

เอกสารแนบ 6

เอกสารสอบเทียบเครื่องมือที่ใช้ในการวิเคราะห์

Certificate No. : T/O 660198

The Reference Standard Instrument :-

Instrument : 1) Data logger with RTD Probe
Model : Agilent 34972A

Serial No. : MY41187730
MY60008352

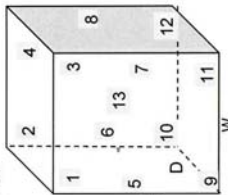
Cert No. : PSL-T 0651-1/66
PSL-T 0651-3/66

21-Apr-2024
21-Apr-2024

Measured room conditions

Temperature : Minimum: 30.8 °C Maximum: 31.9 °C
Humidity : Minimum: 50.7 %RH Maximum: 57.2 %RH
Voltage : Minimum: 219.8 VAC Maximum: 223.4 VAC

Fresh Air Setting: off



Working Space of chamber :

(Inside Dimensions) W x D x H : 1560 mm x 500 mm x 1380 mm

Sensor Installation Details :

- Sensor Number 1 to 12 installed approximately 50 mm From each wall.
- Sensor Number 13 installed approximately geometric of the chamber.

Results : The measurement results of the calibration were reported in the table below.

(*) Without adjustment () After adjustment

UUC* Setting (°C)	UUC* Reading (°C)	Temperature Reading of Standard Sensor											
		1	2	3	4	5	6	7	8	9			
4.0	4.1	4.02	4.35	4.01	4.20	4.37	4.22	4.17	4.39	4.05			
		10	11	12	13								
		4.29	4.30	4.28	4.19								

UUC* Setting (°C)	UUC* Reading (°C)	Temperature Uniformity (°C)	Temperature Stability (°C)	Overall Variation (°C)	Uncertainty of Measurement (± °C)	Coverage Factor K
4.0	4.1	1.19	1.08	2.47	1.5	2

UUC* = Unit Under Calibration

- Remark :-
- Temperature reading of Standard Sensors shown in the table were taken from the average of Standard reading at each position.
 - Temperature Uniformity was calculated from the difference between the maximum and minimum of actual temperature reading from all reference sensors at the same time.
 - Temperature Stability was calculated from the maximum stability of nine positions, and formula of Stability is $[(\text{Maximum Temperature Value} - \text{Minimum Temperature Value}) / 2]$
 - Overall Variation was calculated from the difference between the maximum and minimum measured temperature throughout observation time.

End of Report

Certificate No. : T/O 660198

Date of issue : 11-Oct-2023

Equipment Description : Refrigerator

Equipment Model : P1010

Equipment Serial No. : P1010-1020-0005

I.D. No. or Control No. : TNP-LAB.01

Manufacturer : Entech Industrial Solution Co.,Ltd.

Customer Name : TNP ENVIRONMENT CO.,LTD.

Customer Address : 332/173 Moo. 3 Tambon Bang Rak Phatthana, Amphoe Bang Bua Thong,

: Nonthaburi 11110

Total pages of certificate : 2 pages

Instrument Receiving Date : 9-Oct-2023

Receiving No. : O-230230

Environmental Conditions : All of the measurement were carried out in the working area

Temperature : (25 ± 15) °C

Humidity : (55 ± 30) % RH

Voltage : (220 ± 22) VAC

Calibration Place : 332/173 Moo. 3 Tambon Bang Rak Phatthana, Amphoe Bang Bua Thong,

: Nonthaburi 11110

Calibration Procedure No. : This instrument was calibrated by comparison of reference radiation source standard

according to calibration work instruction no WI-CL-18-C

The calibration certificate expended uncertainty of measurement 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 M 3023

The expression uncertainty and confidence in measurement.

This certificate is applied only to item under test environmental condition.

This calibration certificate may not be reproduced other than in full except with the permission of the issuing laboratory.

Calibration certificates without signature and seal are not valid.

This calibration certificate documents are traceability to national standards, which realize the unit of measurement according to the International system of units (SI).

Date of Calibration : 9-Oct-2023

Calibration Engineer

Technical Manager



CALIBRATION LABORATORY Co., LTD.

210-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel: [REDACTED] Fax: [REDACTED]
www.cal-laboratory.com E-mail:sale@cal-laboratory.com



REPORT OF CALIBRATION

FOR

NOMENCLATURE : pH METER
MANUFACTURER : HORIBA
MODEL / TYPE : LAQUA-PH1100/9615S
SERIAL NO. : B80A0042/9X0B0575
DATE OF CALIBRATION : 12 September 2023

ENVIRONMENT CONDITIONS :

Temperature : $(25 \pm 2.5) ^\circ\text{C}$ Relative Humidity : $(50 \pm 15) \% \text{ RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPCH-01. The calibration was performed by direct measurement with Certified Reference Material (CRM).

REFERENCE STANDARD USED :

- pH Standard Solution, NIMT TRM CODE TRM-S-2003, TRM CODE TRM-S-2007.
- pH Standard Solution, Control Company Catalog Number 06664263, 11784256, Lot Number CC732722.

TRACEABILITY :

- The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand). Lot Number. 040822, 230822. Due Date 26 April 2024.
- The measurements are traceable to International System of Units (SI), through Control Company. Certificate No. 4288-13355261, Due Date 06 May 2024.

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. Q23100397

F3-011-04/01-12

page 2 of 3



CALIBRATION LABORATORY Co., LTD.

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Tel: [REDACTED] Fax: [REDACTED]
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CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : pH METER
MANUFACTURER : HORIBA
MODEL / TYPE : LAQUA-PH1100/9615S
SERIAL NO. : B80A0042/9X0B0575
CLID. NO. : 272001452
JOB CONTROL NO. : 230911100397

CUSTOMER : TNP ENVIRONMENT CO., LTD.

332/173 MOO 3 TAMBON BANG RAK PHATTANA,
AMPHOE BANG BUA THONG, NONTABURI 11110

DATE OF RECEIVED : 11 September 2023 DATE OF ISSUED : 14 September 2023

Report of calibration screening must not be taken in part. Except complete. Without the approval of the Calibration Laboratory Co., Ltd.

Calibrated By :

Calibration Engineer



Approved By :

Authorized Signatory

14 September 2023

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. Q23100397

F3-011-04/01-12

page 1 of 3



CALIBRATION LABORATORY Co., LTD.

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CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : DIGITAL THERMO-HYGROMETER
MANUFACTURER : EXTTECH INSTRUMENTS
MODEL / TYPE : 445814
SERIAL NO. : PONPE5816745
CLID. NO. : 232303263
JOB CONTROL NO. : 230911100396
CUSTOMER : TNP ENVIRONMENT CO., LTD.
332/173 MOO 3 TAMBON BANG RAK PHATTANA,
AMPHOE BANG BUA THONG, NONTABURI 11110

DATE OF RECEIVED : 11 September 2023

DATE OF ISSUED : 15 September 2023

Report of calibration screening must not be taken in part. Except complete. Without the approval of the Calibration Laboratory Co., Ltd.

Calibrated By :

Calibration Engineer

Approved By :

Authorized Signatory

15 September 2023

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. Q23100396
F3-011-04/01-12

page 1 of 3



CALIBRATION LABORATORY Co., LTD.

210-11,14, 55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
www.cal-laboratory.com E-mail:sale@cal-laboratory.com



CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : (X) without adjustment () adjustment

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

CALIBRATION DATA

pH METER RESULT @ 25 °C

Standard pH Buffer Solution (pH)	pH Meter Reading (pH)	pH Meter Reading (mV)	Correction (pH)	Uncertainty of pH Measurement ($\pm$ pH)	k Factor
4.003	4.01	150.2	-0.007	0.010	2.00
7.000	7.00	-26.1	0.000	0.015	2.06
10.003	10.01	-187.1	-0.007	0.016	2.05

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

The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 008 Page 2,3 of 54

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

End of Certificate

Certificate No. Q23100397
F3-011-04/01-12

page 3 of 3

CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : (X) without adjustment () adjustment

The table in the following gives the calibration results and associated measurement uncertainties of the measuring digital thermo-hygrometer.

