

ภาคผนวก ช

เอกสารสอบเทียบเครื่องมือที่ใช้ในการวิเคราะห์



SCIMET Co., Ltd.
818/124 Udomsuk Rd., Bangna-Nuea,
Bangna, Bangkok 10260 Thailand
Email: scimet2022@gmail.com, Tel: 02-460-9239
https://www.scimet.co.th



Page: 2 of 3

Certificate No.: C17250374

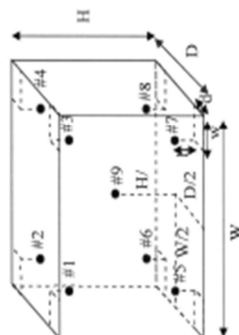
Certificate No.: C17250374

Condition of reference standards instruments:

Instruments	Model	S/N or ID	Certificate No.	Due Date
Datalogger 4	34972A	MY49012108	C23240091	18-Sep-2025

Condition of Calibration item :

In Condition



Standard Installation Locations

Volume (Calibration Zone): 138 (Liters)

Inside chamber: W = 49 (cm) D = 49 (cm) H = 118 (cm)

Standard Locations (#1, #2, #3, #4): w = 5 (cm) d = 5 (cm) h = 15 (cm)

Standard Locations (#5, #6, #7, #8): w = 5 (cm) d = 5 (cm) h = 12 (cm)

#9: Geometric center of the chamber

Position of Std	#1	#2	#3	#4	#5	#6	#7	#8	#9
Channel of Logger	301	302	303	304	305	306	307	308	309

Definitions

Indicating Temperature: The average reading of indicating device which forms the integral part of the enclosure.**Measured Temperature:** The average reading of standards at any positions or location.**Measured Uniformity:** The maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time or at close observation time as possible to determine the temperature pattern or homogeneity with the chamber at steady-state. The reference probe is preferably located in the geometric center of the chamber.**Measured Stability:** The one-half of greatest maximum difference of measured temperatures at any one probe.**Overall Variation:** The difference of maximum and minimum measured temperatures throughout observation time.

บริษัท ชอนันท์ จำกัด (SCIMET CO., LTD.)
818/124 Udomsuk rd., Bangna-Nuea, Bangkok 10260 Thailand
Email: scimet2022@gmail.com, Tel: 02-460-9239

FC17-03: 27 JAN 2025

Certificate No. C17250374

Calibration Certificate

Equipment: Cooled Incubator
Model: SMART I250
Serial No.(or ID): 0410-0423-0017 (LAB-0004)
Manufacturer: Accuplus
Ventilation Valve: None
Shelves(pc): 4

Job No.: KSM72502672
Received Date: 01 July 2025
Issued Date: 02 July 2025
Page: 1 of 3

Customer

WE Environment CO., Ltd.
280/19 Moo. 9 Bang Toei, Sam Khok, Pathum Thani, 12160

Calibration Place

WE Environment CO., Ltd. (Laboratory)
280/19 Moo. 9 Bang Toei, Sam Khok, Pathum Thani, 12160

Calibration Date

01 July 2025

Environment Condition

Temperature: 20.2 °C ± 1.1 °C
Humidity: 55.9 %RH ± 3.0 %RH

The Method used

In-house method, W117, based on G-20-1/02-08 (E)

Traceability

This certificate is traceable to the SI Units maintained by
National Institute of Metrology (NIMT), Thailand through
SCIMET Co., Ltd. Certificate No. C23240091



(Mr. Chanchol Moohammudrasol)
Person in charge

(Mr. Thalengkeat Pongngam)
Authorized signatory

FC17-03: 27 JAN 2025

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : pH METER WITH TEMPERATURE
MANUFACTURER : EUTECH INSTRUMENTS
MODEL / TYPE : PH700
SERIAL NO. : 3150127[LAB-0001]
CLID. NO. : 372400303
JOB CONTROL NO. : 250620071640
CALIBRATION SERVICE : ☐ IN-LABORATORY ☒ ON-SITE

CUSTOMER : WE ENVIRONMENT CO., LTD.
288/19 MOO 9 BANGTOEI SAM KHOK
PATHUM THANI 12160 THAILAND

DATE OF RECEIVED : 20 June 2025 DATE OF ISSUED : 27 June 2025

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

Calibrated By : Sukgasm Sechanart
Wenick Inchaisri
Calibration Engineer

Approved By : Mongkol Yoisoontorn
Authorized Signatory
27 June 2025

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

Certificate No. Q25071640
F3-011-0512-23

page 1 of 4



Certificate No.: C17250374 Page: 3 of 3

Calibration Results:
Without adjustment

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 20.0 °C

Locations	Measured Temperature (°C)	Correction (°C)	Uncertainty (± °C)
#1	20.20	0.20	0.46
#2	20.20	0.20	0.49
#3	20.03	0.03	0.61
#4	20.13	0.13	0.48
#5	20.10	0.10	0.66
#6	20.11	0.11	0.56
#7	19.84	-0.16	0.74
#8	19.97	-0.03	0.49
#9	19.95	-0.05	0.61

