

เอกสารสอบเทียบเครื่องมือวัด



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
สมาคมส่งเสริมเทคโนโลยี (ไทย-ญี่ปุ่น) / CALIBRATION AND TESTING SERVICE
สมาคมส่งเสริมเทคโนโลยี (ไทย-ญี่ปุ่น) / บริการสอบเทียบและทดสอบ
111/1 หมู่ 10 ถนนสุขุมวิท ซอย 11 แขวงคลองตันเหนือ เขตวัฒนา กรุงเทพมหานคร 10110



Cert.No.: 2004534

Page: 1 of 2

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Eutech
Model : pH510
Serial No.: 293152
ID No.: pHM-03
Condition As-Received: Used Item
Received Date : 07 April 2020
Calibration Date : 08 April 2020
Reference : 2004-0121DC-2
Submitted by : Environment & Laboratory Co., Ltd
40 Soi Langmuangnonthaburi 13, Talad Kwan
Musang Nonthaburi 11000

Ambient Temperature : $(25 \pm 2.5) ^\circ\text{C}$
Relative Humidity : $(50 \pm 15) \%$
Calibration Procedure : in-house method
CP-CH5 based on direct measurement by
using standard voltage calibrator and
certified reference materials (CRM)

Calibrated by : Uthairat Kankawin

Approved by :


Approved Signatory

- ☐ Pornthippa Yamyai
☒ Malee Butkruea
☐ Saithir Meangma

Issue Date : 10 April 2020

The Uncertainties are for a confidence probability of approximately 95%

This is a true and correct representation of the actual condition of the product at the
completion of the service of the Service Provider. It is provided as a reference only. No warranty is given.



Cert. No.: 20CH534

Page: 2 of 2

Condition of this calibration result

1. Reference Standard Instrument

Instrument	Model	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	753	43160066	130RC092	19E1939	21 May 2020

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

Traceable to National Institute of Metrology (Thailand), NIMT

2. Certified Reference Materials

The measurement results are traceable to SI through CPA chem Ltd.

ANSLASQ National Accreditation Board, Accredited No. AB-1835

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	677227	12 Mar 2022
pH 6.987	CPA chem	679465	12 Mar 2021
pH 10.009	CPA chem	679464	12 Mar 2021

3. This certificate was certified only for the instrument we calibrated.

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

Calibration Results

Function: mV Measurement

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

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement	Coverage factor
	pH	mV	mV	pH	(mV)	k
pH Meter	4.00	177.48	177.6	4.00	0.11	2.52
S/N 293152	7.00	0.00	0.1	7.00	0.11	2.52
	10.00	-177.48	-177.3	10.00	0.11	2.52

Function: pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4,7,10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement (±)	Coverage factor k
pH Electrode	4.008	4.01	153.0	0.0086	2.05
S/N 29091	6.987	6.99	-19.9	0.011	2.00
	10.009	10.01	-193.3	0.013	2.00

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

-000-

Wd.



THE METROLOGY PROMOTION ASSOCIATION (THAI) AND JAPAN
METROLOGY PROMOTION ASSOCIATION (THAI) AND JAPAN
The Association of Metrology and Calibration (AMC) is a non-profit organization
dedicated to promoting metrology and calibration in Thailand.




Cert. No.: 20TM1161

Page: 1 of 3

Certificate of Calibration

Equipment : Hot Air Oven
Manufacturer : Franco Elevea
Model : XU05B
Serial No. : #427
ID No. : CHC-003
Submitted by : Environment & Laboratory Co., Ltd.
40 Soi Liangmuangnonthaburi 13,
Talat Kwan, Muang,
Nonthaburi 11000
Location : Room No. 303
Received Order : 7 July 2020
Calibration Date : 7 July 2020
Ambient Temperature : $(26 \pm 10) ^\circ\text{C}$
Relative Humidity : $(50 \pm 30) \%$

Calibrated by : Suwit Inyaa

Approved by : 
Approved Signatory

(/) Pornthippa Tameyakul
(/) Malee Butkruea

Issue Date : 20 July 2020

The Uncertainties are for a confidence probability of approximately 95%

For more information, please contact the Metrology and Calibration Department
at the Association of Metrology and Calibration (AMC) at the following address:
The Association of Metrology and Calibration (AMC) is a non-profit organization
dedicated to promoting metrology and calibration in Thailand.



