

ภาคผนวกที่ 6
เอกสารสอบเทียบเครื่องมือตรวจวัด

ภาคผนวกที่ 6-1
เอกสารการสอบเทียบเครื่องมือตรวจวิเคราะห์คุณภาพน้ำ

Certificate of Calibration

Certificate No. : 65-420108-1

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. : 3093341

Environment : On site calibration was carried out at the Laboratory Pacific Laboratory Co.,Ltd.
Ambient Temperature : (25.2 to 25.8)°C
Relative Humidity : (50 to 55) %

Date of Received : 17 December 2022

Date of Calibration : 17 December 2022

Date of Issue : 19 December 2022

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
4.008	61235182	857394	11 Dec 2024	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
6.986	61267169	857395	11 Dec 2023	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
10.010	61260481	857396	11 Dec 2023	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 65-420108-1

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	4.008	4.01	0.00	0.0097
	6.986	7.00	-0.01	0.011
	10.010	10.01	0.00	0.014

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%

- 000 -



CAL

Calibratech Co.,Ltd.

7/106-7 Moo 2, Sukhprachasan 3 Rd., Bangpood, Pakkred, Nonthaburi 11120

Tel.(02) 964-6211 Fax.(02) 964-5155, e-mail : calibratech.cal@yahoo.com, calibratech.cal@hotmail.com



Certificate of Calibration

Certificate No. : 65-400648-1

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. : PHSTEMB01P 049

ID No. : LAB-PH-002

Environment :

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

Ambient Temperature : (25.2 to 25.8) °C

Relative Humidity : (50 to 55) %

Line Voltage : (220.0 to 222.0) VAC

Date of Received :

17 December 2022

Date of Calibration :

17 December 2022

Date of Issue :

19 December 2022

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 TT-0074-22 20 Jun 2024 National Institute of Metrology Thailand (NIMT)

2. Standard Digital Thermometer

ID No. Cert. No. Due Date Traceability

400033 22E569 22 Feb 2024 National Institute of Metrology Thailand (NIMT)

The Uncertainties are for a confidence probability of approximately 95%

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CAL-F0031-03

CAL

Calibratech Co.,Ltd.

7/106-7 Moo 2, Sukhprachasan 3 Rd., Bangpood, Pakkred, Nonthaburi 11120

Tel.(02) 964-6211 Fax.(02) 964-5155, e-mail : calibratech.cal@yahoo.com, calibratech.cal@hotmail.com

Certificate of Calibration

Certificate No. : 65-400648-1

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%

- 0.00 -



CAL-F0031-03



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



CERTIFICATE No : 22M8888
REFERENCE No : 66223-2

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE
MANUFACTURER : SHIMADZU
MODEL : AF225WD
SERIAL No : D316301828
ID No : LAB-BL-003
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 : 01-Aug-22
APPROVED BY :
ISSUED DATE : 02-Aug-22
RECEIVED DATE : 01-Aug-22

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, Bangkac, Bangkok 10160
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584
www.qcalibration.com

CERTIFICATE No : 22M8888

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : AF225WD
MANUFACTURER : SHIMADZU S/N : D316301828
ID No : LAB-BL-003 RECEIVED DATE : 01-Aug-22
AIR PRESSURE : 1005mbar \pm 1mbar CALIBRATION DATE : 01-Aug-22
AMBIENT TEMPERATURE : 25° C \pm 1° C RELATIVE HUMIDITY : 56 %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.

REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) STANDARD WEIGHT SET	E2	QK-I-151	C02210415	09-Feb-23
2) STANDARD WEIGHT	E2	15843	C02210419	10-Feb-23
3) STANDARD WEIGHT	E2	QK-I-349	M2103235S	26-Mar-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:-

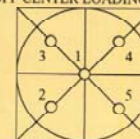
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH CENTRAL BUREAU OF WEIGHTS&MEASURES

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL
2. TARE FUNCTION : NORMAL
3. REPEATABILITY OF READING AT 200 g WAS 0.000045 g
4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (\pm g)
0.000	0.0000	0.0000	0.000075
0.001	0.0010	0.0000	0.000075
0.010	0.0100	0.0000	0.000075
0.050	0.0500	0.0000	0.000076
0.100	0.1000	0.0000	0.000075
1.000	1.0000	0.0000	0.000077
2.000	2.0000	0.0000	0.000077
5.000	5.0000	0.0000	0.000079
20.000	20.0000	0.0000	0.000086
50.000	50.0000	0.0000	0.00011
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	100.0000
3	100.0000
4	100.0000
5	100.0000
OFF-CENTER LOADING	0.0000

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

END OF CALIBRATION REPORT



CERTIFICATE No : 22T8890
REFERENCE No : 66223-4

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, NONTABURI 11110

CALIBRATED BY : CHAICHARN CH.
CALIBRATION DATE : 01-Aug-22

APPROVED BY :
ISSUED DATE : 02-Aug-22
RECEIVED DATE : 01-Aug-22

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



CERTIFICATE No : 22T8890

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : INCUBATOR
MANUFACTURER : AQUA LYTIC
MODEL : TC135S
ID No : LAB-IB-001
RECEIVED DATE : 01-Aug-22
AMBIENT TEMPERATURE : 26 °C ± 1 °C
S/N : 0614/000033
CALIBRATION DATE : 01-Aug-22
RELATIVE HUMIDITY : 53 %RH ± 10 %RH

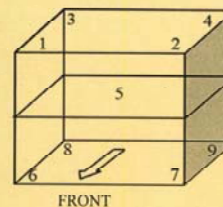
CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO ILAS 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 :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) DATA LOGGER WITH TC TYPE K	HYDRA 2635A	8009008	22T7512	05-Jul-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 QUALITY CALIBRATION CO.,LTD.				