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
20.0	20.0	20.0	#1	#2	#3	#4	#5	#6	#7	#8	#9	
20.0	20.0	20.0	20.20	20.20	20.03	20.13	20.10	20.11	19.84	19.97	19.95	0.74

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
20.0	0.50	0.53	1.28

Note: * Maximum uncertainty of the each position

The End of Certificate

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Email: scimet2022@gmail.com, Tel: 02-460-9239

FC17-03: 27 JAN 2025



REPORT OF CALIBRATION

FOR

NOMENCLATURE : pH METER WITH TEMPERATURE
MANUFACTURER : EUTECH INSTRUMENTS
MODEL / TYPE : PH700
SERIAL NO. : 3150127[LAB-0001]
LOCATION SITE : ANALYTICAL LABORATORY 1
DATE OF CALIBRATION : 25 June 2025

ENVIRONMENT CONDITIONS :

Temperature : 23°C to 25°C
Relative Humidity : 50% to 60%

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPIH-01 [pH Meter]. The calibration was performed by direct measurement with Certified Reference Material (CRM).
This instrument was calibrated under procedure No. CLC-CPTH-03 [Temperature] based on ASTM E 644-04 as calibration guidelines. The calibration was performed by using Micro Calibration Bath, Precision Thermometer and IPRT which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

- pH Standard Solution, NIST TRM CODE TRM-S-2002, TRM CODE TRM-S-2003, TRM CODE TRM-S-2007.
- pH Standard Solution, Control Company Catalog Number 0666263, 11784256, Lot Number CC788789.
- Micro Calibration Bath, Kumbic Model OBM-LT SN. 18015718.
- Precision Thermometer, Wika Model CTH 7000 SN: 014471/18.
- IPRT, ASL Model T100-250-1D SN: L0193A-1-1.

Certificate No. Q25071640
F3-011-0512-23

page 2 of 4



TRACEABILITY :

- The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand). Lot Number: 260124 - 080124, Due Date 23 January 2026.
- The measurements are traceable to International System of Units (SI), through Control Company. Certificate No. 4288-14548619, Due Date 17 October 2025.
- The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q24121000, Due Date 21 November 2025.
- The measurements are traceable to International System of Units (SI), through Thailand Institute of Scientific and Technological Research (TISTR). Certificate No. PSL-T 104367, Due Date 16 October 2025.
- The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand). Certificate No. TT-0169-24, Due Date 11 December 2025.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor complies with the table which for a normal distribution corresponds to a coverage probability of approximately 95 %.
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4:02 M:2022)"

Certificate No. Q25071640
F3-011-0512-23

page 3 of 4





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Certificate No. C17250373

Calibration Certificate

Equipment: Hot Air Oven
Model: XUE112
Serial No.(or ID): Y0137 (LAB-0002)
Manufacturer: France Eluves
Ventilation Valve: Closed
Shelves(pc): 2

Customer

WE Environment CO., Ltd.
280/19 Moo. 9 Bang Toei, Sam Khok, Pathum Thani, 12160

Calibration Place

WE Environment CO., Ltd. (Laboratory)
280/19 Moo. 9 Bang Toei, Sam Khok, Pathum Thani, 12160

Calibration Date

01 July 2025

Environment Condition

Temperature: 31.1 °C ± 0.9 °C
Humidity: 58.6 %RH ± 3.4 %RH

The Method used

In-house method, VM17, based on G-20-102-08 (E)

Traceability

This certificate is traceable to the SI Units maintained by
National Institute of Metrology (NIMT), Thailand through
SCIMET Co.,Ltd. Certificate No. C22240091



(Mr. Chanachol Mochamudrosad)
Person in charge

(Mr. Thalemgklat Pongngam)
Authorized signatory

FC17-03 27 JAN 2025



CALIBRATION LABORATORY CO., LTD.
27/10-11/14/55 Soi Phrasert Mueang 20 Yolk 4, Phrasert Mueang Rd, Ladkrabang, Bangkok 10230
Tel: 02-578-0853-4 Fax: 02-578-2672 www.calibration.co.th Email: info@calibration.co.th



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

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

CALIBRATION DATA

1. pH METER RESULT @ 25 °C

Standard pH Buffer Solution (pH)	pH Meter Reading (pH)	pH Meter Reading (mV)	Correction (pH)	Uncertainty of pH Measurement (± pH)	k Factor
1.684	1.68	309	+0.004	0.013	2.20
4.003	4.00	174.2	+0.003	0.013	2.15
7.005	7.00	-1.5	+0.005	0.015	2.06
10.015	10.01	-172.5	+0.005	0.016	2.05

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

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

2. TEMPERATURE RESULT

Immersion depth (mm)	Actual Temperature (°C)	DUC Reading (°C)	Correction (°C)	Uncertainty ± (°C)
115	25.00	25.1	-0.10	0.12

