Pitot Number : -
Pitot Tube Type : S-type

Calibration Condition

Date : 5 January 2022
Barometric Pressure : 758.99 mm Hg
Digital Caliper : CD-6" ASX
Serial number : A18008059



Pitot tube/Probe: # PS-4HV			
Parameter	Value	Allowable Range	Check
Assembly level?	Yes	Yes	Pass
Ports Damage?	No	No	Pass
$\alpha 1$	0	$-10^{\circ} < \alpha 1 < +10^{\circ}$	Pass
$\alpha 2$	1	$-10^{\circ} < \alpha 2 < +10^{\circ}$	Pass
$\beta 1$	0	$-5^{\circ} < \beta 1 < +5^{\circ}$	Pass
$\beta 2$	0	$-5^{\circ} < \beta 2 < +5^{\circ}$	Pass
γ	0	N/A	-
θ	0	N/A	-
Dt	0.375	.188" to .375"	Pass
A	0.904	$2.1Dt \leq A \leq 3Dt$	Pass
A/2Dt	1.205	$1.05 \leq A/Dt \leq 1.5$	Pass
Z = A tan γ	0.045	$Z \leq .125"$	Pass
W = A tan θ	0.018	$W \leq .031"$	Pass

Remark:

I certified that probe model: **PS-4HV** meets or exceeds all specifications, criteria and/or applicable design and is hereby assigned a pitot tube certification factor of 0.84. See 40 CFR Pt. 60, App. A, EPA Method 2.



THERMOCOUPLES SYSTEM CALIBRATION

Sampling System Equipment Information		Calibration Conditions	
Probe Model Number	PS-4HV	Date	05/01/2022
Probe Serial Number	-	Calibration Reference No.	E22-01003
Meter Box Model Number	JENCO 765 KF	Reference Thermometer	DIGICON
Meter Box Serial Number	JC 13335	Serial Number	183169105

Thermocouple of Standard Probe method 5 = length 4 foot			
Set Point	Reference Thermocouple	Probe Thermocouple	Difference
100	100.0	98.0	0.54
250	250.0	247.0	0.57
300	300.0	298.0	0.35
350	350.0	349.0	0.16



TEST REPORT FOR FLUE GAS ANALYZER

Customer Name : PACIFIC LABORATORY CO.,LTD.

Brand : TESTO
Model : Testo 310
Serial No. : 42828350
Tested on : 26-Oct-21
LCD Display : PASS
Lamp LEDs : PASS
Overall Result : PASS

Standard gas Mixed : Cylinder No.EB0126329 Expired Date Dec 19, 2022

Calibration Results

Gas Applied	Range	Reading	Calibrated To	Result
Zero Air	% O2	21	21	PASS
Zero Air	PPM CO	0	0	PASS

Gas Applied	Range	Reading	Calibrated To	Result
18% Vol Oxygen	% O2	18.4	18.0	PASS
101 PPM CO	PPM CO	99	101	PASS

Calibrated by : Kaitkasin

Approved by : Teerada Santhong

www.esithailand.com / E-mail : info@esithailand.com



esithailand.com
Environmental Service Co., Ltd.



Certificate of Calibration

Equipment: SPECTROPHOTOMETER
Model: DR3900
Serial No. (or ID.): 2076219
Manufacturer: HACH
Condition: New

Certificate No.: C06210315
Issued Date: 13 July 2021
Job No.: KSPR2109642
Page: 1 of 2

Customer: PACIFIC LABORATORY CO.,LTD.
14/5358 Moo 14 Tambol Bang Bua Thong,
Amphoe Bang Bua Thong, Nonthaburi 11110

Environment Condition:
Temperature 23 °C ± 2 °C
Humidity 50 %RH ± 15 %RH

Calibration Place: Environment Laboratory, SPC RT Co., Ltd.
1194 Soi Wachirathamsathit 57, Sukhumvit 101/1 Rd.,
Bangchak, Prakhnong, Bangkok 10260 Thailand

Calibration By: Mr. Atachai Ngamchanat
Calibration Date: 13 July 2021
The Method used: In house method, SPCC-WI-24, base on ASTM E 275-08 and ASTM E 387-04

Traceability: This certificate is traceable to the CRM maintained by National Institute of Standards and Technology (NIST) through Starna Scientific Limited.

The standard for Wavelength Certificate No. 87146 and 87152
The standard for Photometric Certificate No. 87220


(Mr. Atachai Ngamchanat)
Person in charge


(Mr. Dumrong Boonsopon)
Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to International or national standard or other recognized national standard laboratories.
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).
These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of SPC RT Co., Ltd.