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



FRONT

GENERAL INFORMATION

Overall Ambient Temperature around the Chamber (°C) variation : 7
Overall Line Voltage (V) variation : 10
Instrument Condition : Normal

CHAMBER PERFORMANCE

Controller Temperature (°C)	Indicating Temperature (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
20.0	20.0	0.63	0.48	1.43

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			
20.0	20.0	20.07	20.08	20.07	20.07	20.11	20.07	20.01	19.96	19.83	0.91

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



CERTIFICATE No : 22T8896
REFERENCE No : 66224-2

PAGE : 1 OF 2

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 : 01-Aug-22

APPROVED BY :
ISSUED DATE : 02-Aug-22
RECEIVED DATE : 01-Aug-22

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F-G010 REV : 02



CERTIFICATE No : 22T8896

PAGE : 2 OF 2

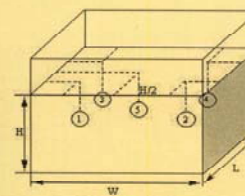
Calibration Report

EQUIPMENT : WATER BATH
MANUFACTURER : MEMMERT
ID NUMBER : LAB-WB-001
RECEIVED DATE : 01-Aug-22
AMBIENT TEMPERATURE : 29 °C ± 1 °C
MODEL : WNB22
SERIAL NUMBER : L514.0184
CALIBRATION DATE : 01-Aug-22
RELATIVE HUMIDITY : 53 %RH ± 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

- 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.
- REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) DATA LOGGER WITH RTD	2625A	6603614	22T7514	05-Jul-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 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	Ref. 5	
85.0	85.0	84.71	84.72	84.66	84.70	84.77	0.23
95.0	95.0	94.71	94.71	94.72	94.66	94.75	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



CERTIFICATE No : 22T8889
REFERENCE No : 66223-3

PAGE : 1 OF 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, NONTABURI 11110

CALIBRATED BY : CHAICHARN CH.
CALIBRATION DATE : 01-Aug-22

APPROVED BY : PONGSAR J.
ISSUED DATE : 02-Aug-22
RECEIVED DATE : 01-Aug-22

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



CERTIFICATE No : 22T8889

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : HOT AIR OVEN
MANUFACTURER : MEMMERT
MODEL : UN55
ID No : LAB-OV-001
RECEIVED DATE : 01-Aug-22
AMBIENT TEMPERATURE : 26 °C ± 1 °C
S/N : B214.1879
CALIBRATION DATE : 01-Aug-22
RELATIVE HUMIDITY : 53 %RH ± 10 %RH

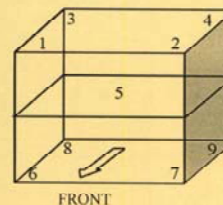
CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO ILAS 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 :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) DATA LOGGER WITH TC TYPE K	HYDRA 2635A	7903007	22T7512	05-Jul-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 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 : 10
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	0.41	1.27	1.41
180.0	180.0	0.67	2.27	2.44

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	104.09	103.96	103.60	103.84	103.93	103.57	103.64	103.15	103.76	0.83
180.0	180.0	179.96	179.74	179.20	179.71	180.02	179.24	179.40	178.55	179.70	1.2

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

ภาคผนวกที่ 6-2

เอกสารการสอบเทียบเครื่องมือตรวจวัดระดับเสียง

Certificate No.: CP20220120EA

Operation No.: CP2022030033

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: 28 March 2022

Calibrated Date: 31 March 2022

Issued Date: 1 April 2022

Calibrated by: Ms. Juntaporn Kunhakom

Approved by:



This report was prepared electronically using applicable electronic signature. Printing or copy of file are considered as a copy of the document.

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor (k) 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.

Certificate No.: CP20220120EA

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-1010-21	13 June 2022
2) Waveform Generator	33511B	MY52302264	0144RF21	17 June 2022
3) Audio Analyzing DMM	2015-P	000136E	E1U214805	16 November 2022
4) Pressure humidity and Temperature Transmitter	PTU301	F0640002	CL1-P210047 0255TE21	16 June 2022 7 July 2022

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	93.99	-0.01	±0.40
1000	114	114.10	0.10	±0.40

2. Function : Frequency

Normal Sound Pressure level (dB)	Specified Frequency (Hz)	Measured value (Hz)	Deviated value ^[2] (%)	Acceptance limit ^[3] (%)
94	1000	970.2	-3.0	±1.7
114	1000	965.8	-3.4	±1.7

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3. Function : Total distortion + noise

Norminal Sound Pressure level (dB)	Norminal Frequency (Hz)	Measured value ^[4] (%)	Acceptance limit ^[5] (%)
94	1000	2.8	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.
2. The coverage factor $k = 2.00$

-- End of Report --

Sound Level Meter Calibration Report

Calibrate No. : SLM 318/2565

Calibrate Date : December 15, 2022

Equipment : Sound Calibrator
 Manufacturer : TENMARS
 Model/Type : TM-100
 Serial No. : 190301469
 Customer Name : โครงการ เอที บางเสร่เลค แอนด์ รีสอร์ท

[illegible]

Approved By