
เอกสารสอบเทียบเครื่องมือที่ใช้ในการวิเคราะห์



บริษัท ไทยยูนิค จำกัด THAI UNIQUE CO., LTD.

80-82 ถนนประชาวิทย์ แขวงบางขุนพรหม เขตพระนคร กรุงเทพฯ 10200
80-82 Prachathipatani Rd., Bangkokhuphrom, Pranakorn, Bangkok 10200
Tel. 0-2629-0191-6, 0-2280-1787, Fax. 0-2280-1788, E-mail : thawati@thaiunique.com, Website : www.thaiunique.com

ATOMIC ABSORPTION SPECTROMETER TEST CERTIFICATE

Certificate No : SV2212/20960
Instrument Type : ATOMIC ABSORPTION SPECTROMETER
Model : AA 240
Serial Number : AA0909M072
Organization : S.P.J. Scientific Co., Ltd.
Address : 80 Soi Nakkeera Lamthong 3, Sapausong, Sapausong, Bangkok 10250
Date : 21 Dec 2022

Hollow cathode lamps used

Element	Lamp number	Comments
Arsenic	56-101003-00	
Copper	56-101014-00	
Potassium	56-101042-00	
Gold	56-101021-00	

Test description	Specification	Result	Comments
Light throughput (% Gain) or (EHT)			
Cu at 324.8 nm	≤ 64 % or 380 V	42 %	Pass
As at 193.7 nm	≤ 80 % or 540 V	69 %	Pass
K at 766.5 nm*	≤ 84 % or 540 V	56 %	Pass
Other.....			
Photometric noise Cu BGC off			
STDV @ 0	≤ 0.0005	0.0000	Pass



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80-82 Prachathipatani Rd., Bangkokhuphrom, Pranakorn, Bangkok 10200
Tel. 0-2629-0191-6, 0-2280-1787, Fax. 0-2280-1788, E-mail : thawati@thaiunique.com, Website : www.thaiunique.com

Wavelength accuracy			
Cu at 324.8 nm	323.0 nm – 326.0 nm	324.8 nm	Pass
As 193.7 nm	192.0 nm – 195.0 nm	193.6 nm	Pass
K at 766.5 nm*	765.0 nm – 768.0 nm	766.5 nm	Pass
Other.....			
High solids nebulizer setting**			
Uptake rate	7.2 – 10.6 ml / min	9.0 ml/min	Pass
Max Abs	≥ 0.75 Abs	0.76 Abs	Pass
Precision(%RSD)	≤ 0.5 %	0.5 %	Pass
Zeeman Background Correction Accuracy (%)***			
BCA @ Au 242.8 nm	< 3.7 %	***	***
Zeeman Magnetic Sensitivity Ratio (%)****			
MSR @ Cu 324.7 nm	> 70 %	***	***
Characteristic mass and sensitivity ****			
Sensitivity	≥ 0.21 Abs	****	****
Precision (%RSD)	≤ 4.0 %	****	****

* for Wideband PMT (Wavelength 190nm – 900nm)

** for Flame system

*** for Zeeman system

**** for Graphite furnace system

CALIBRATED BY :

APPROVED BY :

Signature: [Signature]

Signature: [Signature]

Engineer : Suriya Nacharoen

Service Manager Suchai Sanguankiatichai

Date : 21 / Dec / 2022

Date : 21 / Dec / 2022

CERTIFICATE CALIBRATION

Page 1 of 3



Certificate No. 23-MAS-0747

Page 1 of 3

Equipment : Non-Automatic Weighing Instrument (Electronic Balance)

Instrument Type : Single interval

Environment : under following environment condition

Manufacturer : METTLER TOLEDO

Model : AL204

Serial No. : 1228320221

ID No. : SPJ-TE-012

Received No. : CAHO23/01261-007

Calibration Date : 20 June 2023

Equipment condition : Good

Location : BALANCE ROOM

Customer name : S.P.J. SCIENTIFIC COMPANY LIMITED

Customer address : 80 Soi Nakkhilaemthong 3, Thab Chang, Saphansong, Bangkok 10250

Condition of calibration results :

1. This calibration method is calibrate by direct measurement method against standard weight according to WI-MAS-003-CC on EURAMET Calibration Guid No. 18 Version 4.0 (11/2015)
2. This certificate is traceable to the International System of Unit (SI Unit).
3. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k , providing a level of approximately 95%.
4. This calibration certificate may not be reproduced other than in full except with the permission of CLT Calibration Laboratory.

Calibrated by : Natthawut

Issue Date : 21 June 2023

FM-WI-MAS-003-CC-R0023/03/64/P1/3

Approved by :

Nutpongorn Rattanapon

Central Laboratory (Thailand) Co., Ltd.