Certificate No.: C06210315

Page 2 of 2

Calibration Results: Without Adjustment

Wavelength Accuracy (nm), The spectral bandwidth of Std at 5 nm and UUC at 5 nm

Standard Wavelength	Unit Under Calibration	Correction	Uncertainty
418.40	418	0.40	0.59
537.00	536	1.00	0.59
638.00	637	1.00	0.59
747.61	747	0.61	0.59
807.04	807	0.04	0.59

Photometric Accuracy (Absorbance)

Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
	0.0000	0.000	0.0000	0.0045
420 nm	0.5890	0.587	0.0020	0.0045
	0.7616	0.759	0.0026	0.0045
	1.0263	1.026	0.0003	0.0045
440 nm	0.0000	0.000	0.0000	0.0045
	0.5787	0.576	0.0027	0.0045
	0.7442	0.741	0.0032	0.0045
	1.0039	1.003	0.0009	0.0045
485 nm	0.0000	0.000	0.0000	0.0045
	0.5292	0.529	0.0002	0.0045
	0.6865	0.686	0.0005	0.0045
	0.9534	0.956	-0.0026	0.0045
546.1 nm	0.0000	0.000	0.0000	0.0045
	0.5468	0.546	0.0008	0.0045
	0.6957	0.694	0.0017	0.0045
	0.9991	1.000	-0.0009	0.0045
590 nm	0.0000	0.000	0.0000	0.0045
	0.5851	0.587	-0.0019	0.0045
	0.7238	0.721	0.0028	0.0045
	1.0957	1.093	0.0027	0.0045
635 nm	0.0000	0.000	0.0000	0.0045
	0.5692	0.567	0.0022	0.0045
	0.6914	0.689	0.0024	0.0045
	1.0881	1.087	0.0011	0.0045

The End of Certificate

Analyzer Performance Test

Calibrated Date: 21 July 2021

Instruments Information

Analyzer Type: CO Analyzer	Manufacturer: Thermo Environmental
Model: 48C	S/N: 0528012677

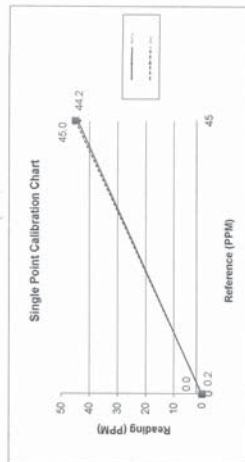
Calibration System

Calibrator Unit	Standard Gas
Dilutor Model Dash Model 5008	NO Conc 55.47 PPM
S/N: 705	SO2 Conc 55.11 PPM
ZERO AIR Generator API MODEL 701	CO Conc 4.535 PPM
S/N: 1924	Cylinder number EB0129027
	Expire Date: 29 Oct. 2027

Environment: Temperature 25.5 °C Humidity 51 %RH

Calibration Report

Status	Reference (ppm)	Reading (ppm)	Drift (ppm)	Reference (ppm)	Reading (ppm)	Drift%
Before	0.0	0.2	0.2	45.0	44.2	-1.7
After	0.0	0.0	0.0	45.0	45.0	0.0



Calibrate By: Mr. PASAGORN SAMOL

Certificate of Calibration

Certificate No.: 64-400590-1

Page: 1 of 2

Submitted by:

Pacific Laboratory Co., Ltd

14-5358 Moo 14, T. Bang Bua Thong, A. Bang Bua Thong, Nonthaburi 11110 Thailand

Equipment:

Digital Thermometer with Thermistor probe
Temperature Indicator

Manufacturer: Eutech Model: pH 700

Range: N/A °C Resolution: 0.1 °C

Serial No.: 2841305 ID No.: LAB-PH-002

Thermistor probe

Model: N/A Sheath Material: Stainless

Diameter: 3 mm Length: 115 mm

Serial No.: PHSITEMB01P 049 ID No.: LAB-PH-002

Environment: On site calibration was carried out at the Laboratory, Pacific Laboratory Co., Ltd

Ambient Temperature: (23.5 to 24.0) °C

Relative Humidity: (50 to 55) %

Line Voltage: (220.0 to 222.0) VAC

Date of Received: 26 November 2021

Date of Calibration: 26 November 2021

Date of Issue: 27 November 2021

Calibrated by: Bunjerd Masri

Calibration Method: This instrument was calibrated by In-house method comparison technique CAL-M4003 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

400002 11-0050-20 18 Jun 2022 National Institute of Metrology Thailand (NIMT)

2. Standard Digital Thermometer

ID No. Cert. No. Due Date Traceability

400033 201612 17 Feb 2022 National Institute of Metrology Thailand (NIMT)

Approved by:

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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



Certificate of Calibration

Certificate No. : 64-400590-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (± °C)
115	25.003	24.9	0.1	0.19

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%.

(Signature)



CAL-F0031-03

Certificate of Calibration

Certificate No. : 64-420130-1

Page : 1 of 2

Submitted by :

Pacific Laboratory Co., Ltd.