Technical Note: Type of sensor : Thermistor

Probe Ø 3 mm

Materials : Stainless Steel

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

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

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

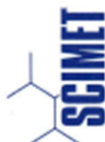
End of Certificate

Certificate No. Q25071640

F3-011-05/12-23

page 4 of 4





Page: 2 of 5

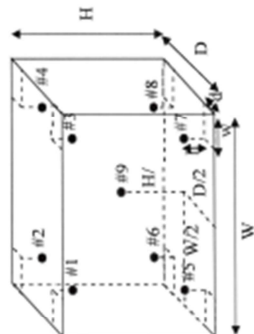
Certificate No.: C17250373

Condition of reference standards instruments:

Instruments	Model	S/N or ID:	Certificate No.	Due Date
Datalogger 4	34972A	MY49012108	C23240091	18-Sep-2025

Condition of Calibration Item :

In Condition



Standard Installation Locations

Volume (Calibration Zone)= 39 (Liters)

Inside chamber: W = 50 (cm) D = 45 (cm) H = 50 (cm)

Standard Locations (#1, #2, #3, #4): w = 5 (cm) d = 5 (cm) h = 12 (cm)

Standard Locations (#5, #6, #7, #8): w = 5 (cm) d = 5 (cm) h = 10 (cm)

#9: Geometric center of the chamber

Position of Std	#1	#2	#3	#4	#5	#6	#7	#8	#9
Channel of Logger	201	202	203	204	205	206	207	208	209

Definitions

Indicating Temperature: The average reading of indicating device which forms the integral part of the enclosure.

Measured Temperature: The average reading of standards at any positions or location.

Measured Uniformity: The maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time or at close observation time as possible to determine the temperature pattern or homogeneity with the chamber at steady-state. The reference probe is preferably located in the geometric center of the chamber.

Measured Stability: The one-half of greatest maximum difference of measured temperatures at any one probe.

Overall Variation: The difference of maximum and minimum measured temperatures throughout observation time.

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FC17-03: 27 JAN 2025



Page: 3 of 5

Certificate No.: C17250373

Calibration Results:

Before adjustment

Desired (°C)	Setting (°C)	Indicating (°C)	#1 (°C)	#2 (°C)	#3 (°C)	#4 (°C)	#5 (°C)	#6 (°C)	#7 (°C)	#8 (°C)	#9 (°C)
104.0	104.0	104.0	104.48	104.44	104.19	104.27	105.00	104.81	104.44	104.36	104.65

After adjustment

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 85.0 °C

Locations	Measured Temperature (°C)	Correction (°C)	Uncertainty (± °C)
#1	85.06	0.06	0.26
#2	85.02	0.02	0.26
#3	84.84	-0.16	0.26
#4	84.88	-0.12	0.26
#5	85.40	0.40	0.26
#6	85.24	0.24	0.26
#7	85.01	0.01	0.26
#8	84.95	-0.05	0.26
#9	85.14	0.14	0.26

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
85.0	85.0	85.0	85.06	85.02	84.84	84.88	85.40	85.24	85.01	84.95	85.14	0.26

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
85.0	0.35	0.08	0.71

Note: * Maximum uncertainty of the each position

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FC17-03: 27 JAN 2025



Certificate No.: C17250373

Page: 5 of 5

After adjustment (Cont.)

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 180.0 °C

Locations	Measured Temperature (°C)	Correction (°C)	Uncertainty (± °C)
#1	179.93	-0.07	0.43
#2	180.14	0.14	0.43
#3	179.34	-0.66	0.43
#4	179.50	-0.50	0.43
#5	181.17	1.17	0.43
#6	180.71	0.71	0.43
#7	179.65	-0.35	0.43
#8	179.75	-0.25	0.43
#9	180.44	0.44	0.43

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
180.0	180.0	180.0	179.93	180.14	179.34	179.50	181.17	180.71	179.65	179.75	180.44	0.43

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
180.0	1.18	0.12	2.05

Note: * Maximum uncertainty of the each position

The End of Certificate

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FC17-03_27 JAN 2025



Certificate No.: C17250373

Page: 4 of 5

After adjustment (Cont.)

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 104.0 °C

Locations	Measured Temperature (°C)	Correction (°C)	Uncertainty (± °C)
#1	103.87	-0.13	0.39
#2	103.87	-0.13	0.39
#3	103.60	-0.40	0.39
#4	103.69	-0.31	0.39
#5	104.41	0.41	0.39
#6	104.20	0.20	0.39
#7	103.85	-0.15	0.39
#8	103.80	-0.20	0.39
#9	104.04	0.04	0.39

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
104.0	104.0	104.0	103.87	103.87	103.60	103.69	104.41	104.20	103.85	103.80	104.04	0.39

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
104.0	0.49	0.10	0.98

Note: * Maximum uncertainty of the each position

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FC17-03_27 JAN 2025



Certificate No.: C1250752 Page: 2 of 3

Condition of reference standards Instruments:

Instruments Model Serial No. or ID. Certificate No. Due date
Standard Weight Set 1mg - 500mg / E2 8.XE-HM-711 210211 C13250243 18 Apr 27
Standard Weight Set 1 g - 200 g / E2 8303EJ 162403 C13250171 06 Mar 28

Calibration Results:

Before Adjustment (Use internal calibration adjustment)

Scientific Error: Weight to be 1/3 or 1/2 of Maximum capacity, taken from the center of the pan as a zero reference.