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2007-0084QC-1

Cert. No.: 20TM1181
Page: 2 of 3

Procedure Used :-

Calibration were conducted using calibration procedure CP-OT62 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD) and Thermocouple Type T

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument :-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY44067B17	19LM4	NIST	13 Jul 2020
2) Data Acquisition	MY41021843	20LM1	NIST, NIST	29 Dec 2020

2. This certification is traceable to the SI unit

3. This certificate is valid only to the item calibrated on date and place of calibration

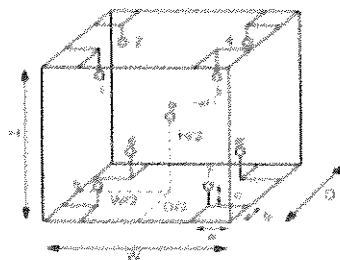
Remark : NIST : National Institute of Standards and Technology, The United State of America

NMT : National Institute of Metrology Thailand

Result of Calibration : (*) Without Adjustment

Function of UUC : Temperature Source

Fresh air setting : Close



Environment during calibration		
	Beginning	Finished
Temp. (°C)	32	29
REL Humid. (%)	45	61
AC Supply (Volt)	220	220

Probe Installation Details :		Dimension of Chamber :	
a =	5.0 cm	D =	0.36 m
b =	5.0 cm	W =	0.40 m
c =	5.0 cm	H =	0.40 m
		Capacity =	0.058 m ³

Ref. Std./ID No.: @		
Calibration Point		
Position :	(154) °C	(180) °C
1	19-15RTD-01	18-04TC-01
2	19-15RTD-02	18-04TC-02
3	19-15RTD-10	18-04TC-03
4	19-15RTD-04	18-04TC-04
5	19-15RTD-05	18-04TC-05
6	19-15RTD-06	18-04TC-07
7	19-15RTD-07	18-04TC-08
8	19-15RTD-08	18-04TC-09
9 (ref.)	19-15RTD-09	18-04TC-10

WU



Equipment : Hot Air Oven
 Condition As-Received : Used Item
 Reference : Z007-00840C-1
 Result of Calibration : (*) Without Adjustment

Cert. No. : 20TM1181

Page : 3 of 3

Function of UUC* : Temperature Source

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor k
104.0	104.0	104.0	0.081	0.74	1.2	0.42	2
180.0	179.0	179.0	0.43	2.5	2.7	1.2	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
104.0	103.914	104.144	104.194	103.501	103.476	103.447	104.518	104.040	104.124
180.0	178.857	180.061	179.558	179.886	180.733	179.373	180.327	180.831	178.602

Average* : The average of 30 values in each position

Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor

Temperature uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions

Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation

UUC* : Unit Under Calibration

Note : The reported uncertainty of measurement was included stability and excluded uniformity

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



THE MANUFACTURERS' ASSOCIATION (THAILAND) JAPAN
สมาคมผู้ผลิตสินค้าญี่ปุ่นแห่งประเทศไทย
111/1 หมู่ 11 ต.บางพลีใหญ่ อ.บางพลี จ.สมุทรปราการ 10540
โทรศัพท์ 02-015-8888 ต่อ 400 โทรสาร 02-015-8888 โทร.มือถือ 09-099-9999