14/5358 Moo 14, T.Bang Bua Thong, A.Bang Bua Thong, Nonthaburi 11110 Thailand

Equipment :

pH Meter with electrode

pH meter

Manufacturer : Eutech

Model : pH 700

Range : N/A

pH

Resolution : 0.01 pH

Serial No. : 2841305

ID No. : LAB-PH-002

Electrode

Model : N/A

Serial No. : 2925294

Environment :

On site calibration was carried out at the Laboratory, Pacific Laboratory Co., Ltd.

Ambient Temperature : (23.4 to 23.8) °C

Relative Humidity : (52 to 55) %

Date of Received : 26 November 2021

Date of Calibration : 26 November 2021

Date of Issue : 26 November 2021

Calibrated by : Bunjerd Masri

Calibration Method :

In-house method CAL-M4201 direct measurement by using standard voltage calibrator and using certified reference material (CRM)

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

1. Multiproduct Calibrator

ID.No.	Cert.No.	Due Date	Traceability
400005	SG-E-00473/64	27 Aug 2023	National Institute of Metrology Thailand (NIMT)

2. Standard Buffer Solution

pH	Cert.No.	Lot No.	Exp. Date	Traceability
4.004	61218215	769926	15 May 2022	CPA chem
6.985	61223875	769927	15 May 2022	CPA chem
9.963	61208865	769928	15 May 2022	CPA chem

Approved by :

(Signature)

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%.

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



CAL-F0031-03

Certificate of Calibration

Certificate No. : 64-420130-1

Page : 2 of 2

Result of Calibration :

UUC Condition As-Received : Good

Function : Electrical measurement

pH meter

Performing standard curve by Multiproduct Calibrator at pH (4,7,10)

Adjustment Curve at nominal pH	Applied Voltage (mV)	Nominal Value (pH)	UUC Reading (pH) (mV)	Correction (mV)	Uncertainty (± mV)
4, 7, 10	177.4800	4	4.00 177.5	0.0	0.12
	0.0000	7	7.00 0.0	0.0	0.086
	-177.4800	10	10.00 -177.5	0.0	0.12

Function : pH meter with electrode

Performing a three - buffer standard curve using buffer nominal pH (4,7,10)

Adjustment Curve at nominal pH	Standard Buffer (pH)	UUC Reading (pH)	Correction (pH)	Uncertainty (± pH)
4, 7, 10	4.004	4.00	0.00	0.011
	6.985	7.00	-0.01	0.020
	9.963	10.00	-0.04	0.053

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%



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)

CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES

534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250

TEL. 0-2717-3000 FAX. 0-2719-9484

Cert.No.: 22TW32

Page.: 1 of 2

Certificate of Testing

Equipment :

DO Meter

Manufacturer :

AZ

Model :

86031

Serial No. :

1041263

ID No. :

LAB-DO-002

Received Date :

10 February 2022

Test Date :

11 February 2022

Reference :

2202-0386WN-1

Submitted by :

Pacific Laboratory Co.,Ltd.

14/5358 Moo 14 Tambol Bang Bua Thong,

Amphoe Bang Bua Thong, Nonthaburi 11110

Laboratory Condition :

Temperature (25 ± 5) °C

Humidity (50 ± 20) %

In - house method : CP-CH9

by Comparison Technique with Azide Modification Method

Tested by :

Walailak Sirithean

Approved by :

[Signature]

Approved Signatory

(☒) Malee Buikrua

(☐) Sathip Meangmai

(☐) Warakorn Lengagrakul

Issue Date :

14 February 2022



CERTIFICATE No : 21T7487
REFERENCE No : 62011-5

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : INCUBATOR
MANUFACTURER : AQUA LYTIC
MODEL : TC135S
SERIAL No : 0614/000033
ID No : LAB-IB-001
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : PACIFIC LABORATORY CO., LTD.
14/5358 MOO. 14 TAMBOL BANGBUA THONG
AMPHOE BANG NUA THONG, NONTHABURI 11110

CALIBRATED BY : CHAICHARN CH.
CALIBRATION DATE : 06-Aug-21

APPROVED BY : 
PONGSAK J.
ISSUED DATE : 07-Aug-21
RECEIVED DATE : 06-Aug-21

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

F-G010 REV : 02



Cert.No.: 22TW32
Page.: 2 of 2

Result : Dissolved Oxygen Meter Adjustment With Air 100 %
Dissolved Oxygen Probe No.: 10426897

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.14	8.2	0.00

This report was certified only for the instrument we tested. It is allowable to use for study the system efficiency. The environmental impact control and present to organization it may concerned. Intend to use for advertising and referral purpose is prohibited. This report may not be reproduced other in full without written approval of the laboratory

-o0o-

Malu.