Nominal Test Value	Reference Points (g)				
	A	B	C	D	E
-	0.0001	-0.0001	0.0000	0.0001	0.0001

Repeatability: Determination of the standard deviation of weighing balance, Readability		0.0001 (g)
Nominal test value (g)	Standard Deviation	
20	0.00004	
200	0.00008	

Error of indication from nominal or conventional mass value, Readability						0.0001 (g)
Nominal Value (g)	Conventional Mass (g)	Displayed Value (g)	Error of Indication (g)	Uncertainty (g)	k	
0.1	0.10000	0.1000	0.0000	0.00011	2.04	
0.2	0.20000	0.2000	0.0000	0.00011	2.04	
0.5	0.49998	0.5000	0.0000	0.00011	2.04	
1	1.00000	1.0000	0.0000	0.00011	2.04	
2	2.00000	2.0000	0.0000	0.00011	2.04	
5	4.99998	5.0000	0.0000	0.00011	2.04	
10	9.99998	10.0000	0.0000	0.00011	2.04	
20	20.00000	20.0000	0.0000	0.00012	2.03	
50	49.99994	50.0000	0.0001	0.00013	2.02	
100	99.99990	99.9998	-0.0001	0.00017	2.01	
200	199.99997	199.9997	-0.0003	0.00030	2.00	

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FC12-03: 27 JAN 2025



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https://www.scimet.co.th



Certificate No. C1250752

Calibration Certificate

Equipment: Balance
Model: BSA224S-CW
Serial No.(or ID): 3143517467 (LAB-0003)
Manufacturer: Sartorius
Condition: In condition
Job No.: KSMT2502671
Received Date: 01 July 2025
Issued Date: 02 July 2025
Page: 1 of 3

Customer
WE Environment CO., Ltd.
280/19 Moo. 9 Bang Toei, Sam Khok, Pathum Thani, 12160

Calibration Place
WE Environment CO., Ltd. (Laboratory)
280/19 Moo. 9 Bang Toei, Sam Khok, Pathum Thani, 12160

Calibration Date
01 July 2025

Environment Condition
Temperature: 21.1 °C ± 0.5 °C
Humidity: 53.7 %RH ± 4.7 %RH

The Method used
In-house method, W12, based on UKAS Lab 14

Traceability
This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through SCIMET Co., Ltd.
Certificate No. C13250243, C13250171

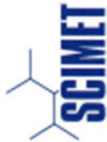
This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standards, recognized national standard laboratories.
The measurement uncertainty stated in the expanded uncertainty which is obtained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



(Mr. Thalerngkeat Pongnam)
Authorized signatory

(Mr. Chanachol Mochammudrosol)
Person in charge

FC12-03: 27 JAN 2025



Certificate No.: C12250752 Page: 3 of 3

After Adjustment (Overwrite or Adjustment Internal calibration weight)

Eccentric Error: Weight to be 1/3 or 1/2 of Maximum capacity, taken from the center of the pan as a zero reference.

Nominal Test Value	Reference Points (g)				
	A	B	C	D	E
100		0.0000	-0.0001	0.0000	0.0001

Repeatability: Determination of the standard deviation of weighing balance... Readability 0.0001 (g)

Nominal test value (g)	Standard Deviation
20	0.00004
200	0.00006

Error of Indication from nominal or conventional mass value... Readability 0.0001 (g)

Nominal Value (g)	Conventional Mass (g)	Displayed Value (g)	Error of Indication (g)	Uncertainty (g)	k
0.1	0.10000	0.1000	0.0000	0.00011	2.04
0.2	0.20000	0.2000	0.0000	0.00011	2.04
0.5	0.49998	0.5000	0.0000	0.00011	2.04
1	1.00000	1.0000	0.0000	0.00011	2.04
2	2.00000	2.0000	0.0000	0.00011	2.04
5	4.99999	5.0000	0.0000	0.00011	2.04
10	9.99999	10.0000	0.0000	0.00011	2.04
20	20.00000	20.0000	0.0000	0.00012	2.03
50	49.99994	50.0000	0.0001	0.00013	2.02
100	99.99990	100.0000	0.0001	0.00017	2.01
200	199.99997	200.0000	0.0000	0.00030	2.00

The End of Certificate

บริษัท ยานีเนก จำกัด (SCIMET CO., LTD.)
815/124 Udonrak rd. Bangna-Nua, Bangna, Bangkok 10260 Thailand
Email: scimet2022@gmail.com, Tel: 02-460-9239