Calibration Service Center : No. 2179 Phaholyothin Road., Laddymak, Jatujak, Bangkok 10900 Thailand
Tel : (662) 940 5993 Ext. 263, 262, 217, 214 Fax : (662) 579 4877 E-mail : clt.calibration@gmail.com

CERTIFICATE CALIBRATION

Page 2 of 3



Certificate No. 23-MAS-0747

Page 2 of 3

Standard Weight Size Class E2

Standard ID No. SWE-02-CC

Certificate No. M23010605

Due Date 17 Jan 2025

Traceability TCS(M23010605)

This certificate is traceable to SI unit

MEASUREMENT RESULTS

1. Repeatability (applied 10 times)

2. Eccentricity Test (Set to zero -> Put on next test load -> removed -> removed -> etc.)

Test load : 100 g

Error Indication from Position 1 (g)

Front left (2) 0.0001

Back left (3) 0.0001

Back right (4) 0.0001

Front right (5) 0.0001

Maximum deviation (g) 0.0001

Standard deviation (g) 0.000052

Test Load (g) 200

Expanded Uncertainty, U(E) (g) 0.00013

Coverage factor, k 2.18

Expanded Uncertainty, U(E) (g) 0.00016

Coverage factor, k 2.06

Expanded Uncertainty, U(E) (g) 0.00019

Coverage factor, k 2.03

Expanded Uncertainty, U(E) (g) 0.00025

Coverage factor, k 2.00

Expanded Uncertainty, U(E) (g) 0.00028

Coverage factor, k 2.00

Expanded Uncertainty, U(E) (g) 0.00015

Coverage factor, k 2.11

Expanded Uncertainty, U(E) (g) 0.00015

Coverage factor, k 2.11

Expanded Uncertainty, U(E) (g) 0.00015

Coverage factor, k 2.11

Expanded Uncertainty, U(E) (g) 0.00015

Coverage factor, k 2.10

Expanded Uncertainty, U(E) (g) 0.00015

Coverage factor, k 2.09

Expanded Uncertainty, U(E) (g) 0.00016

Coverage factor, k 2.08

Expanded Uncertainty, U(E) (g) 0.00016

Coverage factor, k 2.08

Expanded Uncertainty, U(E) (g) 0.00016

Coverage factor, k 2.08

Expanded Uncertainty, U(E) (g) 0.00016

Coverage factor, k 2.08

Expanded Uncertainty, U(E) (g) 0.00016

Coverage factor, k 2.08

Expanded Uncertainty, U(E) (g) 0.00016

Coverage factor, k 2.08

Expanded Uncertainty, U(E) (g) 0.00016

Coverage factor, k 2.08

Expanded Uncertainty, U(E) (g) 0.00016

Coverage factor, k 2.08

Expanded Uncertainty, U(E) (g) 0.00016

Coverage factor, k 2.08

Expanded Uncertainty, U(E) (g) 0.00016

Coverage factor, k 2.08

Remark : This results of calibration was found accurate as shown on environment condition, date and person of calibration only.

Approved by :

Nutpongorn Rattanapon

FM-WI-MAS-003-CC-R0023/03/64/P2/3



FINIX MEASUREMENT CO., LTD.



18 Soi Gosumruamjai 36 Yaek 5, DonMuang, Bangkok, 10210 Tel : 08-3788-1059 Fax : 0-2120-7632

CERTIFICATE OF CALIBRATION

Certificate No. : 23M191

Order No. : SV2343

Page : 1 OF 3

Equipment	:	Electronic Balance
Manufacturer	:	Mettler Toledo
Model	:	ME204T/00
Range	:	0 to 200 g
Resolution	:	0.0001 g
Identification No.	:	SPJ-TE-039
Serial No.	:	B950781446
Location	:	Weighing Room
Condition of item	:	Normal
(On - Site)		
Customer	:	S.P.J. SCIENTIFIC COMPANY LIMITED 80 Soi Nakkhalaenthong 3, Thab Chang, Saphansoong, Bangkok 10250
Ambient Temperature	:	Max. 24.2 °C Min. 23.1 °C
Relative Humidity	:	Max. 55.9 % Min. 52.4 %
Date of received	:	03 May 2023
Date of calibration	:	03 May 2023
Date of issue	:	10 May 2023
Calibration by	:	Mr. Amonsak Ramlaew



Approved by
Mr. Amonsak Ramlaew
(Technical Manager)

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

Approved by: QM Issue Date: 13-Feb-23

CP-501/FR-507 REV.04

CERTIFICATE CALIBRATION



CENTRAL LABORATORY (THAILAND) CO., LTD.
<http://www.centrallabthai.com>



REPORT OF CALIBRATION

NSC-TIS-TIS 17025
CALIBRATION 0125
23-MAS-0747

Certificate No.

Page 3 of 3

Measurement Uncertainty of the Weighing Instrument in Use

This information shall be used for the estimation of the uncertainty under consideration of the same ambient calibration and under the following conditions which is determined by

- 1) Effect of eccentric application of load on indication.
- 2) The device adjustment functionality by External Calibration customer weight applying test load 200 g (S/N or ID.) : SPJ-TE-047
- 3) Temperature coefficient for the evaluation of the measurement uncertainty in use : $2.5 \times 10^{-6} \text{ }^{\circ}\text{C}$
- 4) Temperature range on site for the evaluation of the measurement uncertainty in use : $10 \text{ }^{\circ}\text{C}$
- 5) The device may be use Tare function for weighing.

Linearization of The Weighing Results Equation

The value R represents the net load indication in the unit of measure of the device.

The value W represents the Weighing Results of the device.