CALIBRATION DATA

1. CORRECTION OF TEMPERATURE

Test point (° C)	Actual Temperature (° C)	DUC Reading (° C)	Correction (° C)	Uncertainty ± (° C)
20.0	20.01	19.9	+0.11	0.27
25.0	25.01	25.2	-0.19	

2. CORRECTION OF HUMIDITY

STD Temperature (° C)	STD Reading (%RH)	DUC Reading (%RH)	Correction (%RH)	Uncertainty ± (%RH)
25	50.0	47	+3.0	0.8

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 008 Page 49 of 54

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

End of Certificate

Certificate No. Q23100396

F3-011-04/01-12

page 3 of 3

REPORT OF CALIBRATION

FOR

NOMENCLATURE : DIGITAL THERMO-HYGROMETER
MANUFACTURER : EXTECH INSTRUMENTS
MODEL / TYPE : 445814
SERIAL NO. : PONPE5816745
DATE OF CALIBRATION : 13 September 2023

ENVIRONMENT CONDITIONS :

Temperature : $(23 \pm 2) ^\circ \text{C}$ Relative Humidity : $(55 \pm 10) \% \text{RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPTH-11. The calibration was performed by using Chilled Mirror Hygrometer and Temperature & Humidity Chamber which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

Chilled Mirror Hygrometer, Edgetech Model Dew Master S/N. 36151.
Temperature & Humidity Chamber, PGC Model 9141-5114 S/N.0802282.

TRACEABILITY :

The measurements are traceable to International System of Units (SI) , through Thunder Scientific Corporation.
Certificate No. 21028, Due Date 09 December 2023.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2,00$ 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. Q23100396

F3-011-04/01-12

page 2 of 3

Certificate of Calibration

Certificate No. : 67-400049-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

Ice point check : UUC* reading 0 ° C Standard reading 0.8789 ° C

Standard Reading (° C)	UUC Reading (° C)	Correction (° C)	Uncertainty (± ° C)
21.2064	20	1.2	0.31
31.3084	30	1.3	0.31

Remark

UUC : Unit Under Calibration

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

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

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Certificate of Calibration

Certificate No. : 67-400049-1

Page : 1 of 2

Submitted by : TNP Environment Co., Ltd.

332/173 Moo 3 Bang Rak Phatthana, Bang Bua Thong, Nonthaburi 11110

Equipment : Liquid in Glass Thermometer

Manufacturer : SK

Model : N/A

Range : 0 °C to 200 °C

Resolution : 1 °C

Serial No. : N/A

Immersion : Total

ID No. : TNP.LAB.12

Environment :

Ambient Temperature : (23 ± 2) °C

Relative Humidity : (50 ± 15) %

Line Voltage : (220 ± 22) VAC

Date of Received : 26 January 2024

Date of Calibration : 01 February to 02 February 2024

Date of Issue : 02 February 2024

Calibrated by : Chortip Samchusri

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

The temperature scale used was based on ITS-90

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

1. Platinum Resistance Thermometer (PRT)

ID No. Cert. No. Due Date Traceability

400001 TT-0016-22 07 Feb 2024 National Institute of Metrology Thailand (NIMT)

2. Standard Digital Thermometer

ID No. Cert. No. Due Date Traceability

400003 23E1866 01 Jun 2025 National Institute of Metrology Thailand (NIMT)

400004 23E1866 01 Jun 2025 National Institute of Metrology Thailand (NIMT)

Approved by

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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



Calibration Certificate

ENTECH
Where Success Begins

Certificate no: H/T 670338

Standard references

Standard	Reference No.	Vendor	Due Date
ARALAB 300ECP, Flodima	S2023070040-001	MIT	07-Jul-24
Thermo HygroPalm HP 23-A	SG-H-00579/66	Success Gateway	16-Aug-24

Measured room conditions

Temperature : 22.1 °C Humidity : 55.9 %RH Pressure : 1019.3 mbar

Calibration results (Without Adjustment)

Reference temperature : - °C

Parameter of standard	Standard values	Mean of UUC	Error	Uncertainty (±)
Temperature (°C)	19.97	20.1	0.13	0.50
Temperature (°C)	25.02	25.2	0.18	0.50
Temperature (°C)	29.99	30.2	0.21	0.50

Remark : -

End of Report



Calibration Certificate

ENTECH
Where Success Begins

Certificate no: H/T 670338
Date of issue : 21-Mar-24

Instrument description : Thermo-Hygrometer
Instrument model : Extech 445815
Instrument serial no. : PONPES899554
ID no. or control no. : TNP.LAB.21
Manufacturer : Extech Instruments
Probe description : -
Probe model : -
Probe serial : -
Customer name : TNP ENVIRONMENT CO.,LTD.
Customer address : 332/173 Moo 3 Tambon Bang Rak Phatthana, Amphoe Bang Bua Thong, Nonthaburi 11110

Total pages of certificate : 2 Pages
Receiving no. : L-241004-1
Receiving date. : 08-Mar-24
Parameter of calibration : Temperature Calibration
Condition of UUC. : Used
Ambient condition : All of the Measurement were carried out the stabilized laboratory
Temperature : 23 ±5 °C
Humidity : 55 ± 15 %RH

Calibration place : 17/121 Soi Ngamwongwan 47 Yaek 48, Toongsonghong, Laksi, Bangkok 10210

Calibration procedure no. : This instrument was calibrated by comparison of indication with the Standard Thermo- hygrometer according to calibration Work Instruction no .WI-CL-11-C

The calibration certificate expanded uncertainty of measurement is stated as the standard uncertainty of measurement Multiplied by coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.
This certificate is applied only to item under test Environmental condition.
This Calibration Certificate may not be reproduced other than in full except with the permission of the issuing laboratory.
Calibration certificates without signature and seal not valid.
This calibration certificate documents are traceability to national standards, which realize measurement according to the International System of Units (SI).

Date of calibration : 20-Mar-24



Calibration Certificate

ENTECH
Where Satisfaction Begins

Certificate no: H 670285

Standard references

Standard	Reference No.	Vendor	Due Date
Thermo HygroPalm HP 23-A	SG-H-00579/66	Success Gateway	16-Aug-24
Hydrogen 2-XL	Performance	Entech	24-Mar-24

Measured room conditions

Temperature : 22.7 °C Humidity : 56.7 %RH Pressure : 1013.3 mbar.

Calibration results (Without Adjustment)

Reference temperature : 25.0 °C

Parameter of standard	Standard values	Mean of UUC.	Error	Uncertainty (±)
Humidity (%RH)	35.09	31	-4.09	1.3
Humidity (%RH)	50.03	48	-2.03	1.5
Humidity (%RH)	64.97	68	3.03	1.5

Remark : -

End of Report



Calibration Certificate

Certificate no: H 670285
Date of issue : 21-Mar-24

Instrument description : Thermo-Hygrometer
Instrument model : Extech 445815
Instrument serial no. : PONPES89554
ID no. or control no. : TNP.LAB.21
Manufacturer : Extech Instruments
Probe description : -
Probe model : -
Probe serial : -
Customer name : TNP ENVIRONMENT CO.,LTD.
Customer address : 332/173 Moo 3 Tambon Bang Rak Phatthana, Amphoe Bang Bua Thong, Nonthaburi 11110

Total pages of certificate : 2 Pages
Receiving no. : L-241004
Receiving date. : 08-Mar-24
Parameter of calibration : Humidity Calibration
Condition of UUC. : Used
Ambient condition : All of the Measurement were carried out the stabilized laboratory
Temperature : 23 ± 5 °C
Humidity : 55 ± 15 %RH
Calibration place : 17/121 Soi Ngamwongwan 47 Yaek 48, Toongsonghong, Laksi, Bangkok 10210

Calibration procedure no.

This instrument was calibrated by comparison of indication with the Standard Thermo- hygrometer according to calibration Work Instruction no .WI-CL-11-C

The calibration certificate expanded uncertainty of measurement is stated as the standard uncertainty of measurement Multiplied by coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%. This certificate is applied only to item under test Environmental condition.

This Calibration Certificate may not be reproduced other than in full except with the permission of the issuing laboratory. Calibration certificates without signature and seal not valid.

This calibration certificate documents are traceability to national standards, which realize measurement according to the International System of Units (SI).

Date of calibration

19-Mar-24

Calibration Technician

Technical Manager



Cert No.: 23M455
Page: 2 of 2

Result of calibration

Nominal Value	Conventional mass		Uncertainty of Measurement (±)	Maximum Permissible error (±)
	Before Adjustment	After Adjustment		
200 g	199.99986 g	-	0.30 mg	1.0 mg
100 g	100.00015 g	-	0.16 mg	0.50 mg
50 g	50.00015 g	-	0.10 mg	0.30 mg
20 g	20.000116 g	-	0.080 mg	0.25 mg
10 g	10.000041 g	-	0.060 mg	0.20 mg
5 g	5.000010 g	-	0.050 mg	0.16 mg
2 g	1.999936 g	-	0.040 mg	0.12 mg
1 g	0.999973 g	-	0.030 mg	0.10 mg
200 mg	200.059 mg	200.007 mg	0.020 mg	0.060 mg
100 mg	100.037 mg	99.981 mg	0.016 mg	0.050 mg

The 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 %.