Cert. No.: 20TM1644

Page: 1 of 3

Certificate of Calibration

Equipment : Incubator
Manufacturer : Songasem Intercoor
Model :
Serial No :
ID No. : CH1-001
Submitted by : Environment & Laboratory Co. Ltd
40 Soi Luangmueangnonthaburi 13
Talat Kwan, Mueang,
Nonthaburi 11000
Location : Room No. 301
Received Order : 19 August 2020
Calibration Date : 19 August 2020
Ambient Temperature : $(26 \pm 10) ^\circ\text{C}$
Relative Humidity : $(50 \pm 30) \%$

Calibrated by : Kunchat Promprat

Approved by :

Approved Signatory

- ☐ Pornthippa Tamayakul
☒ Malee Butkrues
☐ Suwit Injai

Issue Date : 26 August 2020

The Uncertainties are for a confidence probability of approximately 95%

การวัดและการสอบเทียบนี้ดำเนินการขึ้นภายใต้เงื่อนไขการสอบเทียบตามข้อกำหนด
ของมาตรฐาน ISO/IEC 17025:2017 และได้รับการรับรองโดยกรมการค้าระหว่างประเทศ



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2008-0401OC-2

Cert. No.: 20TM1644
Page.: 2 of 3

Procedure Used :-

Calibration were conducted using calibration procedure CP-0102 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD)

The temperature scale used was based on ITS-90

Condition of this result of calibration

1 Reference standard instrument :-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY44067517	20X.M6	NIST, NIMT	29 Jul 2021

2 This certification is traceable to the SI unit

3 This certificate is valid only to the item calibrated on date and place of calibration

Remark : NIST : National Institute of Standards and Technology, The United State of America

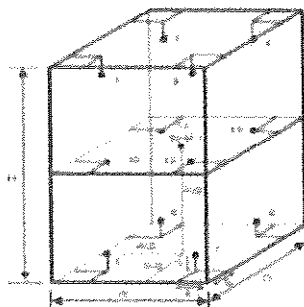
NIMT : National Institute of Metrology Thailand.

Result of Calibration :- (°) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available

Environment during calibration		
	Beginning	Finished
Temp (°C)	28	28
REL Humd (%)	51	60
AC Supply (Volt)	220	220



Position :	Ref. Std./D No.:
1	19-15RTD-01
2	19-15RTD-02
3	19-15RTD-03
4	19-15RTD-04
5	19-15RTD-05
6	19-15RTD-06
7	19-15RTD-07
8	19-15RTD-08
9 (ref.)	19-15RTD-09
10	19-15RTD-10
11	15RTD2/11
12	15RTD2/12
13	15RTD2/13

Dimension of Chamber :

D = 0.60 m
W = 0.60 m
H = 1.2 m
Capacity = 0.43 m³

Probe Installation Details :

a = 10 cm
b = 10 cm
c = 10 cm

Walu



Equipment : Incubator
 Condition As-Received : Used Item
 Reference : 2008-0401OC-2
 Result of Calibration : (*) Without Adjustment
 Function of UUC* : Temperature Source

Cert. No.: 20TM1644

Page.: 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor k
20.0	20.0	20.0	0.31	0.40	0.97	0.44	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
20.0	1	2	3	4	5	6	7	8	9 (ref.)
	19.982	19.966	20.292	19.831	20.086	20.032	19.942	19.887	19.975
	10	11	12	13					
	19.958	20.100	19.870	19.999					

Average* : The average of 30 values in each position.

Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor

Temperature uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions

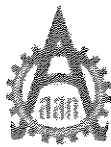
Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation

UUC* : Unit Under Calibration

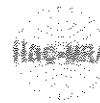
Note : The reported uncertainty of measurement was included stability and excluded uniformity

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

Wale



THE MINISTRY OF NATURAL RESOURCES AND ENVIRONMENT, THAILAND
กรมทรัพยากรธรรมชาติและสิ่งแวดล้อม
กรมการตรวจประเมินผลกระทบสิ่งแวดล้อม
กรมการตรวจประเมินผลกระทบสิ่งแวดล้อม
กรมการตรวจประเมินผลกระทบสิ่งแวดล้อม