Range	The Weighing Results Equation (g)	Net load [R]	Examples value (g)
0 g - 200 g	$W = R - (-3.933E-07 \times R)$	63.0000	Weighting Results [W] 63.0000

Linearization of Uncertainty Equation with adjust of the device

Expanded uncertainty of The Weighing Results providing a coverage probability of approximately 95%

Range	Uncertainty Equation with adjust (g)	Net load [R]	Examples value (g)
0 g - 200 g	$U = 1.322E-04 + (1.391E-05 \times R)$	63.0000	Uncertainty [U] 0.0011

Linearization of Uncertainty Equation without adjust of the device

Expanded uncertainty of The Weighing Results providing a coverage probability of approximately 95%

Range	Uncertainty Equation without adjust (g)	Net load [R]	Examples value (g)
0 g - 200 g	$U = 1.322E-04 + (1.430E-05 \times R)$	63.0000	Uncertainty [U] 0.0011

Approved by :

Nutpongorn Rattanasoon

-- End of Report --

FM-WI-MAS-003-003-CC-R00023/03/6A/P3/3



FINIX MEASUREMENT CO.,LTD.

Certificate No. : 23M191
Order No. : SV2343
Page : 2 OF 3

Reference Standard :

Model	Id No.	Certificate No.	Due Date
Thermo-hygrometer Standard Weights (1)	TH-01 50 mg - 200 g	T0-1204002/23 23-65/0557	12 Apr 24 12 Jul 23

Traceability : This certification is traceable to the international system of unit maintained at
Certificate No. T0-1204002/23 - Thai Heart Calibration Co.,Ltd. (Calibration AC-2695)
Certificate No. 23-65/0557 - Thailand Institute of Scientific And Technological Research (TISTR)
(Calibration 0060)

Calibration Method :

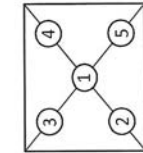
In - House method : CP - 501 base on UKAS LAB 14 : 2022

Calibration Result :

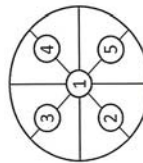
Internal Adjustment

Test Load (g)	Standard Deviation (g)
200.0	0.00005

1. Repeatability



()



(X)

2. Off - Center Loading

Test Load : 50.0 g		
Loading Position	UUC* Reading (g)	Max. Difference (g)
1	50.0000	-0.00010
2	50.0001	
3	50.0000	
4	50.0000	
5	50.0000	
1	50.0000	



FINIX MEASUREMENT CO.,LTD.

Certificate No. : 23M191
Order No. : SV2343
Page : 3 OF 3

3. Departure of indication from nominal value

Normal Value (g)	STD* (g)	UUC* (g)	UUC* Error (g)	Uncertainty ± (g)	Convergence Factor (k)
0.0	Unload	0.0000	0.0000	0.00030	2.06
0.1	0.1000	0.1000	0.0000	0.00030	2.06
0.5	0.5000	0.5000	0.0000	0.00030	2.06
1.0	1.0000	1.0000	0.0000	0.00030	2.06
2.0	2.0000	2.0000	0.0000	0.00030	2.06
5.0	5.0000	5.0000	0.0000	0.00030	2.05
10.0	10.0000	10.0000	0.0000	0.00030	2.05
20.0	20.0000	20.0000	0.0000	0.00030	2.04
50.0	50.0000	50.0000	0.0000	0.00030	2.04
100.0	100.0000	100.0001	0.0001	0.00030	2.00
200.0	200.0001	200.0000	-0.0001	0.00030	2.00

MPE : $< \pm 0.0005$ g
✓ : $p_{0.95}$
✗ : $F_{0.95}$

$\sqrt{0.00030^2 + 0.0001^2}$
15/5/65
T.M.P.

UUC* = Unit Under Calibration
Note : STD* = Standard

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

Uncertainty of measurement :

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 End -

CERTIFICATE CALIBRATION

5 014

CENTRAL LABORATORY (THAILAND) CO., LTD.
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CERTIFICATE
of CALIBRATION

NSC-TISI-TIS 17025
CALIBRATION 0125

Certificate No. 23-MAS-0748

Page 1 of 2

Equipment : Non-Automatic Weighing Instrument (Electronic Balance)

Instrument Type : Multiple interval

Manufacturer : METTLER TOLEDO

Model : MS105DU

Serial No. : B216861078

ID No. : SPJ-TE-013

Received No. : CAHO23/01261-029

Calibration Date : 20 June 2023

Equipment condition : Good

Location : BALANCE ROOM

Customer name : S.P.J. SCIENTIFIC COMPANY LIMITED

Customer address : 80 Soi Nakkhalaemthong 3, Thab Chang, Saphansong, Bangkok 10250

Condition of calibration results :

1. This calibration method is calibrated by direct measurement method against standard weight according to WI-MAS-003-CC on EURAMET Calibration Guid No. 18 Version 4.0 (11/2015)
2. This certificate is traceable to the International System of Unit (SI Unit).
3. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k , providing a level of approximately 95%.
4. This calibration certificate may not be reproduced other than in full except with the permission of CLT Calibration Laboratory.

Calibrated by : Natthawut

Issue Date : 21 June 2023

FM-WI-MAS-003-CC-R0023/03/60P1/3

Approved by :

Nutpongorn Rattanaporn

Central Laboratory (Thailand) Co., Ltd.