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, BANGKOK 10250



NSC-TS1-TS17025
CALIBRATION 0008

Certificate of Calibration

Certificate No.: 23M455
Page: 1 of 2

Equipment:

Standard Weight Set

Manufacturer:

This certificate may not be reproduced other than in full, except with the prior written approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

Model:

Class:F1

Serial No.:

15022021-01

ID No.:

TNP.LAB.25

Condition As-Received:

Used Item

Received Date:

02 March 2023

Calibration Date:

04 March 2023

Reference:

2303-0104WN

Submitted by: TNP ENVIRONMENT CO.,LTD.

Ambient Temperature:

(23 ± 2) °C

Relative Humidity:

(50 ± 15) %

Atmospheric Pressure:

1015.25 mbar

332/173 Moo 3, Bang Rak Phatthana, Bang Bua Thong,
Nonthaburi 11110

Procedure used: Calibration were conducted using in-house calibration procedure CP-M01 according to comparison method against standard weights on the basis of weightings at an average air density of 1.2 kg/m³ and a temperature of 23.4 °C material density of weight is 8000 kg/m³.

Condition of this result of calibration

1. Reference standards instruments:

Instrument

	Model	Serial No.	Certificate No.	Due Date
1) Standard Weight Set (E2)	73336	20026	MM-0018-22	28 Feb 2024
2) Standard Weight Set (E2)	73338	20028	MM-0019-22	28 Feb 2024

2. This certificate is not certified for any commercial transaction.

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

4. This Certification is traceable to the International System of Unit maintained at-

-National Institute of Metrology Thailand (NIMT)

Calibrated by:

Issue Date: 07 March 2023

Approved Signatory:

B 0309848



THAI CALIBRATION SERVICES CO., LTD.

19/8 Moo 9 Soi Railing 30 Puttamonthon 5 Rd., Sampran, Nakhonratchasima 32100

www.thaicall.com E-mail : sale@thaicallibration.com, lab@thaicallibration.com



CALIBRATION CERTIFICATE

Certificate No.S2306518S

page 2 of 2

The repeatability of indication

Nominal Value (g)	Standard Deviation of reading (g)	Maximum difference between successive reading (g)	n
100	0.000005	0.00001	5
200	0.000005	0.0001	5

The effect of eccentric application of a load on the indication (test load : 100 g)

Position	Balance Reading (g)
Point 1	100.0000
Point 2	100.0002
Point 3	100.0001
Point 4	100.0000
Point 5	100.0001
Eccentric Value	0.0002



The error of indication

Nominal Value (g)	Value of Reference Standard Weight (g)	Balance Reading (g)	Correction (g)	Uncertainty (±) (g)	k
Unload	0.00000	0.00000	0.00000	0.000016	2.32
0.1	0.10000	0.10003	-0.00003	0.000019	2.10
0.5	0.50000	0.50001	-0.00001	0.000023	2.04
1	1.00001	1.00000	+0.00001	0.000026	2.00
5	5.00000	5.00001	-0.00001	0.000038	2.00
10	9.99999	10.00001	-0.00002	0.000046	2.00
20	20.00000	20.00000	0.00000	0.000085	2.00
50	50.00000	50.00001	-0.00001	0.00011	2.00
100	100.00000	100.00000	0.00000	0.00018	2.00
200	200.00000	200.00004	-0.00004	0.00034	2.00

Remark : Adjustment, External weight nominal value 100 g, Standard weight of Lab

Uncertainty of measurement

The reported expanded uncertainty of measurement is stated as the standard uncertainty multiplied by the coverage factor (k), which for a normal distribution corresponds to a coverage probability of approximately 95% (confidence level).

This report will certify of the calibrated equipment only.

--End--



THAI CALIBRATION SERVICES CO., LTD.

19/8 Moo 9 Soi Railing 30 Puttamonthon 5 Rd., Sampran, Nakhonratchasima 73210

www.thaicall.com E-mail : sale@thaicallibration.com, lab@thaicallibration.com



CALIBRATION CERTIFICATE

Certificate No.S2306518S

page 1 of 2

Customer :

TNP ENVIRONMENT CO., LTD.

332/173 Moo 3 Tambon Bang Rak Phatthana,

Amphoe Bang Bua Thong, Nonthaburi 11110

Equipment :

Non-automatic weighing instrument (Electronic instrument)

Manufacturer :

Shimadzu

Model :

AP225WD

Accuracy class :

10 g / 220 g

Capacity :

0.00001 g / 0.0001 g

Resolution :

D316301848

Serial No. :

TNP.LAB.30

ID No. :

Place of calibration : ห้อง LAB

Order No. : 66S2523-1

Ambient temperature : (26.9 ± 5.0) °C

Relative humidity : (52.0 ± 10.0) %

Received date : 21-Jun-2023

Date of calibration : 21-Jun-2023

Date of issue : 24-Jun-2023

Condition of the balance : Good working conditions

Calibration method

This instrument was calibrated according to the EURAMET Calibration Guide No. 18.

Condition of reference standard weight

Instrument Nominal value Serial No. Certificate No. Due-date Density (kg/m³)

1 Standard weight set 1 mg to 2 kg 15885+15849 M2210001S 8-Oct-2023 7950

Traceability of the reference standard weight

This certificate is traceable to SI unit through Mass Calibration Laboratory Thai Calibration Services Co., Ltd., NSC-ONSC accredited no. Calibration 0189.

Calibrated By :

Technician

Approved Signatory :

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



THAI CALIBRATION SERVICES CO., LTD.

19/8 Moo 9 Soi Railing 30 Puttamonthon 5 Rd., Sampran, Nakhonratchasima 73210

www.thaicall.com E-mail : sale@thaicallibration.com, lab@thaicallibration.com



CALIBRATION CERTIFICATE

Certificate No.S2306519S

page 2 of 2

The repeatability of indication

Nominal Value (g)	Standard Deviation of reading (g)	Maximum difference between successive reading (g)	n
200	0.00000	0.0000	5

The effect of eccentric application of a load on the indication (test load : 100 g)

Position	Balance Reading (g)
Point 1	100.0000
Point 2	100.0000
Point 3	100.0000
Point 4	99.9998
Point 5	99.9998
Eccentric Value	0.0002



The error of indication

Nominal Value (g)	Value of Reference Standard Weight (g)	Balance Reading (g)	Correction (g)	Uncertainty ($\pm$) (g)	k
Unload	0.0000	0.0000	0.0000	0.000082	2.00
0.1	0.1000	0.1000	0.0000	0.000083	2.00
0.5	0.5000	0.5000	0.0000	0.000084	2.00
1	1.0000	0.9999	+0.0001	0.000085	2.00
5	5.0000	5.0000	0.0000	0.000090	2.00
10	10.0000	10.0000	0.0000	0.000094	2.00
20	20.0000	20.0001	-0.0001	0.00011	2.00
50	50.0000	50.0001	-0.0001	0.00013	2.00
100	100.0000	100.0000	0.0000	0.00019	2.00
200	200.0000	199.9998	+0.0002	0.00033	2.00

Remark : Without adjustment

Uncertainty of measurement

The reported expanded uncertainty of measurement 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% (confidence level).

This report will certify of the calibrated equipment only.

--End--



THAI CALIBRATION SERVICES CO., LTD.

19/8 Moo 9 Soi Railing 30 Puttamonthon 5 Rd., Sampran, Nakhonratchasima 73210

www.thaicall.com E-mail : sale@thaicallibration.com, lab@thaicallibration.com



CALIBRATION CERTIFICATE

Certificate No.S2306519S

page 1 of 2

Customer : TNP ENVIRONMENT CO., LTD.

332/173 Moo 3 Tambon Bang Rak Phatthana,

Amphoe Bang Bua Thong, Nonthaburi 11110

Equipment : Non-automatic weighing instrument (Electronic instrument)

Manufacturer : Sartorius

Model : SECURA224-1S

Accuracy class : -

Capacity : 220 g

Resolution : 0.0001 g

Serial No. : 0041305301

ID No. : TNP.LAB.31

Place of calibration : ห้อง LAB

Order No. : 66S2523-2

Ambient temperature : $(26.8 \pm 5.0) ^\circ\text{C}$

Relative humidity : $(52.0 \pm 10.0) \%$

Received date : 21-Jun-2023

Date of calibration : 21-Jun-2023

Date of issue : 24-Jun-2023

Condition of the balance : Good working conditions

Calibration method

This instrument was calibrated according to the EURAMET Calibration Guide No. 18.

Condition of reference standard weight

Instrument	Nominal value	Serial No.	Certificate No.	Due-date	Density (kg/m^3)
1 Standard weight set	1 mg to 2 kg	15885+15849	M2210001S	8-Oct-2023	7950

Traceability of the reference standard weight

This certificate is traceable to SI unit through Mass Calibration Laboratory Thai Calibration Services Co., Ltd., NSC-ONSC accredited no. Calibration 0189.