FC12-03: 27 JAN 2025

Global Leader in Test Equipment Solutions
96/38-39 Hwa Cross Street, Domeng, Polay, Yekha Road, Samutprakarn, Thailand 17128
Tel: +66231-5141

CERTIFICATE OF CALIBRATION

Customer: WE ENVIRONMENT CO.,LTD
280/19 Moo 9 Bangpoo,
Sam Khok, Pathum Thani 12160Manufacturer: Elite Lab Instrument
Model Number: JRX-208X
Description: Curve Heating Digestion System
Asset Number: 208X-231007-0071
Serial #: 208X-231007-0071
P.O. #: N/A
Procedure: CPTD-05 (Sep. 2020)
Certificate Number: TTH-136610
Temperature: 28 °C
Relative Humidity: 45 %RH
Calibration Location: On-Site
Calibrated By: CHAIYAPONG KONGKAMUT
Calibration Date: 16/DEC/2024
Next Due Date: 16/DEC/2025
Condition Received: IN TOLERANCE
Condition Returned: IN TOLERANCE

This certifies that the above instrument was calibrated in compliance with the Calibration System Requirements of ISO/IEC 17025:2017, ANSI/NCSL Z540-1:1994 (2003) in accordance with referenced procedures. Standards used to perform this calibration are traceable to SI units; their source of traceability derives from a National Metrology Institute such as NIST, CENAM, NPL, DIN, from national physical constants, consensus standards or derived by the ratio type of calibrations. Collective uncertainties are determined as required with a distribution that corresponds to a probability of approximately 95% (k=2). Unless otherwise noted, calibrations are performed to manufacturer's specifications. Compliance statements are in conformance with ILAC-G8:2019 sample acceptance decision rule. This form shall not be reproduced, except in full, without the expressed written consent of Techmaster. Contact our customer service representative for clarification of this document.

Standards Utilized			
Standard #	Description	Manufacturer	Model #
5680	Digital Multimeter	Revolet Pockard	3458A
5755	Standard PRTs	FLUKE	5626

Remarks:

Due Date Test Report #
MAR/29/2025 TTH-0-90662
OCT/01/2025 TTH-0-135336-R1

W. Chaitan

Wanits Cheviton
Quality Assurance

P. Moemungsan

Ponleap Moemungsan
Technical Manager

M. Hanta

Noppant Homta
Approved By

Issued on: 2024-12-16 01:45:19:5470000-08:00

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TTH-136610

TTH 52

Page 1 of 2



INCUBATOR
Manufacturer: Harsco
Model: HSC-400
Serial No.: 002738
ID No.: B-4-32
Calibration Date: 12 Mar 25
Calibration By: ANAB
Certificate No.: 24-07237
Unit: 38 ± 1 °C
Unit: 38 ± 1 °C (26.0 - 37.0 °C)

แนบภาพใบผลการสอบเทียบเครื่องมือ



Figure: Example of sensor installation positions

UUC Setting (°C)	UUC Reading (°C)	Calibration point (TIS) (°C)	Uncertainty (°C)	Position	Actual temp. (TIS) (°C)	Error (E-Ta) (°C)	E-U (°C)	E-U (UUC temp. Error) (°C)
38.0	38.0	38.0	0.24	1	26.89	-0.11	0.13	-0.26
				2	26.98	-0.02	0.22	-0.26
				3	26.98	-0.02	0.22	-0.26
				4	35.99	-0.01	0.23	-0.25
				5	35.96	-0.04	0.20	-0.28
				6	36.02	0.02	0.26	-0.22
				7	35.95	-0.05	0.19	-0.29
				8	35.96	-0.04	0.20	-0.28
				9	35.95	-0.05	0.19	-0.29

ผลการสอบเทียบที่ Incubator สามารถใช้ร่วมกับชุดควบคุม

Error (°C)	Correction Error x (-1) (°C)	UUC Setting - TIS (°C)	หาค่าที่ใช้ในการแก้ไข (°C)
Min -0.11	0.1	0.00	36.1
Max 0.02	0.0	37.0	

ค่าการอ่านจากชุด Incubator ที่สามารถใช้งานได้คือ 35.1 - 37.0 °C

ผู้สอบ: 4-หน้าจั่ว
(นางสาว ศิริพร สมบัติกุล)

Date: 12 JUN 2025

ผู้ตรวจสอบ: 4-หน้าจั่ว
(นางสาว ศิริพร สมบัติกุล)

Date: 12 JUN 2025

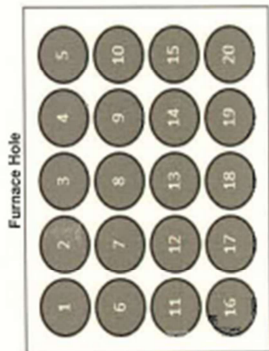
ผู้สอบ: 4-หน้าจั่ว
(นางสาว ศิริพร สมบัติกุล)