Calibration Service Center : No. 2179 Phaholyothin Road., Ladao, Jatujak, Bangkok 10900 Thailand

Tel : (662) 940 5993 Ext. 263, 262, 217, 214 Fax : (662) 579 4877 E-mail : clt.calibration@gmail.com

CERTIFICATE CALIBRATION



CENTRAL LABORATORY (THAILAND) CO., LTD.
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REPORT
of CALIBRATION

NSC-TISI-TIS 17025
CALIBRATION 0125

Certificate No. 23-MAS-0748

Page 2 of 2

Traceability
TCS(M23010605)

Certificate No.
M23010605

Standard ID No.
SWE-02-CC

Class
E2

Standard Weight Size
Set 1 mg to 200 g

This certificate is traceable to SI unit

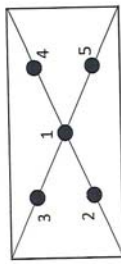
MEASUREMENT RESULTS

1. Repeatability (applied 10 times)

2. Eccentricity Test (Set to zero -> Test load put on next position -> removed -> etc.)

Test Load (g)	Standard deviation (g)
40	0.0000048

Test load : 50 g	Error Indication from Position 1 (g)
Front left (2)	0.0000
Back left (3)	0.0001
Back right (4)	0.0000
Front right (5)	0.0002
Maximum deviation (g)	0.0002



(NPE L 0.0005)

3. Error of Indications Calibration Requirement (Set to zero -> Put on smallest test load -> removed -> increasing put on next test load -> removed -> etc.)

Test Load (g)	Error of Indication, E (g)	Expanded Uncertainty, U(E) (g) F=1.1	Coverage factor, k
0	0.00000	0.000013	2.17
25	0.00001	0.00012	2.00
50	0.0000	0.00016	2.00
75	0.0000	0.00026	2.00
100	-0.0002	0.00028	2.00
Test Load (g)	Error of Indication, E (g)	Expanded Uncertainty, U(E) (g)	Coverage factor, k
0.05	0.00000	0.000017	2.04
0.1	0.00000	0.000018	2.03
0.5	-0.00001	0.000023	2.00
1	0.00000	0.000026	2.00
5	0.00000	0.000040	2.00
10	0.00000	0.000051	2.00
20	-0.00001	0.000075	2.00
40	-0.00002	0.00015	2.00
70	0.0000	0.00023	2.00
120	-0.0002	0.00034	2.00

Remark : This results of calibration was found accurate as shown on environment condition, date and person of calibration only.

Approved by :

Nutpongorn Rattanaporn

11/06/23

~ End of Report ~

FM-WI-MAS-003-CC-R0023/03/60P2/2

CALIBRATION REPORT

Issued By B.T.METROLOGY CO.,LTD.
Date of Issue 22 July 2023

B.T.METROLOGY CO.,LTD.
17/166 Soi Prachachun 14 (PEA Village)
Tungsonghong Laksi, Bangkok 10210

Approved Signatory
P.P.
P.Prasitmate

Customer : S.P.J.Scientific Co.,Ltd.
Address : 80, Soi Nakkeela Laem Thong 3,Thap Chang Subdistrict, Saphan Sung District, Bangkok 10250

Date of Received : 21 July 2023

Instrument – Description : COD REACTOR

Id. Number : N/A
Manufacturer : HANNA
Model Number : HI839800
Serial Number : 08090031111

Calibration Procedure : Indicate temperature of Unit Under Test (UUC) was compared to temperature Obtained from reference standards at calibration point.

Measurement Method : The thermocouples shall be placed with in the chamber in accordance with the appendix A and the temp. readings of the thermocouples could be found in the appendix A.

Cal. Inform. : Cal. (✓) Only () Adjusted

Location of Calibration : At Customer Location

Environmental Conditions :

Temperature is $27 \pm 3^{\circ}\text{C}$

Relative Humidity is $60 \pm 10\%$ Rh

Comments

The temperature scale in use is the International Temperature Scale of 1990 (ITS-90).

The Uncertainties of report based on a standard uncertainty Multiplied by a coverage factor $k=2$,

Providing level of confidence approximately 95%

All Tests pass standard tolerance.

Traceability Information

Reference Standards Description	Serial Number	Certificate Number	Cal. Date	Due Date
STD Thermometer with Probe, PRT	1912	22-650709	7-9/September/2022	7-9/September/2023
Equipment Description	Serial Number	Certificate Number	Cal. Date	Due Date
Data logger With Probe (RTD : 01-10)	MY49020096	BTC-T-001-66	1/February/2023	1/February/2024
	Maker: Agilent	Model: 34972A	Make in USA	

This certification is traceable to SI Unit through the reference standard laboratory of In-house B.T.Metrology Calibration Lab. The used to perform this calibration is Traceable to National Institute of Metrology (Thailand), NIMT through Reference Standard Laboratory of Thailand. Institute of Scientific and Technological Research (TISTR), No. Calibration 0260.(Laboratories was Accreditation by TISI According to ITS ISO / IEC 17025

Calibrated By:

B. Sompraj
(Mr. Boonlue Somprajob)

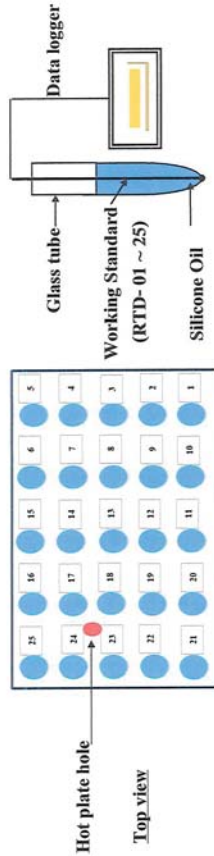
Date of Calibration : 21 July 2023

CALIBRATION REPORT

Issued By B.T.METROLOGY CO.,LTD.
Date of Issue 22 July 2023

Cert. Number
BTC-T-04/66
Page 2 of 4 pages

Appendix A.