a 1094709



CERTIFICATE No : 21T7487

PAGE : 2 OF 2

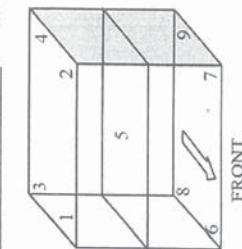
Calibration Report

EQUIPMENT : INCUBATOR
MANUFACTURER : AQUALYTIC
MODEL : TC135S
ID No : LAB-IB-001
RECEIVED DATE : 06-Aug-21
AMBIENT TEMPERATURE : 30 °C ± 1 °C
S/N : 0614/000033
CALIBRATION DATE : 06-Aug-21
RELATIVE HUMIDITY : 50 %RH ± 10 %RH

CONDITION OF THIS RESULTS OF CALIBRATION

- THIS INSTRUMENT WAS CALIBRATED ACCORDING TO TLAS G-20 BY COMPARISON WITH CALIBRATED RTD Pt100 UNDER NO LOAD CONDITION. THE TEMPERATURE PROBES WERE PLACED ON NINE POINTS AND LOCATED ONE THERMOMETER PROBE IN EACH OF THE EIGHT CORNERS OF THE CHAMBER AND WAS AWAY FROM THE EACH WALL OF 5 cm TO 10 cm. AND PLACED THE NINTH THERMOMETER PROBE WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE CHAMBER. THE UNIFORMITY WAS MEASURED BETWEEN REFERENCE PROBE AND OTHER PROBES AT THE SAME TIME.
- REFERENCE STANDARD INSTRUMENTS :-
- 1) DATA LOGGER WITH RTD HYDRA 2655A
3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON 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



GENERAL INFORMATION

Overall Ambient Temperature around the Chamber (°C) variation : 0
Overall Line Voltage (V) variation : 4
Instrument Condition : Normal
Chamber Size (W*L*H): 55*42*70 cm

CHAMBER PERFORMANCE

Controller Temperature (°C)	Indicating Temperature (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
20.0	20.0	0.28	0.15	0.65

TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Measured Temperature (°C) at Spread Locations									Uncertainty (± °C)
	#1	#2	#3	#4	Ref. 5	#6	#7	#8	#9	
20.0	19.95	19.96	19.97	19.95	20.00	19.97	19.94	19.89	19.99	0.38

- NOTE 1 : THE UNCERTAINTY OF MEASUREMENT EXCLUDED TEMPERATURE UNIFORMITY OF THE CHAMBER.
- NOTE 2 : LOCATION 5 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

F-G010 REV : 02

CERTIFICATE No : 21T7484
REFERENCE No : 62011-2

Certificate of Calibration

EQUIPMENT : HOT AIR OVEN
MANUFACTURER : MEMMERT
MODEL : UN55
SERIAL No : B214.1879
ID No : LAB-OV-001
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : PACIFIC LABORATORY CO., LTD.
14/5358 MOO. 14 TAMBOL BANGBUA THONG
AMPHOE BANG NUA THONG, NONTHABURI 11110

CALIBRATED BY : CHAICHARN CH.
CALIBRATION DATE : 06-Aug-21

APPROVED BY :
PONGSAK J.
ISSUED DATE : 07-Aug-21
RECEIVED DATE : 06-Aug-21



CERTIFICATE No : 21T7484

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : HOT AIR OVEN
MANUFACTURER : MEMMERT
MODEL : UN55
ID No : LAB-OV-001
RECEIVED DATE : 06-Aug-21
AMBIENT TEMPERATURE : 30 °C ± 1 °C
S/N : B214.1879
CALIBRATION DATE : 06-Aug-21
RELATIVE HUMIDITY : 50 %RH ± 10 %RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO TLAS G-20 BY COMPARISON WITH CALIBRATED THERMOCOUPLE TYPE K UNDER NO LOAD CONDITION. THE THERMOCOUPLES WERE PLACED ON NINE POINTS AND LOCATED ONE THERMOCOUPLE IN EACH OF THE EIGHT CORNERS OF THE CHAMBER AND WAS AWAY FROM THE EACH WALL OF 5 cm TO 10 cm. AND PLACED THE NINTH THERMOCOUPLE WITHIN 2.5 cm. OF THE GEOMETRIC CENTER OF THE CHAMBER. THE UNIFORMITY WAS MEASURED BETWEEN REFERENCE PROBE AND OTHER PROBES AT THE SAME TIME.