Calibrated By : [Redacted]

Technician

Approved Signatory : [Redacted]

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



Certificate of Calibration

Page : 1 of 2

Certificate No. : 66-400687-1

Submitted by : TNP Environment Co., Ltd.

332/173 Moo 3 Bang Rak Phatthana, Bang Bua Thong, Nonthaburi 11110

Equipment : Air Chamber (Oven)

Manufacturer : Memmert

Model : UF75

Range : N/A °C Resolution : 0.1 °C

Serial No. : B320.0251 ID No. : N/A

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

Ambient Temperature : (27.0 to 28.0) °C

Relative Humidity : (45 to 50) %

Line Voltage : (228.0 to 230.0) V

Date of Received : 11 December 2023

Date of Calibration : 11 December 2023

Date of Issue : 14 December 2023

Calibrated by : Pernipon Chanpu

Calibration Method : CAL-M4004, TLAS G-20

The temperature scale used was based on ITS-90

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

Standard Digital Thermometer with Thermocouple probe

ID No. Cert. No. Due Date Traceability

400046 & 400023 66-400547-1 04 Apr 2024

National Institute of Metrology Thailand (NIMT)

Approved by

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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



CERT. NO.: HS-U039F

Certificate of Calibration

Calibration Date : 20 Jun 23

Model : YSI 4010-2W

Submitted by : TNP ENVIRONMENT COMPANY LIMITED.

SIN : 22051520

332/173 Moo. 3, Tambon Bang Rak Phatthana,

Probe : YSI 4100

Amphoe Bang Bua Thong, Nonthaburi 11110

SIN : 22C102711

ID NO. :

Air Temp ref : SIN E00522

Barometric ref : SIN E00522

Water Temp ref : SIN 11431

Avg Room Temp : 20 °C

Avg Water Temp : 20 °C

Air Pressure : 757.00 mmHg

Salinity : 0 ppt

Technician : Kitipong M.

Calibration Details

Calibration Point	100% air sat. (@20 °C, DO = 9.09 mg/l)	(status)	(status)
Measurement 1 (mg/l)	9.05	(PASS)	-
Measurement 2 (mg/l)	9.05	(PASS)	-
Measurement 3 (mg/l)	9.04	(PASS)	-
Measurement 4 (mg/l)	9.03	(PASS)	-
Measurement 5 (mg/l)	9.04	(PASS)	-
Measurement 6 (mg/l)	9.04	(PASS)	-
Measurement 7 (mg/l)	9.04	(PASS)	-
Measurement 8 (mg/l)	9.03	(PASS)	-
Measurement 9 (mg/l)	9.03	(PASS)	-
Measurement 10 (mg/l)	9.03	(PASS)	-
Mean Measurement	9.04	mg/l	-
Inaccuracy	0.05	mg/l	-
Overall Status	(PASS)		

Manufacturer Specification

Accuracy = +/- 0.2 mg/l

- 1) This certificate is issued based on the result that are found as shown on date and place of test only.
- 2) The calibration procedure followed in accordance with Harikul Science Co., Ltd.
- 3) This result shall not be used for advertising purpose.



Certificate of Calibration

Certificate Number : SPR23110535-2
Customer : TNP ENVIRONMENT CO.,LTD.
332/173 Moo.3, Bang Rak Phatthana, Bang Bua Thong, Nonthaburi
11110

Page : 1 of 3

Equipment Name : Water Quality Meter
Manufacturer : Digicon
Model : WA-48SD
Serial Number : T.075714
ID. Number : TNP-LAB-46

Environmental Conditions

Ambient Temperature : 23 °C ± 2 °C
Relative Humidity : 50 % ± 15 %
Location of Calibration : In-Lab
Calibration Procedure : SP-CPC-04-01,
SP-CPC-04-02,
SP-CPC-04-11

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs. The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by : [Redacted]

Approved by : [Redacted]

Calibration Officer

Authorized Signatory

Calibratech Co.,Ltd.
7/106-7 Moo 2, Sukhaphichan 3 Rd., Bangpoed, Pakkred, Nonthaburi 11120
e-mail : calibratech.cal@yahoo.com, calibratech.cal@hotmail.com

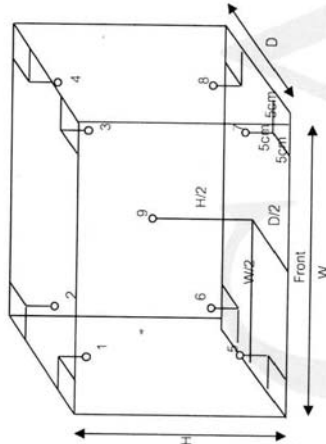
Certificate of Calibration

Certificate No. : 66-400687-1

Page : 2 of 2

Result of Calibration : Without Adjustment
UUC Condition As-Received : Good
Function : Temperature measurement

This instrument was setting air ventilation at position 0 (close)



Inside of Chamber
W = 0.40 m
D = 0.33 m
H = 0.56 m
Capacity = 0.07 m³

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Temperature (°C) @ Sensor No.									Uncertainty (± °C)
			1	2	3	4	5	6	7	8	9	
85.0	85.0	85.0	85.3	85.1	85.2	85.1	85.0	84.8	84.7	84.7	85.0	0.64
104.0	104.0	104.0	104.3	104.2	104.3	104.1	104.0	103.8	103.7	103.7	104.0	0.69
180.0	180.0	180.0	179.5	179.9	180.0	179.8	179.9	179.4	178.9	179.4	180.0	0.95
			Indicating Temperature (°C)			Measured Uniformity (°C)			Measured Stability (°C)			Overall Variation (°C)
85.0	85.0		85.0			0.4			0.1			0.8
104.0	104.0		104.0			0.4			0.1			0.8
180.0	180.0		180.0			1.4			0.3			1.6

Remark The uncertainty is not combine uniformity of the air chamber

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%

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Result of Calibration

Certificate No. : SPR23110535-2

Page : 3 of 3

pH Measurement @ 25 °C

Unit : pH

Standard Solution	UUC Reading	Error	Uncertainty (±)
4.008	3.98	-0.028	0.014
6.984	7.01	0.026	0.012
10.011	10.02	0.009	0.018

Conductivity Measurement @ 25 °C

Standard Solution	UUC Reading	Error	Uncertainty (±)
84 µS/cm	84.6 µS/cm	0.6 µS/cm	0.60 µS/cm
1.413 mS/cm	1.415 mS/cm	0.002 mS/cm	0.0082 mS/cm
12.88 mS/cm	12.89 mS/cm	0.01 mS/cm	0.075 mS/cm

* Dissolved Oxygen Permanence Test

Actual Standard	UUC Reading	Error	Uncertainty (±)
0.0	0.0	0.0	0.13
5.0	4.9	-0.1	0.13
8.3	8.2	-0.1	0.13

Salinity Measurement

Actual Standard	UUC Reading	Error	Uncertainty (±)
5.0269	5.04	0.0131	0.015

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.

Calibration Marked (*) "Not ANAB Accredited" in this Certificate have been included for completeness.

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 -



Calibration Report

Certificate Number : SPR23110535-2

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Zero Oxygen Solution	HI7040L	Lot S0027-23 _	21C31	21 Mar 2028
Standard pH Solution	PH016.L5	Lot No.882984	61267077	20 Mar 2024
Standard pH Solution	PH107.L5	Lot No.882985	61275614	13 Apr 2024
Standard pH Solution	PH020.L5	Lot No.882986	61268050	20 Mar 2024
Conductivity Standard 84 µS/cm	CS84M0S.L5	Lot No.882987	61247444	20 Mar 2024
Conductivity Standard 1413 µS/cm	CS1413M0S.L5	Lot No.882988	61267992	20 Mar 2024
Conductivity Standard 12880 µS/cm	CS1288P1S.L5	Lot No.882989	61247253	20 Mar 2024
Sodium Chloride Standard Solution	RM003461L25	Lot No.841770	97756699	23 Sep 2024

Traceability

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

HANNA - Hanna Instruments (Thailand) Ltd.

C.P.A. Chem - ANAB#AT-1836 (ISO/IEC 17025:2017) and ANAB#AR-1835 (ISO/IEC 17034:2016)



Cert. No. : 23CHO565

Page : 2 of 3

Condition of calibration result

1. Reference Standard Material :

Material	Serial No.	Certificate No.	Due date
1. Absorbance Standard set	39130	106269	10 Oct 2024
2. Wavelength Standard set	36730	98330	19 Jan 2024
3. Wavelength Standard set	36730	98331	19 Jan 2024

- This certificate is valid only to the item calibrated on date and place of calibration.
- This certificate is traceable to the International System of Unit maintained through :
- Stama Scientific Ltd.