Calibrated By:

B. Sompraj
(Mr. Boonlue Somprajob)

Date of Calibration : 21 July 2023

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CALIBRATION REPORT

Cert. Number
BTC-T-04/66
Page 3 of 4 pages

Issued By B.T.METROLOGY CO.,LTD.
Date of Issue 22 July 2023

Hole No. (Position)	Max (°C)	Min (°C)	Mid-Range (°C)	Difference (°C)	Uncertainty of measurement (±°C)	Accepted
1	149.10	148.90	149.00	0.23		0.93
2	149.00	148.80	148.90	0.19		0.47
3	148.90	148.80	148.85	0.19		0.69
4	148.80	148.60	148.70	0.21		0.91
5	148.90	148.70	148.80	0.22		0.99
6	149.80	149.50	149.65	0.28		0.96
7	148.80	148.60	148.70	0.25		0.45
8	150.70	150.40	150.55	0.30		1.00
9	150.70	150.40	150.55	0.28		0.96
10	150.50	150.10	150.30	0.41		1.11
11	149.10	148.80	148.95	0.25		0.45
12	150.90	150.20	150.55	0.63		1.33
13	151.50	151.00	151.25	0.52		1.99
14	151.00	150.60	150.80	0.37	0.7	1.04
15	149.90	149.60	149.75	0.31		1.01
16	150.70	150.20	150.45	0.54		1.34
17	150.00	149.70	149.85	0.29		0.99
18	149.80	149.40	149.60	0.37		1.07
19	150.50	150.00	150.25	0.47		1.47
20	148.70	148.50	148.60	0.16		0.46
21	149.60	149.40	149.50	0.22		0.93
22	149.20	149.00	149.10	0.21		0.91
23	149.30	149.10	149.20	0.24		0.91
24	149.60	149.40	149.50	0.22		0.93
25	149.00	148.50	148.75	0.59		1.99
Hot plate hole	150.30	149.60	149.95	0.62		1.93

Calibrated By:

B. Somprajob

(Mr. Boonlue Somprajob)

Date of Calibration : 21 July 2023

166-1166

CALIBRATION REPORT

Cert. Number
BTC-T-04/66
Page 4 of 4 pages

Issued By B.T.METROLOGY CO.,LTD.
Date of Issue 22 July 2023

UUC		Average Measured Temperature * (°C)	Measured Temperature		Measured Variation	
Setting (°C)	Reading (°C)		Max (°C)	Min (°C)	Stability (±°C)	Overall (°C)
150.0	148.5-151.5	149.6	151.5	148.5	0.3	2.7
						3.0

Note : - Reference Standards are measurement in tube silicone oil at 240 value record after temperature stability.
- Level high of silicone oil is equal heater plate of UUC.

... end of certificate ...

Calibrated By:

B. Somprajob

(Mr. Boonlue Somprajob)

Date of Calibration : 21 July 2023

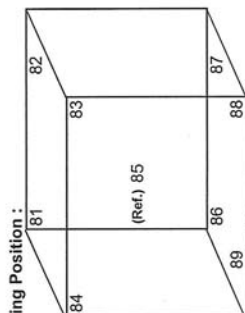
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Certificate No. 23-TMP-2127

Page 2 of 2

Remark :	The quoted uncertainty include "Stability" and "Loading Effect" (20% of Uniformity)
Stability :	One-half of the greatest maximum difference of measured temperatures at any one sensor.
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.
Overall Variation :	The difference of the maximum and the minimum measured temperatures throughout observation time.



Results of Calibration :

Calibration Point	Average Standard Reading at each position (°C)								
(°C)	81	82	83	84	85	86	87	88	89
T_{E1-2}	103.94	104.08	104.25	104.01	103.96	103.81	103.72	103.56	103.94
T_{E2-3}	180.36	180.64	180.77	180.33	180.20	179.84	180.06	179.63	180.69
$10A^{\circ}$ Error	-0.06	0.08	0.35	0.01	-0.04	-0.19	-0.28	-0.44	-0.06
Error + Uncer	1.01	1.03	1.20	0.96	0.99	1.11	1.23	1.39	1.01
140° Error	0.36	0.64	0.71	0.33	0.30	-0.16	0.06	-0.37	0.67
Error + Uncer	1.46	1.94	2.07	1.63	1.50	1.26	1.36	1.67	1.97

Equipment

Setting *UUC (°C)	Experiment				Over All Variation (°C)	Uncertainty (°C)
	Reading *UUC Min (°C)	Reading *UUC Max (°C)	Uniformity (°C)	Stability (°C)		
104.0	104.0	104.0	0.46	± 0.10	0.87	± 0.95
180.0	180.0	180.0	0.69	± 0.20	1.45	± 1.3

Verified
08/06/2009
09/14/2009

UUC = Unit Under Calibration

Approved by :