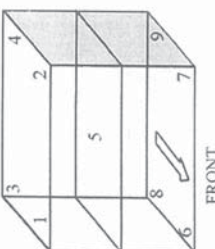
2. REFERENCE STANDARD INSTRUMENTS :-

- 1) DATA LOGGER WITH TC TYPE K HYDRA 2635A
2) THERMOCOUPLE : 21T6764
3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON 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

GENERAL INFORMATION

Overall Ambient Temperature around the Chamber (°C) variation : 2
Overall Line Voltage (V) variation : 9
Instrument Condition : Normal
Chamber Size (W*L*H): 40*33*40 cm



CHAMBER PERFORMANCE

Controller Temperature (°C)	Indicating Temperature (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
104.0	104.0	0.42	0.94	1.35
180.0	180.0	0.41	1.13	1.60

TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Indicating Temp (°C)	Measured Temperature (°C) at Spread Locations									Uncertainty (±°C)
		#1	#2	#3	#4	Ref. 5	#6	#7	#8	#9	
104.0	104.0	103.89	103.72	103.48	103.59	103.70	103.49	103.49	104.20	103.67	0.78
180.0	180.0	179.68	179.51	179.35	179.12	179.36	179.17	179.26	180.03	179.97	1.1

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

NOTE 2: LOCATION 5 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

[Signature]

F-G010 REV : 02

CERTIFICATE No : 21T7486
REFERENCE No : 62011-4

Certificate of Calibration

EQUIPMENT : WATER BATH
MANUFACTURER : MEMMERT
MODEL : WNB22
SERIAL No : L514.0184
ID No : LAB-WB-001
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : PACIFIC LABORATORY CO., LTD.
14/5358 MOO. 14 TAMBOL BANGBUA THONG
AMPHOE BANG NUA THONG, NONTABURI 11110

CALIBRATED BY : CHAICHARN CH.

CALIBRATION DATE : 06-Aug-21

APPROVED BY : *[Signature]*
PONGSAK J.

ISSUED DATE : 07-Aug-21

RECEIVED DATE : 06-Aug-21

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

F-G010 REV : 02



QUALITY CALIBRATION CO., LTD.

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

CERTIFICATE No : 21T7486

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : WATER BATH
MANUFACTURER : MEMMERT
ID NUMBER : LAB-WB-001
RECEIVED DATE : 06-Aug-21
AMBIENT TEMPERATURE : 30 °C ± 1 °C

MODEL : WNB22
SERIAL NUMBER : L514.0184
CALIBRATION DATE : 06-Aug-21
RELATIVE HUMIDITY : 50 %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.

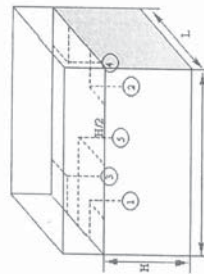
2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT : MODEL : 2625A SERIAL No : 6603614 CERTIFICATE No : 21T6761 DUE DATE : 05-Jul-22

1) DATA LOGGER WITH RTD
3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON 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) : 1.5
Overall Variation of Line Voltage (V) : 11
Instrument Condition : Normal

BATH PERFORMANCE

Controller Temperature (°C)	Indicating Temperature (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
85.0	85.0	0.16	0.12	0.33
95.0	95.0	0.17	0.09	0.35

TEMPERATURE MEASUREMENT ACCURACY TEST

Controller Temp (°C)	Indicating Temp (°C)	Measured Temperature (°C) at Spread Locations				Uncertainty (± °C)
		#1	#2	#3	#4	
85.0	85.0	84.59	84.60	84.53	84.58	0.23
95.0	95.0	94.59	94.58	94.60	94.54	0.24

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

F-G010 REV : 02



Hanna Instruments (Thailand) Ltd.

410/67-68 Soi Ratchadapisek 24, Ratchadapisek Rd., Samsen-nok,

Huaykwang, Bangkok 10310 Tel: 0-2541-4199 Fax: 0-2541-4198

Certificate No. : HIT-2208-0177

Page : 1 of 3

CERTIFICATE OF CALIBRATION

Equipment : COD Test Tube Heater
Meter Model : HI839800-02 Serial No. : 04500100101
Manufacturer : Hanna Instruments
Made in : Romania
Condition As-Received : Used Product
Reference : RE220215
Customer name : Pacific Laboratory Co., Ltd.

14/5358 Moo. 14, Tambol Bang Bua Thong,
Amphoe Bang Bua Thong, Nonthaburi 11110

Received date : 18 February 2022

Calibrate date : 25 February 2022

Issue date : 28 February 2022

Ambient Temperature : (25 ± 2) °C

Relative Humidity : (50 ± 15) % RH

Calibrated Location : Hanna Instruments (Thailand) Ltd.

Calibrated by : *ATHAKOM*

Approved by : *o f i -*

Mr. Athakom Sumpnan
Calibration Engineer

Mr. Anan Suwanchaisakul

Authorized Signatory



This certificate was certified only for the instrument we calibrated.