- Spectral Bandwidth : 4 nm
Scan Speed : - nm/min

Calibration Results : without adjustment Wavelength Accuracy

Certified Values of Reference Material (nm)	UUC Reading (nm)	Uncertainty of Measurement (± nm)	Coverage Factor k
418.48	418.5	0.15	2.00
513.70	513.1	0.14	2.00
536.90	536.3	0.14	2.00
637.94	637.6	0.14	2.00
879.70	878.8	0.15	2.00

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLIANG, SUANLIANG BANGKOK 10250



Cert.No.: 23CHO565

Page.: 1 of 3

Certificate of Calibration

Equipment : Spectrophotometer
Manufacturer : Merck
Model : Prove 100
Serial No. : 1904113676
ID No. : S2019025
Condition As-Received : Used Item
Received Date : 21 September 2023
Calibration Date : 21 September 2023
Reference : 2309-0483OC-2
Submitted by : SGS (Thailand) Limited
1/209, 1/211 Moo 1, Ban Chang,
Ban Chang, Rayong 21130
Calibration Place : Spectrophotometry Lab
Ambient Temperature : (23.8 - 20.9) °C (On-Site)
Relative Humidity : (50.1 - 50.2) % (On-Site)
Calibration Procedure : In - house method :
CP-OCH4 based on ASTM E 275-01

Calibrated by :

Kunchit Promprat

Approved by :

Issue Date :

26 September 2023

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 head of Corporate Services 3 : Equipment Calibration and Testing Services.

a 1182165

A 0058836

Verification COD Reactor

Equipment Name	Temperature Ver	150±2 °C
Serial No.	Model	DB 200/3
Reference Standard	Certificate No.	21/4272
Calibration Date	Next Cal. Date	10/03/2024

Left	Hole 1				Hole 2				Hole 3			
	NO.	Result	temp. °C	NO.	Result	temp. °C	NO.	Result	temp. °C	NO.	Result	temp. °C
	1	151.1	-0.36	150.7	1	150.6	-0.36	150.2	1	151.4	-0.36	151.0
	2	150.8	-0.36	150.4	2	151.7	-0.36	151.3	2	151.3	-0.36	150.9
	3	151.2	-0.36	150.8	3	151.1	-0.36	150.7	3	151.7	-0.36	151.3
		Mean		150.67		Mean		150.77		Mean		151.11
		SD		0.208		SD		0.551		SD		0.208
		%RSD		0.138		%RSD		0.365		%RSD		0.138

Hole 4				Hole 5				Hole 6			
NO.	Result		temp. °C	NO.	Result		temp. °C	NO.	Result		temp. °C
	Temp/Corr.	Corr.			Temp/Corr.	Corr.			Temp/Corr.	Corr.	
1	151.7	-0.36	151.3	1	150.5	-0.36	150.1	1	151.5	-0.36	151.1
2	151.6	-0.36	151.2	2	151.3	-0.36	150.9	2	151.4	-0.36	151.0
3	151.5	-0.36	151.1	3	150.6	-0.36	150.2	3	150.5	-0.36	150.1
		Mean	151.24			Mean	150.44			Mean	150.77
		SD	0.100			SD	0.436			SD	0.551
		%RSD	0.066			%RSD	0.290			%RSD	0.365

Hole 7				Hole 8				Hole 9			
NO.	Result			NO.	Result			NO.	Result		
	temp. °C	Corr.	temp/Corr.		temp. °C	Corr.	temp/Corr.		temp. °C	Corr.	temp/Corr.
1	151.3	-0.36	150.9	1	151.7	-0.36	151.3	1	150.5	-0.36	150.1
2	151.0	-0.36	150.6	2	150.5	-0.36	150.1	2	151.2	-0.36	150.8
3	151.3	-0.36	150.9	3	151.4	-0.36	151.0	3	150.8	-0.36	150.4
		Mean	150.84			Mean	150.84			Mean	150.47
		SD	0.173			SD	0.624			SD	0.351
		%RSD	0.115			%RSD	0.414			%RSD	0.233

Hole 10				Hole 11				Hole 12			
NO.	Result		temp. °C	NO.	Result		temp. °C	NO.	Result		temp. °C
	Corr.	Inner+Corr.			Corr.	Inner+Corr.			Corr.	Inner+Corr.	
1	151.6	-0.36	151.2	1	151.5	-0.36	151.1	1	150.7	-0.36	150.3
2	151.6	-0.36	151.2	2	151.2	-0.36	150.8	2	151.6	-0.36	151.2
3	150.8	-0.36	150.4	3	151.5	-0.36	151.1	3	151.2	-0.36	150.8
	Mean		150.97		Mean		151.04		Mean		150.81
	SD		0.462		SD		0.173		SD		0.451
	%RSD		0.306		%RSD		0.115		%RSD		0.299

Verified By	Approved By	
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Calibration Results : without adjustment
Photometric Accuracy

Wavelength (nm)	Certified Values of Reference Material (Abs)	UUC Reading (Abs)	Uncertainty of Measurement (±Abs)	Coverage Factor k
440.0	Zero 0.5645 0.6988 1.0017	0.000 0.563 0.698 1.001	0.0028 0.0028 0.0028 0.0028	2.00 2.00 2.00 2.00
546.1	Zero 0.5281 0.6962 0.9984	0.000 0.527 0.696 0.998	0.0028 0.0028 0.0028 0.0028	2.00 2.00 2.00 2.00
635.0	Zero 0.5699 0.7606 1.0927	0.000 0.569 0.760 1.092	0.0028 0.0028 0.0028 0.0028	2.00 2.00 2.00 2.00

Remark

- Each individual filter is measured against the empty filter holder (blank) used to zero the spectrophotometer

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 %.

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Verification COD Reactor

Equipment Name	Dr-Block Heater Digital	Temperature Ver	150±2 °C
Serial No.	0008271A	Model	DB 200/3
Reference Standard	Thermocouple Type K	Certificate No.	21/4272
Calibration Date	10/03/2023	Next Cal. Date	10/03/2024

Right	Hole 1				Hole 2				Hole 3			
	NO.	Result		NO.	Result		NO.	Result				
		temp. °C	temp+Corr.		temp. °C	temp+Corr.		temp. °C	temp+Corr.			
	1	149.9	-0.36	149.5	1	150.3	-0.36	149.9	1	151.0	-0.36	150.6
	2	151.1	-0.36	150.7	2	151.0	-0.36	150.6	2	151.0	-0.36	150.6
	3	150.9	-0.36	150.5	3	149.9	-0.36	149.5	3	150.4	-0.36	150.0
		Mean		150.27		Mean		150.04		Mean		150.44
		SD		0.643		SD		0.557		SD		0.346
		%RSD		0.428		%RSD		0.371		%RSD		0.230

Hole 4				Hole 5				Hole 6			
NO.	Result		NO.	Result		NO.	Result				
	temp. °C	temp+Corr.		temp. °C	Corr.		temp. °C	Corr.			
1	150.8	-0.36	150.4	1	150.0	-0.36	149.6	1	150.5	-0.36	150.1
2	151.0	-0.36	150.6	2	150.0	-0.36	149.6	2	150.8	-0.36	150.4
3	150.9	-0.36	150.5	3	150.7	-0.36	150.3	3	149.8	-0.36	149.4
	Mean		150.54	Mean		149.87	Mean		150.01		
	SD		0.100	SD		0.404	SD		0.513		
	%RSD		0.066	%RSD		0.270	%RSD		0.342		

Hole 7				Hole 8				Hole 9			
NO.	Result		NO.	Result		NO.	Result				
	temp. °C	temp+Corr.		temp. °C	Corr.		temp. °C	Corr.			
1	150.8	-0.36	150.4	1	151.1	-0.36	150.7	1	150.2	-0.36	149.8
2	150.9	-0.36	150.5	2	150.7	-0.36	150.3	2	150.2	-0.36	149.8
3	151.0	-0.36	150.6	3	151.1	-0.36	150.7	3	149.9	-0.36	149.5
	Mean		150.54	Mean		150.61	Mean		149.74		
	SD		0.100	SD		0.231	SD		0.173		
	%RSD		0.066	%RSD		0.153	%RSD		0.116		

Hole 10				Hole 11				Hole 12			
NO.	Result		NO.	Result		NO.	Result				
	temp. °C	temp+Corr.		temp. °C	temp+Corr.		temp. °C	temp+Corr.			
1	150.6	-0.36	150.2	1	150.5	-0.36	150.1	1	150.9	-0.36	150.5
2	150.5	-0.36	150.1	2	150.9	-0.36	150.5	2	150.0	-0.36	149.6
3	149.9	-0.36	149.5	3	151.1	-0.36	150.7	3	150.5	-0.36	150.1
	Mean		149.97	Mean		150.47	Mean		150.11		
	SD		0.379	SD		0.306	SD		0.451		
	%RSD		0.252	%RSD		0.203	%RSD		0.300		