Dachdamrong Songchom

~ End of Report ~

EM-WI-TMP-002-004-CC-R06(14/09/64)P2/2

Equipment :	Hot Air Oven
Manufacturer :	Memmert
Model :	UF 55
Serial No :	B221.0746
ID No :	SPJ-TE-049
Location :	LAB 3
Customer name :	S.P.J. SCIENTIFIC

Customer Address : 80 Soi Nakkilalaemthong 3, Thab Chang, Saphansong, Bangkok 10250

Received no. : CAHO23/01261-005

Received Date : 20 Jun 23

Calibration Date: 20 Jun 23

Condition of calibration results :

1. This calibration method was calibrated by insert 9 standard temperature sensors into this chamber of equipment and test according to WI-TMP-002-CC.
2. This certificate is traceable to SI Unit through National Institute of Metrology (Thailand) NIMT.
3. This Temperature Scale is base on ITS-90
4. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of approximately 95%, the uncertainty evaluation has been carried out in accordance with UKAS M3003 requirements.
5. This calibration certificate may not be reproduced other than in full except with the permission of CLT Calibration Laboratory.

Environment Condition :

Temperature : 28 °C to 29 °C
Humidity : 64 %RH to 66 %RH

Good

Description :

Reference Sta

Ailant Data Loader

Agilent Data Logger
Agilent Multiplexer Module

TC type T

This certificate is traceable to SI unit

Reference Standard : _____
Standard ID : _____
Reference no. : _____ Due Date : _____

Seilant Data Logger

Agilent Data Logger	SRO-Z7-CC	-	-
Agilent Multiplexer Module	SRO-Z8-CC	22-TMP-2217	28 Oct 23

TC type T	TCT-81-CC to TCT-90-CC	22-TMP-2217
Effluent multiplexed module	22-TMP-2217	22 Oct 23
TC type T	22-TMP-2217	22 Oct 23

This certificate is traceable to SI unit

Calibrated by: _____
Sutin

Issued Date: 21 Jun 23

Approved by: 
Dachdamrong Songchom

EM-WI-TMP-002-004-CC-R06(14/09/64)P1/2

Central Laboratory (Thailand) Co., Ltd.

Calibration Service Center : No 2179 Phaholyothin Road | Ladysao | Latulak | Bangkok 10900 Thailand

Tel : (662) 940 5993 Ext. 263, 262, 217, 214 Fax : (662) 579 4877 E-mail : clt.callibration@gmail.com

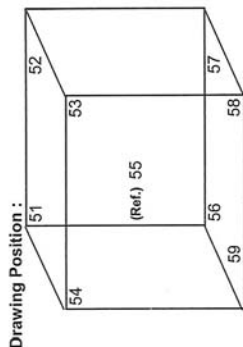
CERTIFICATE CALIBRATION

CENTRAL LAB THAI
GATEWAY TO GLOBAL QUALITY



Certificate No. 23-TMP-2126

Page 2 of 2



Remark :
The quoted uncertainty include "Stability" and "Loading Effect"
(20% of Uniformity)

Stability :
One-half of the greatest maximum difference of measured temperatures at any one sensor.

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.

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

Results of Calibration :

Calibration Point (°C)	51	52	53	54	55	56	57	58	59
Average Standard Reading at each position (°C) (Ref.)	19.83	20.11	20.04	19.81	19.99	19.83	20.02	20.03	19.82
Error	-0.14	0.11	0.04	-0.19	-0.01	-0.14	0.03	0.03	-0.18
Expanded Uncertainty	0.64	0.56	0.51	0.66	0.44	0.64	0.49	0.50	0.65
UUC	✓	✓	✓	✓	✓	✓	✓	✓	✓

UUC = Unit Under Calibration
Remark : This result of calibration was found accurate as shown on date and place of calibration only.

Setting *UUC (°C)	20.2
Reading *UUC Min (°C)	20.2
Reading *UUC Max (°C)	20.2
Uniformity (°C)	0.22
Stability (°C)	± 0.09
Over All Variation (°C)	0.46
Uncertainty (°C)	± 0.47

UUC = Unit Under Calibration

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

Approved by :
Dachdamrong Songhom

~ End of Report ~

FM-WI-TMP-002-004-CC-R06(14/09/64)P22

CERTIFICATE CALIBRATION

CENTRAL LAB THAI
GATEWAY TO GLOBAL QUALITY



Certificate No. 23-TMP-2126

Page 1 of 2

Equipment : Incubator
Manufacturer :
Model :
Serial No :
ID No : SPJ-TE-028
Location : LAB 1
Customer name : S.P.J. SCIENTIFIC COMPANY LIMITED
Customer Address : 80 Soi Nakkilaemthong 3, Thab Chang, Saphansong, Bangkok 10250

Received no. : CAHO23/01261-004

Received Date : 20 Jun 23

Calibration Date : 20 Jun 23

Condition of calibration results :

1. This calibration method was calibrated by insert 9 standard temperature sensors into this chamber of equipment and test according to WI-TMP-002-CC.
2. This certificate is traceable to SI Unit through National Institute of Metrology (Thailand) NIMT.
3. This Temperature Scale is based on ITS-90
4. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of approximately 95% the uncertainty evaluation has been carried out in accordance with UKAS M3003 requirements.
5. This calibration certificate may not be reproduced other than in full except with the permission of CLT Calibration Laboratory.