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

** This certificate may not be reproduced other than in full, except with the prior written **
approval of the head of Hanna Instrument (Thailand)

Condition of this result of calibration

Reference Standard Instruments :

Instruments	Model	Serial No.	Certificate No.	Traceable
Thermometer With Sensor	HI935005	03250060101	211167	Technology Promotion Association (Thailand-Japan)

Reference / Procedure :

This equipment was calibration by comparison to the reference standard (Standard platinum resistance thermometer) whose accuracy is traceable to the national standard. The calibration was performed by generating the specified working point of temperature then recorded the temperature reading values against the reference standard according to Hanna Calibration Laboratory work Instruction No. 141.

This temperature scale used was based on ITS-90

All data shown below were as-received values without adjustment.

SITE CALIBRATION

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25

Result of Calibration :

Calibration Point	Unit Under Calibration Setting	Unit Under Calibration Reading	Temperature Stability	Uncertainty of Measurement
150.0 (°C)	150.8 (°C)	150.6 (°C)	1.6 (°C)	± 0.48 (°C)

Calibration Point (°C)	Average Standard Reading (°C)				
	Position				
150.0	1	2	3	4	5
	150.0	150.9	151.0	151.0	149.9
	6	7	8	9	10
	150.1	151.0	151.2	150.9	150.8
	11	12	13	14	15
	150.0	151.2	151.4	150.8	150.7
	16	17	18	19	20
	150.1	150.9	151.1	150.8	150.3
	21	22	23	24	25
	149.8	150.6	151.0	150.9	149.8

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

** End of certificate **



RECALIBRATION
DUE DATE:

August 16, 2022

Certificate of Calibration

Calibration Certification Information			
Cal. Date:	August 16, 2021	Rootmeter S/N:	438320
Operator:	Jim Tisch	Ta:	296 °K
Calibration Model #:	TE-5025A	Pa:	750.8 mm Hg
Calibrator S/N:	710725		

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.3820	3.2	2.00
2	3	4	1	0.9810	6.4	4.00
3	5	6	1	0.8740	8.0	5.00
4	7	8	1	0.8340	8.8	5.50
5	9	10	1	0.6910	12.7	8.00

Data Tabulation			
Vstd (m3)	Qstd (x-axis)	$\sqrt{\Delta H \left(\frac{Pa}{Pstd} \times \frac{Tstd}{Ta} \right)}$ (y-axis)	$\sqrt{\Delta H \left(\frac{Ta}{Pa} \right)}$ (y-axis)
0.9904	0.7166	1.4104	0.9957
0.9861	1.0052	1.9946	0.9915
0.9840	1.1259	2.2300	0.9893
0.9829	1.1786	2.3389	0.9883
0.9778	1.4150	2.8208	0.9831
QA	m= 2.01649		m= 1.26269
	b= -0.03554		b= -0.02237
	r= 0.99998		r= 0.99998

Calculations	
Vstd= ΔVol((Pa-ΔP)/Pstd)(Tstd/Ta)	Va= ΔVol((Pa-ΔP)/Pa)
Qstd= Vstd/ΔTime	Qa= Va/ΔTime
For subsequent flow rate calculations:	
$Qstd = \frac{1}{m} \left(\sqrt{\Delta H \left(\frac{Pa}{Pstd} \times \frac{Tstd}{Ta} \right)} - b \right)$	
$Qa = \frac{1}{m} \left(\sqrt{\Delta H \left(\frac{Ta}{Pa} \right)} - b \right)$	

Standard Conditions	
Tstd:	298.15 °K
Pstd:	760 mm Hg
Key	
ΔH:	calibrator manometer reading (in H2O)
ΔP:	rootmeter manometer reading (mm Hg)
Ta:	actual absolute temperature (°K)
Pa:	actual barometric pressure (mm Hg)
b:	intercept
m:	slope

RECALIBRATION
US EPA recommends annual recalibration per 1998 40 Code of Federal Regulations Part 50 to 51, Appendix B to Part 50, Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere, 9.2.17, page 30



บริษัท เอ็นวีอาร์ เซอร์วิส จำกัด

42 ถนนพหลโยธิน 14 แขวง 9 แขวงท่าแร้ง เขตบางเขน กรุงเทพฯ 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201
E-MAIL: SERVICE@ENVIR.CO.TH

Analyzer Performance Test

Calibrated Date: 15 October 2021

Instruments Information

Analyzer Type:	NONOX/NOx Analyzer	Manufacturer:	Thermo Environmental
Model:	42C	SIN:	0526012676

Calibration System

Calibrator Unit		Standard Gas	
Dilutor Model:	Daabli Model 5008	NO Conc:	55.47 PPM
SIN:	705	SO2 Conc:	55.11 PPM
ZERO AIR Generator API Model:	701	CO Conc:	4.535 PPM
SIN:	1924	Cylinder number:	EB0126027
		Expire Date:	28 Oct. 2027