Verified By

Approved By

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Verification COD Reactor

Equipment Name	Dr-Block Heater Digital	Temperature Ver	150±2 °C
Serial No.	000827-A	Model	DB 200/3
Reference Standard	Thermocouple Type K	Certificate No.	21/4272
Calibration Date	10/03/2023	Next Cal. Date	10/03/2024

Middle	Hole 1						Hole 2						Hole 3					
	NO.	Result		NO.	Result		NO.	Result		NO.	Result							
		temp. °C	temp+Corr.		temp. °C	Corr.		temp. °C	Corr.		temp. °C	Corr.						
	1	151.2	-0.36	150.8	1	150.7	-0.36	150.3	1	151.1	-0.36	150.7						
	2	151.5	-0.36	151.1	2	151.7	-0.36	151.3	2	151.6	-0.36	151.2						
	3	151.6	-0.36	151.2	3	150.8	-0.36	150.4	3	150.9	-0.36	150.5						
	Mean		151.07		Mean		150.71		Mean		150.84							
	SD		0.208		SD		0.551		SD		0.361							
	%RSD		0.138		%RSD		0.365		%RSD		0.239							

Hole 4			Hole 5			Hole 6					
NO.	Result		NO.	Result		NO.	Result				
	temp. °C	temp/Corr.		temp. °C	temp/Corr.		temp. °C	temp/Corr.			
1	151.5	-0.36	151.1	1	151.6	-0.36	151.2	1	150.5	-0.36	150.1
2	150.7	-0.36	150.3	2	151.2	-0.36	150.8	2	150.6	-0.36	150.2
3	151.6	-0.36	151.2	3	151.2	-0.36	150.8	3	151.2	-0.36	150.8
	Mean		150.91	Mean		150.97	Mean		150.41		
	SD		0.493	SD		0.231	SD		0.379		
	%RSD		0.327	%RSD		0.153	%RSD		0.252		

Hole 7				Hole 8				Hole 9			
NO.	Result		NO.	Result		NO.	Result				
	temp. °C	Temp+Corr.		temp. °C	Temp+Corr.		temp. °C	Temp+Corr.			
1	151.5	-0.36	151.1	1	151.5	-0.36	151.1	1	151.2	-0.36	150.8
2	150.5	-0.36	150.1	2	151.7	-0.36	151.3	2	150.9	-0.36	150.5
3	150.8	-0.36	150.4	3	151.1	-0.36	150.7	3	151.4	-0.36	151.0
	Mean		150.57	Mean		151.07	Mean		150.81		
	SD		0.513	SD		0.306	SD		0.252		
	%RSD		0.341	%RSD		0.202	%RSD		0.167		

Hole 10				Hole 11				Hole 12			
NO.	Result		NO.	Result		NO.	Result				
	temp. °C	Corr.		temp. °C	Corr.		temp. °C	Corr.			
1	151	-0.36	150.6	1	151.5	-0.36	151.1	1	151.2	-0.36	150.8
2	150.6	-0.36	150.2	2	150.6	-0.36	150.2	2	150.5	-0.36	150.1
3	151.5	-0.36	151.1	3	151.0	-0.36	150.6	3	151.1	-0.36	150.7
	Mean		150.67	Mean		150.67	Mean		150.57		
	SD		0.451	SD		0.451	SD		0.379		
	%RSD		0.299	%RSD		0.299	%RSD		0.251		

Verified By

Approved By

Confidential - Not to be photocopied except by permission of the Laboratory Quality Manager or nominee.

สรุปผลการ Verify

ปรับอุณหภูมิ 15.0 °C แสดงค่าเฉลี่ยอุณหภูมิ 15.0 ± 0.1 °C ภาณุพล



Certificate of Calibration

Aquion RFIC : Anion System (ID#1054)

This certificate is to verify that instrument below are calibrated
by

Archemica Lab Co., Ltd.

Aquion	S/N 220380025
AS-DV	S/N 2203880170

For

SGS (Thailand) Limited (Rayong Branch).



Operator Signature: _____ Date: 15 / Nov / 2023

Applications Chemist

Verified By

Approved By

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MAINTENANCE AND TEST CERTIFICATE MODEL
Avio220 Max

SERIAL NUMBER	M79S2304111	DATE TESTED	January 10, 2024
1. MECHANICAL CHECKS			
A. Inspect and clean all fans and filters. ☐			
B. Inspect and replace as necessary, all torch components including the RF coil. ☐			
C. Inspect all tubing for sign of clacking or leaking. ☐			
D. Adjust water and gas pressure regulator settings. ☐			
E. Inspect and leak check pneumatics drawers. ☐			
F. Clean the exterior of the instrument. ☐			
2. OPTICAL CHECKS			
A. Inspect and clean all optical components. ☐			
B. As required, check and replace all purgefilters. ☐			
C. Recheck optical alignment. ☐			
3. COOLING SYSTEM CHECKS			
A. Perform preventive maintenance on chiller. ☐			
B. Flush out the chiller every year. ☐			
4. PERFORMANCE CHECKS			
A. Torch View Alignment. ☐			
B. Wavelength Calibration. ☐			



MAINTENANCE AND TEST CERTIFICATE MODEL
Avio220 Max

Customer : SGS(Thailand)Limited	Date Tested: January 10, 2024
Rayong Branch	Recommendation Recertification Period 6 Months
T. Banchang, A. Banchang	Recertification Due: July 10, 2024
Rayong 21130	Date Last Certified: N/A
User Name	Visit Number: 10F2 W
Phone:	PerkinElmer Phone: 02-719-6420 ext 206
Email: sajai.ruangsawat@sas.com	PerkinElmer Fax: 02-318-5597

CONFIGURATION TESTED		
MODEL	SERIAL NUMBER	SOFTWARE
AVIO200 MAX	M79S2304111	Syngristix V5
TESTED EQUIPMENT		
IPV Methods	CALIBRATION NUMBER	EXPIRATION
TEST STANDARD USED		
Part Number	EXPIRATION DATE	
Multielement Standard	30-Dec-24	
Instrument Cal. STD4	30-Nov-24	
CUSTOMER SUPPLIED	COMMENTS	CUSTOMER INITIALS
2 % HNO3		
10 % HNO3		



MAINTENANCE AND TEST CERTIFICATE MODEL

Avio220 Max

SERIAL NUMBER	M79S2304111	DATE TESTED	January 10, 2024
Remarks :	Commissioning follow as commissioning performance sheets.		

This is to certify that the above tests have been performed and the configuration tested meets does not meet

the PerkinElmer Specifications listed on this certificate.

This certificate does not modify PerkinElmer's standard terms and condition of sale, including warranty terms.

Service Department PerkinElmer Ltd.

Customer Service Engineer: [Redacted Signature]

Service Engineer



MAINTENANCE AND TEST CERTIFICATE MODEL

Avio220 Max

SERIAL NUMBER M79S2304111	DATE TESTED	January 10, 2024
PARAMETER	SPECIFICATION	FINAL VALUE
Spectral Resolution : UV		
As 193.696 nm	≤ 0.009 nm	0.00864 nm
Ni 231.604 nm	≤ 0.011 nm	0.01009 nm
Ni 341.476 nm	≤ 0.015 nm	0.01169 nm
Spectral Resolution : VIS		
Ba 455.403 nm	≤ 0.020 nm	0.01776 nm
Precision		
Zn 206.200 nm	% RSD ≤ 1.0 %	0.28 %
Mg 280.271 nm	% RSD ≤ 1.0 %	0.73 %
Mg 285.213 nm	% RSD ≤ 1.0 %	0.61 %
Ba 455.403 nm	% RSD ≤ 1.0 %	0.54 %
Detection Limits : Axial		
Ti 190.801 nm	3(sd)	1.52 ppb
As 193.696 nm	3(sd)	1.4 ppb
Se 196.026 nm	3(sd)	1.53 ppb
Pb 220.353 nm	3(sd)	1.72 ppb
Detection Limits : Radial		
As 193.696 nm	3(sd)	1.69 ppb
Zn 213.857 nm	3(sd)	0.42 ppb
Mn 257.610 nm	3(sd)	0.1 ppb
La 379.478 nm	3(sd)	0.61 ppb
Ba 455.403 nm	3(sd)	0.13 ppb
Ba 493.408 nm	3(sd)	0.1 ppb
BEC : Axial (IB X 1000)/(IS-IB)		
Mn 257.610 nm	≤ 30 ppb	7.83 ppb
BEC : Radial (IB X 1000)/(IS-IB)		
Mn 257.610 nm	≤ 30 ppb	17.57 ppb