Environment Condition :

Temperature : 28 °C to 29 °C
Humidity : 64 %RH to 66 %RH

Condition of Calibration :

Calibration Result without Adjustment			
Description :	Reference Standard :	Standard ID :	Reference no. : Due Date : Traceability :
Agilent Data Logger	SRO-27-CC	22-TMP-2217	28 Oct 23
Agilent Multiplexer Module	SRO-29-CC	22-TMP-2217	28 Oct 23
RTD Probe PT100	RTD-51-CC to RTD-60-CC	22-TMP-2217	28 Oct 23
			CLT(22-TMP-2217)
			CLT(22-TMP-2217)

This certificate is traceable to SI unit

Calibrated by : Sutin

Issued Date : 21 Jun 23

FM-WI-TMP-002-004-CC-R06(14/09/64)P1/2

Approved by :
Dachdamrong Songhom

Central Laboratory (Thailand) Co., Ltd.

Calibration Service Center : No. 2179 Phaholyothin Road., Ladysao, Jatujak, Bangkok 10900 Thailand
Tel : (662) 940 5993 Ext. 263, 262, 217, 214 Fax : (662) 579 4877 E-mail : clt.calibration@gmail.com

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REPORT
of CALIBRATION

Certificate No. 23-CHM-0150
Page 2 of 2

Calibration Result :

1. pH Meter Calibration

Unit Under Calibration pH Meter SIN : 200800040522 pH Meter ID: SPJ-TE-045

Before				Actual Reading			
Calibration Point (pH)	Standard Voltage (mV)			mV		pH	
4	177.48			-		-	-
7	0.00			-		-	-
10	-177.48			-		-	-
After				Uncertainty			
Calibration Point (pH)	Standard Voltage (mV)			mV	pH		k
4	177.48			-	-	-	-
7	0.00			-	-	-	-
10	-177.48			-	-	-	-

Set Calibration Curve with point at Slope - % (MPE of Slope 95% to 105%)

2. Electrode and pH Meter Calibration

Performing pH Meter system read using nominal standard pH buffer controlled at $25 \pm 0.5^\circ\text{C}$ and automatic temperature compensation.

Unit Under Calibration Electrode SIN : 220772562511 Electrode ID: -

Before				Actual Reading			
Calibration Point (pH)	Standard pH Buffer Solution at 95% confidence level (k=2)						
4	4.008 ± 0.004			4.04		0.0084	2.05
7	6.985 ± 0.007			7.07		0.011	2.05
10	10.008 ± 0.004			10.07		0.0087	2.00
After				Uncertainty			
Calibration Point (pH)	Standard pH Buffer Solution at 95% confidence level (k=2)						
4	4.008 ± 0.004			4.00		0.0084	2.05
7	6.985 ± 0.007			7.01		0.011	2.05
10	10.008 ± 0.004			10.01		0.0087	2.00

Remark : MPE is Maximum Permissible Error
this result of calibration was found accurate as shown on date and place of calibration only.

Approved by :

Nulpongorn Rattanaon

~ End of Report ~

Veri: 1.1.1
17/06/2023
08/11/2023

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CERTIFICATE
of CALIBRATION

Certificate No. 23-CHM-0150
Page 1 of 2

Equipment : pH meter
Manufacturer : HACH
Model : HQ11d
Serial No : 200800040522
ID No : SPJ-TE-045
Location : LAB 4
Received No : CAHO23/01261-008
Received Date : 20 Jun 2023
Calibration Date : 20 Jun 2023
Customer : S.P.J. SCIENTIFIC COMPANY LIMITED
Address : 80 Soi Nakkilaiaemthong 3, Thab Chang, Saphansong, Bangkok 10250

Environment Condition : Room Temperature (25 \pm 5) $^\circ\text{C}$
Room Humidity (60 \pm 15) %RH

Reference Standard :

1 : The measurement results are traceable to SI unit through CPA chem Ltd., ANSI National Accreditation Board, Accredited No. AR-1835

Nominal Value 4
Manufacturer CPA chem
Lot No. 809355
Certificate No. PH216.L5
21 Apr 24
7
CPA chem
21 Apr 24
10
CPA chem
21 Apr 24
PH220.L5

2: Multifunction Process Calibrator is traceable to SI unit through Technology Promotion Association (Thai-Japan), NSC-ONSAC accredited no. Calibration 0008

Standard
Manufacturer Sika
Serial No. 0306Y Z43 0788A
Certificate No. 23E11
Expire Date: 3-Jan-24

Condition of calibration results :

- This calibration method was based on direct measurement by using standard voltage calibrator and certified reference material (CRM) According to inhouse method WI-CHM-001-CC
- The report of expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor of k providing a confident level of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS M3003 requirements.
- This calibration certificate may not be reproduced other than in full except with the permission of CLT Calibration Laboratory

Calibrated by : Natthawut

Approved by :

Nulpongorn Rattanaon

Issue Date : 21 Jun 2023

FM-WI-CHM-001-003-CC-R05(25/06/61)P1/2

Central Laboratory (Thailand) Co., Ltd.