Date: 12 JUN 2025

15-05259-04-008 Rev 01 / วันที่บังคับใช้ 15.05.2020



Calibration Results Number: TTH-136610



Controller

Temperature Accuracy

Furnace Hole	UUT Displayed	STD Reading	Error	Result	Uncertainty	Tolerance
1	380 °C	378.9 °C	1.1 °C	Pass	0.1 °C	375 °C - 385 °C
2	380 °C	378.5 °C	1.5 °C	Pass	0.1 °C	375 °C - 385 °C
3	380 °C	377.6 °C	2.4 °C	Pass	0.1 °C	375 °C - 385 °C
4	380 °C	378.4 °C	1.6 °C	Pass	0.1 °C	375 °C - 385 °C
5	380 °C	378.1 °C	1.9 °C	Pass	0.1 °C	375 °C - 385 °C
6	380 °C	378.4 °C	1.6 °C	Pass	0.1 °C	375 °C - 385 °C
7	380 °C	378.0 °C	2.0 °C	Pass	0.1 °C	375 °C - 385 °C
8	380 °C	378.1 °C	1.9 °C	Pass	0.1 °C	375 °C - 385 °C
9	380 °C	378.5 °C	1.5 °C	Pass	0.1 °C	375 °C - 385 °C
10	380 °C	378.9 °C	1.1 °C	Pass	0.1 °C	375 °C - 385 °C
11	380 °C	378.1 °C	1.9 °C	Pass	0.1 °C	375 °C - 385 °C
12	380 °C	377.9 °C	2.1 °C	Pass	0.1 °C	375 °C - 385 °C
13	380 °C	378.7 °C	1.3 °C	Pass	0.1 °C	375 °C - 385 °C
14	380 °C	378.0 °C	2.0 °C	Pass	0.1 °C	375 °C - 385 °C
15	380 °C	378.6 °C	1.4 °C	Pass	0.1 °C	375 °C - 385 °C
16	380 °C	377.9 °C	2.1 °C	Pass	0.1 °C	375 °C - 385 °C
17	380 °C	378.2 °C	1.8 °C	Pass	0.1 °C	375 °C - 385 °C
18	380 °C	378.1 °C	1.9 °C	Pass	0.1 °C	375 °C - 385 °C
19	380 °C	378.6 °C	1.4 °C	Pass	0.1 °C	375 °C - 385 °C
20	380 °C	378.4 °C	1.6 °C	Pass	0.1 °C	375 °C - 385 °C

- Notes: 1) The calibration results are verified its balance with the customer's specification.
2) The instrument was calibrated for the parameter and at the points specified by the customer.
3) This result of calibration was found accurate as show on date and place of calibration only.

End of Certificate



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Page 2 of 2

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CERTIFICATE OF CALIBRATION

Page 1 of 3
NSC-TS-1037025
CALIBRATION 0132

Certificate No. : 25-037337
Sample Code : 25-15766-010

Customer : Betagro Science Center Co., Ltd.
136 Moo 8, Klong Nueng, Klong Luang,
Pathumthani 12120

Location of Calibration : Betagro Science Center Co., Ltd.
(104/1 Incubator room)

Equipment : Temperature controlled enclosures (Incubator)

Manufacturer : Hettich

Model : Hettich 400

Serial No. : 0002138

ID No. : B-IN-32

Date of Receipt : 12 March 2025

Date of Calibration : 12 March 2025

Condition of Calibration

1. Environment : 1.1 Ambient temperature : Maximum 25.4 °C ; Minimum 24.7 °C
: 1.2 Relative humidity : Maximum 56.6 % ; Minimum 56.4 %
: 1.3 Line voltage supplied : Maximum 232.1 VAC ; Minimum 227.2 VAC

2. Calibration method : TLAS-G-20: Guidelines for calibration and checks of temperature controlled enclosures.

3. Reference standard instrument : Instrument ID No. Certificate No. Due Date
Data acquisition with sensor : LB-DA-19 (RTD-302 to RTD-303, RTD-311, 25-010559 04 February 2026
(RTD-P1100) : RTD-305 to RTD-310)

4. This certificate is traceable to the international system of unit (SI Unit).
The measurement is traceable to Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.

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

6. Condition of calibration item : Normal

Calibrated by : Mr. Sanut Sa-nguanan
Approved by : (Mr. Somchai Niamput) Signed for Director
Issue date : 13 March 2025

The instrument is for a confidence probability of approximately 95%.
The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

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Effective Date: 15/03/21

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REPORT OF CALIBRATION

Page 2 of 3
NSC-TS-1037025
CALIBRATION 0132

Certificate No. : 25-037337
Sample Code : 25-15766-010

Results of Calibration

Resolution : 0.1 °C

1. Reporting of Temperature

Calibration point (°C)	UUC* setting (°C)	Measured temperature at each positions (°C)								Uncertainty ± (°C)	Coverage factor k
		#1	#2	#3	#4	#5	#6	#7	#8		
35	36.0	35.89	35.98	35.98	35.99	35.99	36.02	35.95	35.95	0.24	2.00

2. Characterization results

Calibration point (°C)	Stability ± (°C)	Uniformity (°C)	Overall variation (°C)
36	0.04	0.09	0.16