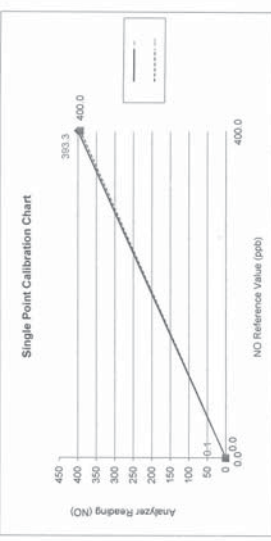
Environment: Temperature: 25.5 °C Humidity: 51 %RH

Calibration Check (Before adjust)

Zero				Span	
GAS	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)
NO	0.1	0.0	0.1	393.3	400.0
NOx	0.1	0.0	0.1	397.7	400.0
					Drift%
					-1.7
					-0.6

Calibration Check (After adjust)

Zero				Span	
GAS	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)
NO	0.0	0.0	0.0	400.0	400.0
NOx	0.0	0.0	0.0	400.0	400.0
					Drift%
					0.0
					0.0



Calibrate By: Mr. Pasagorn Samol



บริษัท เอ็นวีอาร์ เซอร์วิส จำกัด

42 รามอินทรา 14 เขต 9 แขวงจันทน์บุรี กรุงเทพมหานคร 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201
บริษัท เอ็นวีอาร์ เซอร์วิส จำกัด
ENVIR SERVICE CO.,LTD. 42 Ramindra 14 yeak 9, Thu Rang, Bangkok, Bangkok 10230 Tel : 02-9435814-5 Fax : 02-9438201

Analyzer Performance Test

Calibrated Date: 19 July 2021

Instruments Information

Analyzer Type: NONOX/NOx Analyzer	Manufacturer Thermo Environmental
Model: 42C	SIN: 42C-66850-350

Calibration System

Calibrator Unit	Standard Gas
Dilutor Model Dastibi Model 5008	NO Conc 55.47 PPM
SIN: 705	SO2 Conc 55.11 PPM
ZERO AIR Generator API Model 701	CO Conc 4.535 PPM
SIN: 1924	Cylinder number EB0129027
	Expire Date: 29 Oct. 2027

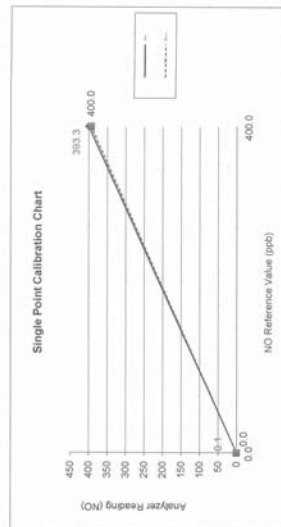
Environment: Temperature 25.5 °C Humidity 51 %RH

Calibration Check (Before adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.1	0.0	0.1	393.3	400.0	-1.7
NOx	0.1	0.0	0.1	396.6	400.0	-0.6

Calibration Check (After adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.0	0.0	0.0	400.0	400.0	0.0
NOx	0.0	0.0	0.0	400.0	400.0	0.0



01/07/2021

Calibrate By : Mr. Pasagorn Samol



บริษัท เอ็นวีอาร์ เซอร์วิส จำกัด

42 รามอินทรา 14 เขต 9 แขวงจันทน์บุรี กรุงเทพมหานคร 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201
บริษัท เอ็นวีอาร์ เซอร์วิส จำกัด
ENVIR SERVICE CO.,LTD. 42 Ramindra 14 yeak 9, Thu Rang, Bangkok, Bangkok 10230 Tel : 02-9435814-5 Fax : 02-9438201

Analyzer Performance Test

Calibrated Date: 12 July 2021

Instruments Information

Analyzer Type: NONOX/NOx Analyzer	Manufacturer Thermo Environmental
Model: 42C	SIN: 42C-66864-352

Calibration System

Calibrator Unit	Standard Gas
Dilutor Model Dastibi Model 5008	NO Conc 55.47 PPM
SIN: 705	SO2 Conc 55.11 PPM
ZERO AIR Generator API Model 701	CO Conc 4.535 PPM
SIN: 1924	Cylinder number EB0129027
	Expire Date: 28 Oct. 2027

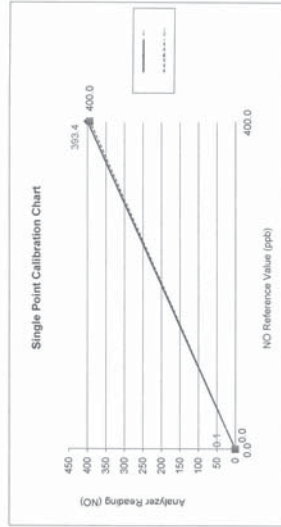
Environment: Temperature 25.5 °C Humidity 51 %RH

Calibration Check (Before adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.1	0.0	0.1	393.4	400.0	-1.7
NOx	0.1	0.0	0.1	396.8	400.0	-0.3