Certificate of Calibration

Cert.No.: 20MM439

Page.: 1 of 3

Equipment : Electronic Balance
Manufacturer : Mettler Toledo
Model : AL204
Serial No. : 1228510730
ID No. : ANB-002
Submitted by : Environment & Laboratory Co.,Ltd
40 Suk Liangmuesengnonthaburi 13,
Talat Kwai, Mueang,
Nonthaburi 11000
Location : Room No. 304
Received order : 7 July 2020
Calibration Date : 7 July 2020
Ambient Temperature : 16 °C to 40 °C
Relative Humidity : 30 % to 90 %
Calibrated by : Tawatchai Pansa
Approved by : 
Approved Signatory
☐ Pornnipa Tameyakul
☒ Malee Butkruea
☐ Suwit Imjai

Issue Date : 20 July 2020

The uncertainties are for a confidence probability of approximately 95%

การวัดความไม่แน่นอนของผลการวัดเป็นไปตามข้อกำหนดของมาตรฐาน ISO 9001:2015
การวัดความไม่แน่นอนของผลการวัดเป็นไปตามข้อกำหนดของมาตรฐาน ISO 9001:2015
การวัดความไม่แน่นอนของผลการวัดเป็นไปตามข้อกำหนดของมาตรฐาน ISO 9001:2015



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2007-00840C-9

Cert.No.: 20MM436

Page: 2 of 3

Procedure used :-

Calibration were conducted using in-house calibration procedure CP-QB01 according to direct measurement method against standard weight.

Condition of this result of calibration

1. Reference standard instruments :-

Instruments	Model	Serial No.	ID No.	Test report No.	Due date
1) Standard Weight Set (E2)	O-72336	00602134	70RC067	MM-0053-20	27 Apr 2022
2) Standard Weight Set (E2)		B125177491-2	70RC233	MM-0054-20	27 Apr 2022

- This certificate is valid only to the item calibrated on date and place of calibration
- This result of calibration was made on requested at the point specified by customer
- This certificate is not certified for any commercial transaction
- This certification is traceable to the International System of Unit maintained at :-
National Institute of Metrology (Thailand)

Result of calibration () Without Adjustment (*) After Adjustment by External Calibration

Range capacity : 0 g to 210 g Resolution 0.0001 g

Before Adjustment :

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (± mg)	Coverage Factor (k)
100	100.0005	-0.0005	0.20	2.04
200	200.0012	-0.0012	0.30	2.00

After Adjustment :

1. Determination of the standard deviation of weighing machine (n = 10)

Applied Weight (g)	Standard Deviation of Reading (g)
100	0.00008
200	0.00009

Signature



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2007-0084OC-9

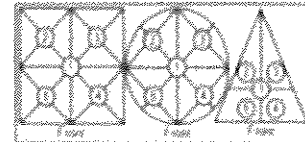
Cert.No.: 2018M439

Page: 3 of 3

Result of calibration

2. Effect of off center loading

A mass of 100 g was placed in various position on the pan.
The weighing machine reading error obtained is given in the table



Maximum difference between
off-center and central loading

Position 1 (g)	Position 2 (g)	Position 3 (g)	Position 4 (g)	Position 5 (g)	(g)
-0.0001	0.0001	0.0000	+0.0001	+0.0001	0.0002

3. Departure from nominal value

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (± mg)	Coverage Factor (k)
Unloaded	0.0000	0.0000	0.15	2.13
0.2	0.2000	0.0000	0.15	2.13
0.5	0.5000	0.0000	0.15	2.13
2	2.0000	0.0000	0.15	2.13
5	5.0000	0.0000	0.15	2.13
10	9.9999	+0.0001	0.15	2.13
20	19.9999	+0.0001	0.15	2.13
50	49.9999	+0.0001	0.17	2.09
100	99.9997	+0.0003	0.20	2.04
150	149.9996	+0.0002	0.29	2.00
200	199.9995	+0.0002	0.30	2.00

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

7/11/2018