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website : www.thermology.co



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website : www.thermology.co



CALIBRATION CERTIFICATE

Date of Issue Jun 28, 2024 Cert No. 24/2419
Site Calibration Site Calibration Order No. 24060337

Customer Bureau Veritas AQ Lab (Thailand) Limited
111 Thailand Science Park
Moo 9 Paholyothin Rd., Klong 1, Klong Luang, Pathumthani 12120 Thailand

Place of Calibration Prepare Culture Media

Description Autoclave
Model VE-65
Serial No. 7202
ID.No. CHM000206
Date of Receipt Jun 26, 2024
Date of Calibration Jun 26, 2024
Environment

Temperature (Min) 22.1 °C (Max) 25.5 °C
Relative Humidity (Min) 42.7 %RH (Max) 56.3 %RH

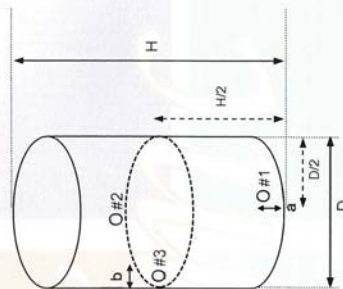
Calibration Method

WI-22 : The reference thermometer was placing into the chamber and measurement based on BS-2646.
The temperature scale in use at this laboratory is the International Temperature Scale of 1990.

CALIBRATION CERTIFICATE

Date of Issue Jun 28, 2024 Cert No. 24/2419
Site Calibration Site Calibration Order No. 24060337

Results (without adjustment)



Position of reference thermometers were placed

Note.

- 1). Duration of the holding time was 45 minutes.
- 2). Stability - greatest one half of difference between max peak and min peak of each reference probe measured temperature obtained during the calibration interval.
- 3). 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. The reference sensor should preferably be located at the geometric center of the chamber.



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CALIBRATION CERTIFICATE

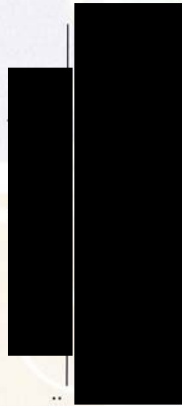
Date of Issue
Site Calibration

Jun 28, 2024

Cert No. 24/2419
Order No. 24060337

The stability and uniformity was taken into account in the measurement uncertainty stated.
The above results are valid exclusively for calibration samples as mentioned in the report.
The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with ONAC requirements.

APPROVED SIGNATORY :



Page 4 of 4



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CALIBRATION CERTIFICATE

Date of Issue
Site Calibration

Jun 28, 2024

Cert No. 24/2419
Order No. 24060337

Results (without adjustment)

UUC Setting (°C)	UUC Reading		Reference Thermometer (°C)	Stability (°C)	Uniformity (°C)	Uncertainty (±°C)
	(°C)	(kPa)				
115.0	115.3	179.6	Position 1	0.25	0.15	±0.70
			Position 2			
			Position 3			

UUC Setting (°C)	UUC Reading		Reference Thermometer (°C)	Stability (°C)	Uniformity (°C)	Uncertainty (±°C)
	(°C)	(kPa)				
121.0	121.4	211.0	Position 1	0.20	0.13	±0.70
			Position 2			
			Position 3			

Standard

- 1) Standard Datalogger with RTD Model. HiTemp. 140-PT S/N. R32397, Certificate No. QR23-1962, Calibrated by Quality Reborn Co., Ltd., ONAC Calibration No. 0292. Due Date Aug 07, 2024.
 - 2) Standard Datalogger with RTD Model. HiTemp. 140-PT S/N. R32398, Certificate No. QR23-1963, Calibrated by Quality Reborn Co., Ltd., ONAC Calibration No. 0292. Due Date Aug 07, 2024.
 - 3) Standard Datalogger with RTD Model. HiTemp. 140-PT S/N. R32399, Certificate No. QR23-1964, Calibrated by Quality Reborn Co., Ltd., ONAC Calibration No. 0292. Due Date Aug 07, 2024.
- This certificate is traceable to SI unit.



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CALIBRATION CERTIFICATE

Date of Issue Jun 28, 2024 Cert No. 24/2418
Site Calibration Order No. 24060337

Customer Bureau Veritas AQ Lab (Thailand) Limited
111 Thailand Science Park
Moo 9 Pathayothin Rd., Klong 1, Klong Luang, Pathumthani 12120 Thailand

Place of Calibration

Description Water Bath
Model SC100
Serial No. 0152187501160414
ID.No. CHM000205

Date of Receipt Jun 24, 2024
Date of Calibration Jun 24, 2024

Environment
Temperature (Min) 22.8 °C (Max) 25.2 °C
Relative Humidity (Min) 44.1 %RH (Max) 58.5 %RH
Line Voltage (Min) 227.2 VAC (Max) 229.6 VAC

Calibration Method

WI-18 : The reference thermometer was placed into the chamber and measurement was performed based on AS-2853.
The temperature scale in use at this laboratory is the International Temperature Scale of 1990.

Standard

1) Data Acquisition with Sensor Model 34972A S/N. MY49007789, Certificate No. QR24-0186, Calibrated by Quality Reborn Co., Ltd., ONAC Calibration No. 0292. Due Date Jan 23, 2025.

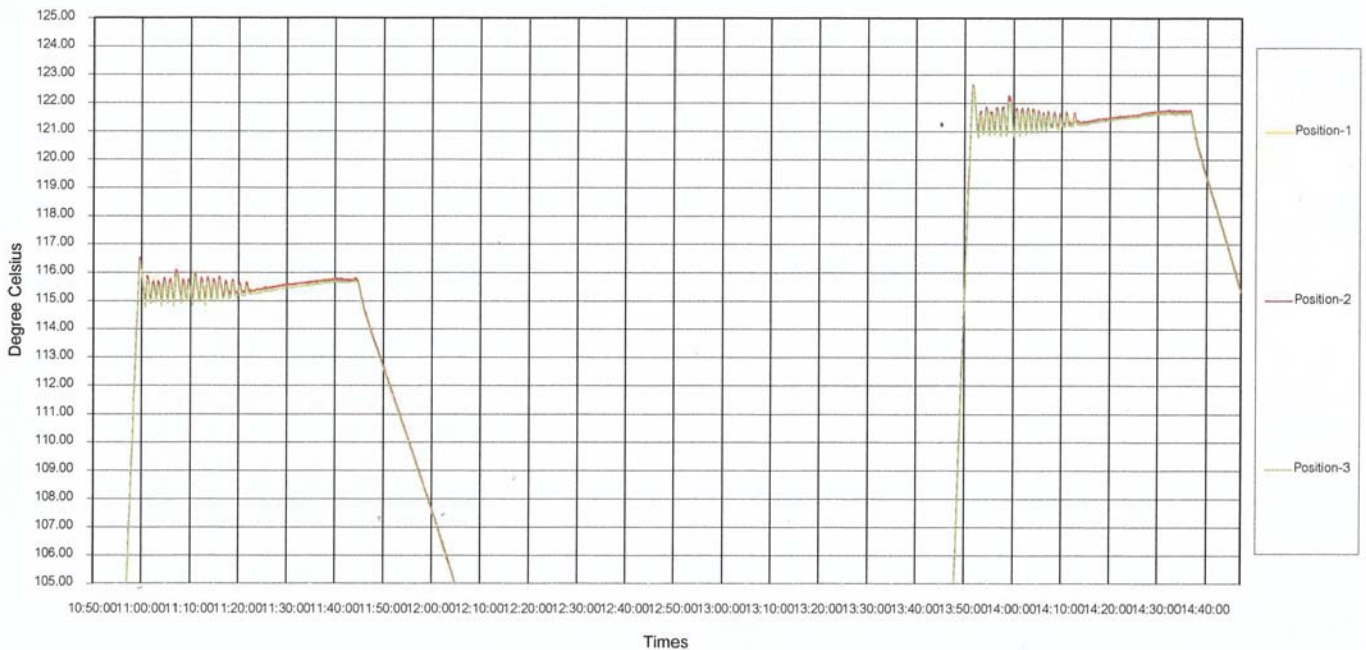
This certificate is traceable to SI unit.

Page 1 of 3

This certificate is issued in accordance with the conditions of Thermology Laboratory. The traceability to recognised national standard and the unit of measurement realised at corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of laboratory.