Calibration Check (After adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.0	0.0	0.0	400.0	400.0	0.0
NOx	0.0	0.0	0.0	400.0	400.0	0.0



01/07/2021

Calibrate By : Mr. Pasagorn Samol



บริษัท เอ็นวีแอร์ เซอร์วิส จำกัด

42 หมู่ 9 ถนน 9 มิถุนายน กรุงเทพมหานคร 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201
E-MAIL : ENVIS@ENVISERVICE.CO.TH
ENVIS SERVICE CO., LTD. 42 Ramindra 14 Yeak 9, The Rang, Bangkok, Bangkok 10230 Tel : 02-9435814-5 Fax : 02-9438201

Analyzer Performance Test

Calibrated Date: 06 July 2021

Instruments Information

Analyzer Type: NONOXINOx Analyzer
Model: 42C
Manufacturer: Thermo Environmental
S/N: 42C-69273-362

Calibration System

Calibrator Unit		Standard Gas	
Dilutor Model: Datalab Model 5508		NO Conc 55.47 PPM	
S/N: 705		SO2 Conc 55.11 PPM	
ZERO AIR Generator API Model 701		CO Conc 4.535 PPM	
S/N: 1924		Cylinder number EB0126027	
		Expire Date: 28 Oct 2027	

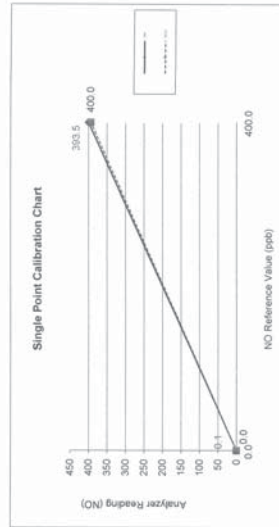
Environment: Temperature 25.5 °C Humidity 51 %RH

Calibration Check (Before adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.1	0.0	0.1	393.5	400.0	-1.6
NOx	0.1	0.0	0.1	400.0	400.0	0.0

Calibration Check (After adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.0	0.0	0.0	400.0	400.0	0.0
NOx	0.0	0.0	0.0	400.0	400.0	0.0



Calibrate By: Mr. Pasagorn Samol

THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469



Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue : 27 October, 2021 Certification No. 475/21

Page : 1 of 3

Object : Wind speed and wind direction

Manufacturer : Davis Instruments Inc.

Type : Weather Wizard III Product No. 7425

Serial No. : WCO1009A97

Customer : Pacific Laboratory Co., Ltd.

14/5358 Moo 14, T. Bang Bua,

A. Bang Bua Thong, Nonthaburi 11110.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1010.7 hPa

NATIONAL STANDARD WIND TUNNEL :

: Thermal Anemometer 642 S/N 91563

: HOOK GAGE NO 1425 Plot Tube Theodor Friedrichs Type 0800 0000 serial 9023

N.I.S.T. Test Reference Number 731/241460

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION

STANDARD THERMOMETER

: Theodor Friedrich : Dry No. 8380/94 Wet No. 8389/94

: Thermo Schneider No. 918802

Calibrated by : Watchapol Subwat

Signed :

Mr. Watchapol Subwat

Mr. Pichod Pomsut

Mechanical Engineer

(Authorized Signatory)
for the Chief

Sub-Standard Instrument
DEPARTMENT OF METEOROLOGY



The Result of Calibration

Certification No. 475/21

27 October, 2021

Page : 2 of 3

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425		TESTED ANEMOMETER	
	Pressure inches	Vacuum inches	Velocity m/sec	Correction m/sec
1.00	-	-	0.9	0.10
3.02	-	-	2.7	0.32
5.00	-	-	4.9	0.10
7.04	-	-	6.7	0.34
9.02	-	-	8.9	0.12
11.01	-	-	10.7	0.31
13.01	-	-	12.5	0.51
15.01	-	-	14.8	0.21
17.02	-	-	16.5	0.52
20.02	-	-	19.8	0.22

Wind Aloft Plotting Board.	
US DEPARTMENT OF COMMERCE WEATHER BUREAU	
WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	90
180	180
270	270

Calibrated by :

Mr. Watchapol Subwat
Mechanical Engineer



The Result of Calibration

Certification No. 475/21

27 October, 2021

Page : 3 of 3

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.2	45.1	0.1
30.2	30.2	0.0
15.2	15.2	0.0

Calibrated by :

Mr. Watchapol Subwat
Mechanical Engineer



Calibrate No. : SLM 047/2565
Calibrate Date : March 16, 2022

Equipment	: Sound Calibrator
Manufacturer	: TENMARS
Model/Type	: TM-100
Serial No.	: 190301469
Customer Name	: โครงการโรงงานผลิตไวน์ บริษัท ไทย สตรีท อินดัสตรี จำกัด

[illegible]

Approved By