Notes : UUC* = Unit Under Calibration

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Effective Date: 15/03/21



CERTIFICATE OF CALIBRATION

Certificate No. : 25-054691
Sample Code : 25-23097-001
Page 1 of 3

Customer : Betagro Science Center Co., Ltd.
136 Moo 9, Hong Nueang, Klong Luang,
Pathumthani 12120
Location of Calibration : Betagro Science Center Co., Ltd.
(INCUBATION)

Equipment : Temperature controlled enclosures (Incubator)
Manufacturer : Hettich
Model : Hettich 400
Serial No. : 0002152
ID No. : MLIN_47
Date of Receipt : 09 April 2025
Date of Calibration : 09 April 2025

Condition of Calibration
1. Environment
1.1 Ambient temperature : Maximum 23.0 °C / Minimum 20.9 °C
1.2 Relative humidity : Maximum 57.7 % / Minimum 48.3 %
1.3 Line voltage supplied : Maximum 247.8 VAC / Minimum 238.9 VAC

2. Calibration method
TLAS-G-20: Guidelines for calibration and checks of temperature controlled enclosures.

3. Reference standard instrument
Instrument ID No. Certificate No. Due Date
Dela acquisition with sensor LB-DA-19 (RTD-302 to RTD-303, RTD-311, 25-010059 04 February 2026
(RTD-P100) RTD-305 to RTD-310)

4. This certificate is traceable to the international system of unit (SI Unit).
The measurement is traceable to Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.
5. This result of calibration was found accurate as shown on date and place of calibration only.
6. Condition of calibration item : Normal

Calibrated by : Mr. Pattapong Pungam Approved by : (Mr. Somchai Namput) Signed for Director
Issue date : 11 April 2025
Scientist

This certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced (other than in full) except with the prior written approval of the Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

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REPORT OF CALIBRATION

Certificate No. : 25-037337
Sample Code : 25-15766-010
Page 3 of 3

Results of Calibration

Notes
1. Sensor installation locations
1.1 All sensors at any corners or walls should be positioned 5 cm (a x b x c) from the wall.
1.2 The reference sensor is preferably located of the geometric center of the chamber.
2. Interior dimensions approx of chamber :
W = 54 cm ; D = 69 cm ; H = 85 cm
3. Air valve or fresh air level : Off
4. Fan level : N/A
5. The quoted uncertainty includes "Stability of chamber and loading effect in chamber at 20% of uniformity".
6. 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.
7. Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.
8. Overall variation - the difference of the maximum and the minimum measured temperatures throughout observation time.
9. UUC reading - the average reading of indicating device that forms the integral part of the enclosure.
10. Calibration results without adjustment.

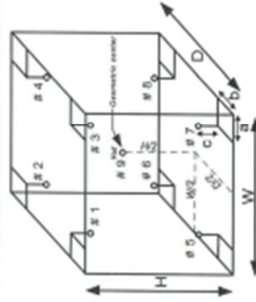


Figure. Example of sensor installation Positions

The result expanded uncertainty of measurement (U) is stated at the standard uncertainty of measurement multiplied by the coverage factor k, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with ISO 9000.

- End of Report -

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Page 2 of 3

Certificate No. : 25-054691
Sample Code : 25-23097-001

REPORT OF CALIBRATION

NSC-TS-1817025
CALIBRATION 0132

Results of Calibration

Resolution : 0.1 °C

1. Reporting of Temperature

Calibration point (°C)	UUC* setting (°C)	Measured temperature at each positions (°C)								Uncertainty ± (°C)	Coverage factor k
		#1	#2	#3	#4	#5	#6	#7	#8		
35	35.0	34.94	34.95	34.99	34.98	34.97	34.98	34.95	34.94	0.24	2.00
37	37.0	36.93	36.95	36.99	36.97	36.95	36.97	36.95	36.94	0.24	2.00

2. Characterization results

Calibration point (°C)	Stability ± (°C)	Uniformity (°C)	Overall variation (°C)
35	0.05	0.08	0.13
37	0.05	0.09	0.12

Notes

UUC* - Unit Under Calibration

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Page 3 of 3

Certificate No. : 25-054691
Sample Code : 25-23097-001

REPORT OF CALIBRATION

NSC-TS-1817025
CALIBRATION 0132

Results of Calibration

Notes

1. Sensor installation locations
 - 1.1 All sensors at any corners or walls should be positioned 5 cm (a x b x c) from the wall.
 - 1.2 The reference sensor is preferably located of the geometric center of the chamber.
2. Interior dimensions approx of chamber :
W = 54 cm ; D = 69 cm ; H = 85 cm
3. Air valve or fresh air level : Off
4. Fan level : N/A
5. The quoted uncertainty includes "Stability of chamber and loading effect in chamber at 20% of uniformity".
6. 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.
7. Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.
8. Overall variation - the difference of the maximum and the minimum measured temperatures throughout observation time.
9. UUC* reading - the average reading of indicating device that forms the integral part of the enclosure.
10. Calibration results without adjustment.