Autoclave
Model. VE-65 S/N. 7202 ID.No. CHM000206

Cert.No. 24/2419





CALIBRATION CERTIFICATE

Date of Issue Jun 28, 2024
Site Calibration
Cert No. 24/2418
Order No. 24060337

Results (without adjustment)

Cal Point (°C)	UUC Setting (°C)	UUC Reading (°C)	Reference Thermometer (°C)	Stability ±(°C)	Uniformity (°C)	Uncertainty ±(°C)
44.5	44.5	44.5	Position 1 44.490	0.020	0.043	0.13
			Position 2 44.494			
			Position 3 44.491			
			Position 4 44.499			
			Position 5 44.503			

The stability and uniformity was taken into account in the measurement uncertainty stated.
The above results are valid exclusively for calibration samples as mentioned in the report.
The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with ONAC requirements.

APPROVED SIGNATORY :

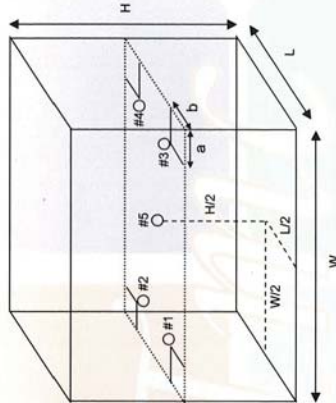
Page 3 of 3



CALIBRATION CERTIFICATE

Date of Issue Jun 28, 2024
Site Calibration
Cert No. 24/2418
Order No. 24060337

Results (without adjustment)



Position of reference thermometers were placed

Note:

- 1). Dimension (W x L x H) is 30 x 34 x 20 cm.
- 2). Stability - greatest one half of difference between max peak and min peak of each reference probe measured temperature obtained during the calibration interval.
- 3). 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. The reference sensor should preferably be located at the geometric center of the chamber.

Page 2 of 3



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NSQ-TISI-TSI 7035
CALIBRATION 0109

CALIBRATION CERTIFICATE

Date of Issue Jun 28, 2024
Site Calibration
Customer Bureau Veritas AQ Lab (Thailand) Limited
111 Thailand Science Park
Moo 9 Paholyothin Rd., Klong 1, Klong Luang, Pathumthani 12120 Thailand

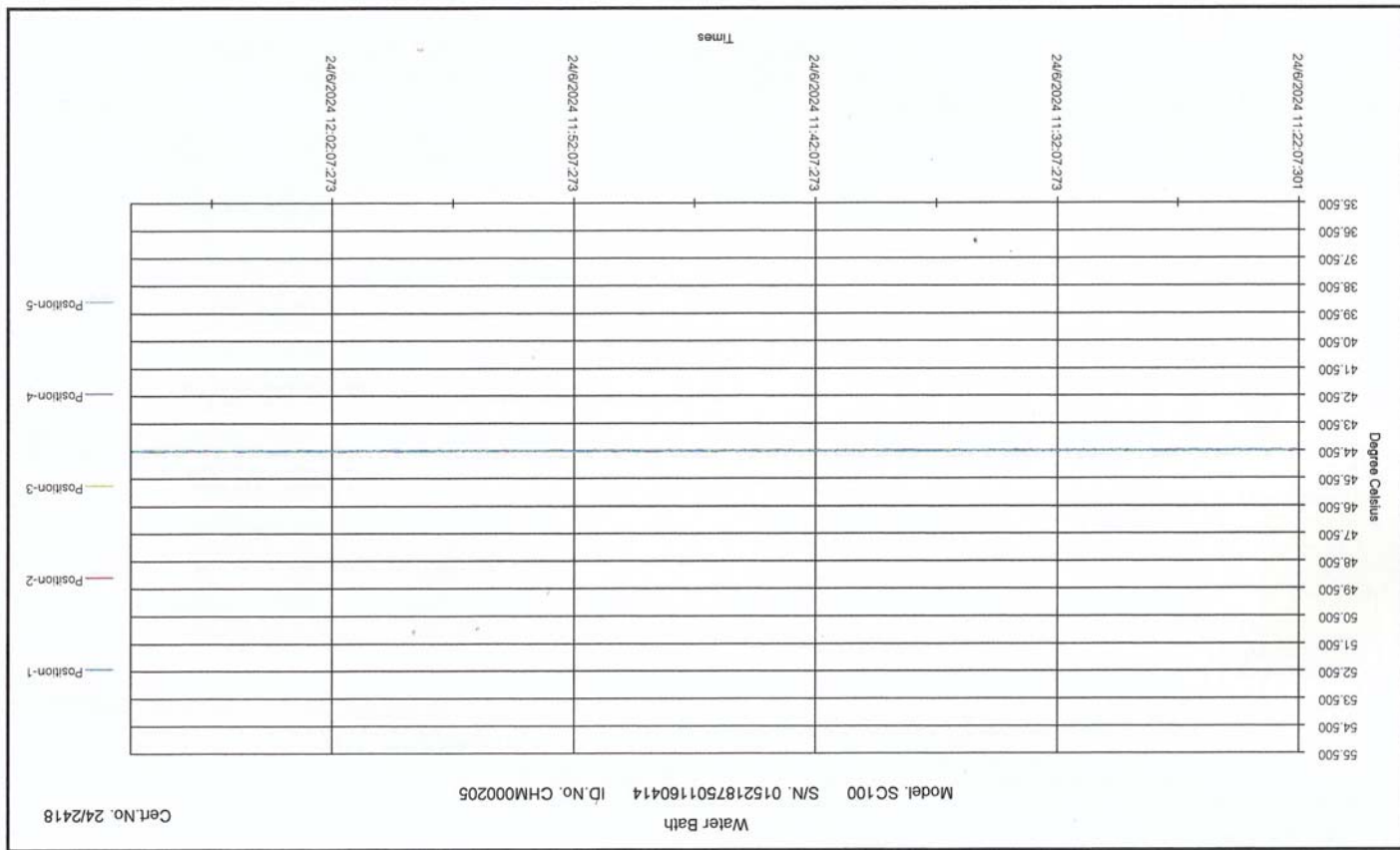
Incubation Room
Description Incubator
Model IN110
Serial No. D415.0797
ID.No. CHM000181
Date of Receipt Jun 24, 2024
Date of Calibration Jun 24, 2024

Environment
Temperature (Min) 22.8 °C (Max) 25.2 °C
Relative Humidity (Min) 44.1 %RH (Max) 58.5 %RH

Calibration Method
WI-17 : The reference thermometer was placed into the chamber and measurement was performed based on AS-2853.
The temperature scale in use at this laboratory is the International Temperature Scale of 1990.

Standard
1) Data Acquisition with Sensor Model 34972A S/N. MV49010059, Certificate No. QR24-0874, Calibrated by Quality Reborn Co., Ltd., ONAC Calibration No. 0292. Due Date Apr 24, 2025.
This certificate is traceable to SI unit.

This certificate is issued in accordance with the conditions of Thermology Laboratory. The traceability to recognised national standard and the unit of measurement realised at corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of laboratory.





CALIBRATION CERTIFICATE

Date of Issue Jun 28, 2024
Site Calibration
Cert No. 24/2415
Order No. 24060337

Results (without adjustment)

Cal Point (°C)	UUC Setting (°C)	UUC Reading (°C)	Reference Thermometer (°C)	Stability ±(°C)	Uniformity (°C)	Uncertainty ±(°C)
35.0	35.0	35.0	Position 1	35.138	0.253	0.30
			Position 2	35.099		
			Position 3	35.075		
			Position 4	35.187		
			Position 5	35.173		
			Position 6	34.988		
			Position 7	34.878		
			Position 8	34.965		
			Position 9	34.970		

The stability and uniformity was taken into account in the measurement uncertainty stated.
The above results are valid exclusively for calibration samples as mentioned in the report.
The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with ONAC requirements.

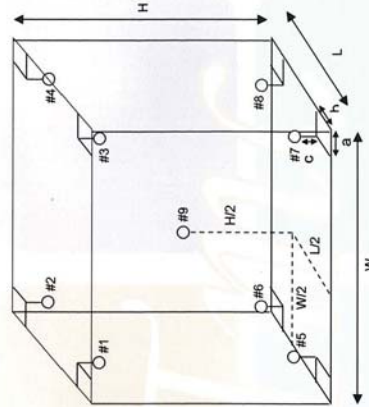
APPROVED SIGNATORY :



CALIBRATION CERTIFICATE

Date of Issue Jun 28, 2024
Site Calibration
Cert No. 24/2415
Order No. 24060337

Results (without adjustment)



Position of reference thermometers were placed

Note.

- 1). Dimension (W x L x H) is 56 x 40 x 48 cm.
- 2). Stability - greatest one half of difference between max peak and min peak of each reference probe measured temperature obtained during the calibration interval.
- 3). 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. The reference sensor should preferably be located at the geometric center of the chamber.

Incubator

Cert.No. 24/2415

Model. IN110 S/N. D415.0797 ID.No. CHM000181