Figure: Example of sensor installation positions

- End of Report -

The result reported uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor k, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with ISO 15020.

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ลำดับ Item	ชื่อเครื่องมือ Equipment name	ผู้ผลิต Manufacturer	แบบรุ่น Type/Model /Class	เลขประจำ Serial No.	เลขประจำ ID No.	จุดสอบเทียบ Calibration Point	ความละเอียด Resolution	หมายเลข ใบรับรอง Certificate No.
1	Temperature controlled enclosures (incubator)	Hatch	HeatCube 400	0002152	MLIN_47	35, 37 °C	0.1 °C	25-004691

1. สรุปการประเมินผลการสอบเทียบ (Certificate of Calibration) ใช้ควบคุมอุณหภูมิและหาความไม่แน่นอนผลการสอบเทียบ

จากผลการสอบเทียบ (Certificate of Calibration) ใช้ควบคุมอุณหภูมิ ใช้หาค่าการวัด Measured temperature (°C) at spread location แล้วคำนวณค่า $\pm 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9$ นก และ ± 0.1 Uncertainty แล้วนำค่าไปคูณกับค่าการขยายตัว สามารถใช้งานได้ และมากกว่าค่าการขยายตัว ถือว่า "ไม่ผ่าน" และไม่สามารถใช้งานได้จนกว่าได้ดำเนินการแก้ไขที่พร้อมกับการใช้เครื่องมือการวัดและใช้การวัดในจุดที่ไม่ผ่านเกณฑ์

วิธีคำนวณ

จากเกณฑ์ที่ได้คือ 35 ± 0.5 °C คือ $35 + 0.5 = 35.5$ และ $34 - 0.5 = 33.5$ นั่นหมายความว่า Measured temperature (°C) at spread location \pm Uncertainty = อยู่ในช่วง 34.5 °C ถึง 35.5 °C ถือว่าผ่าน และสามารถใช้งานได้จนกว่าการประเมิน (location+Uncertainty) = $34.94 + 0.24 = 35.18$ °C และ (location+Uncertainty) $34.94 - 0.24 = 34.70$ °C และค่าที่ได้ใช้การภายใน ช่วง 34.5 °C ถึง 35.5 °C ถือว่า "ผ่าน"

ตารางที่ 1. แผลผลการสอบเทียบ (Certificate of Calibration) ใช้ควบคุมอุณหภูมิและผลการประเมิน

Calibration Point	Location (#)	#1	#2	#3	#4	#5	#6	#7	#8	#9	Uncertainty
35 °C	ผลการสอบเทียบ	34.94	34.95	34.99	34.98	34.97	34.98	34.95	34.94	34.93	0.24
	ผลการประเมิน	ผ่าน	ผ่าน	ผ่าน	ผ่าน	ผ่าน	ผ่าน	ผ่าน	ผ่าน	ผ่าน	

Calibration Point	Location (#)	#1	#2	#3	#4	#5	#6	#7	#8	#9	Uncertainty
37 °C	ผลการสอบเทียบ	36.93	36.96	36.99	36.97	36.95	36.97	36.95	36.94	36.92	0.24
	ผลการประเมิน	ผ่าน	ผ่าน	ผ่าน	ผ่าน	ผ่าน	ผ่าน	ผ่าน	ผ่าน	ผ่าน	

*เกณฑ์การยอมรับ $\pm 0.5, 1$ °C



Figure: Example of sensor installation locations

2. บันทึกและรายงานผลการสอบเทียบ
- 2.1 ควรจัดทำไฟล์ข้อมูลเครื่องมือที่มิใช่จุดวัดอุณหภูมิ (Chamber) ที่ใช้ในการ 45°C อุณหภูมิห้อง (ambient temperature) ค่าต่ำกว่า 5°C คือประมาณ 40°C หรือ 30°C หรือต่ำกว่า 5°C
- 2.2 จุดสอบเทียบในภาคการประเมินแล้ว "ไม่ผ่าน" ให้ระงับการวัดและแจ้งไปยังผู้เกี่ยวข้อง หรือหากประเมินแล้วไม่ผ่านก็ควรแจ้งผู้เกี่ยวข้องให้ทราบ แล้วทำการแจ้งผู้เกี่ยวข้องและผู้เกี่ยวข้องที่เกี่ยวข้องต่อไป แล้วจึงทำการสอบเทียบใหม่เพื่อใช้ในการต่อไป
- 2.3 ควรจัดทำข้อมูลการประเมินการสอบเทียบ (daily Check) ของเครื่องมืออยู่เป็นประจำ เพื่อใช้ในการใช้ในการ และ เพื่อ
- เป็นต้นมาการวัดหรือการสอบเทียบเครื่องมือในสนาม โดยทั่วไปการประเมินค่าจะอยู่ในช่วง 220 VAC \pm 10% หรือความถี่ของ
- ค่าการประเมินค่าให้คงที่ (stabilize)