Calibration Service Center : No. 2179 Phatthayothin Road., Laddyma, Jatujak, Bangkok 10900 Thailand
Tel : (662) 940 5993 Ext. 263, 262, 217, 214 Fax : (662) 579 4877 E-mail : clt.calibration@gmail.com

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REPORT of CALIBRATION

Certificate No. 23-TMP-2129

Pages 2 of 3

Equipment : pH meter (Temperature Part)
Manufacturer : HACH
Model : HQ11d
Made in :
Serial No : 200800040522
ID No : SPJ-TE-045
Location : LAB4 (On-site Calibration)
Calibration Date : 20 Jun 23

Reference Standard : Chub E-4
IPRT Probe
Reference No. : 23-TMP-1225
23-TMP-1225
Due Date : 27 Mar 24
27 Mar 24

Environment Condition :

Room Temperature : 20 to 21 °C
Room Humidity : 59 to 60 %RH
Room Pressure :

Condition of Calibration : Good

Description : Calibration Result without Adjustment

Approved by :
Dachdamrong Songchom

FM-WI-TMP-114-007-CC-R02(05/10/54)P2/3

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CERTIFICATE of CALIBRATION

Certificate No. 23-TMP-2129

Pages 1 of 3

Equipment : pH meter (Temperature Part)
Manufacturer : HACH
Model : HQ11d
Made in :
Serial No : 200800040522
ID No : SPJ-TE-045
Customer name : S.P.J. SCIENTIFIC COMPANY LIMITED

Customer address : 80 Soi Nakkhilaemthong 3, Thab Chang, Saphansong, Bangkok 10250

Received No : CAHO23/01261-009

Received Date : 20 Jun 23

Condition of calibration results :

1. This calibration method was calibrated by comparison unit under test into stabilize calibration bath and comparison with Standard Platinum resistance probe according to WI-TMP-114-CC
2. This certificate is traceable to The International system of Units maintained at
- The National Institute of Metrology (Thailand) NIMT.
3. This Temperature Scale is base on ITS-90
4. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of approximately 95% the uncertainty evaluation has been carried out in accordance with UKAS M3003 requirements.
5. This calibration certificate may not be reproduced other than in full except with the permission of CLT Calibration Laboratory
6. This result of calibration was found accurate as shown on date and place of calibration only.

Calibrated by : Sulin

Issued person : Passara

Issued date : 23 Jun 23

FM-WI-TMP-114-007-CC-R02(05/10/54)P1/3

Approved by :
Dachdamrong Songchom

Central Laboratory (Thailand) Co., Ltd.

Calibration Service Center : No. 2179 Phaholyothin Road., Ladysao, Jatujak, Bangkok 10900 Thailand
Tel : (662) 940 5993 Ext. 263, 262, 217, 214 Fax : (662) 579 4877 E-mail : clt.calibration@gmail.com

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NSC-TIS-TIS 17025
CALIBRATION 0125

REPORT of CALIBRATION

Certificate No. 23-TMP-2125

Page 1 of 2

Results of Calibration:

Dimension of Probe : Diameter(Ø) 10 mm
Sheath Material Plastic
Immersion Depth : 122 mm
Probe ID No: SPJ-TE-045
Probe Description : RTD PROBE
Probe Model :
Connection Channel :
Parameter Setting :
Probe Serial No. :
10PE ± 0.2°C

Results before Adjustment				
Calibration Point (°C)	Average of Standard Reading (°C)	UUC Reading (°C)	Correction Value (°C)	Uncertainty (±°C)
20.00	20.0038	19.9	0.1038	±0.12
25.00	25.0054	24.9	0.1054	±0.12
30.00	30.0052	29.9	0.1052	±0.12

CENTRAL LAB THAI
GATEWAY TO GLOBAL QUALITY

Verified by
mm.0000
26/11/66

Results After Adjustment				
Calibration Point (°C)	Average of Standard Reading (°C)	UUC Reading (°C)	Correction Value (°C)	Uncertainty (±°C)

Parameter Setting:

* Remark : UUC is Unit under calibration.
The Certification Values with marked are not covered by TLAS Accreditation
-End of Report-

Approved by :
Dachdamrong Songchom

FM-WI-TMP-114-007-CC-R02(05/10/54)P3/3

Equipment : Refrigerator

Manufacturer : -

Model : -

Serial No : -

ID No : SPJ-TE-014

Location : Sample Receive Area

Customer name : S.P.J. SCIENTIFIC COMPANY LIMITED

Customer Address : 80 Soi Nakkhilaemthong 3, Thab Chang, Saphansong, Bangkok 10250

Received no. : CAHO23/01261-003

Received Date : 20 Jun 23

Calibration Date : 20 Jun 23

Condition of calibration results :

1. This calibration method was calibrated by insert 9 standard temperature sensors into this chamber of equipment and test according to WI-TMP-002-CC.
2. This certificate is traceable to SI Unit through National Institute of Metrology (Thailand) NIMT.
3. This Temperature Scale is base on ITS-90
4. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of approximately 95% the uncertainty evaluation has been carried out in accordance with UKAS M3003 requirements.
5. This calibration certificate may not be reproduced other than in full except with the permission of CLT Calibration Laboratory.

Environment Condition :

Temperature : 28 °C to 29 °C
Humidity : 64 %RH to 66 %RH

Condition of Calibration : Good

Description : Calibration Result without Adjustment

Reference Standard : SRO-27-CC

Agilent Data Logger

Agilent Multiplexer Module

RTD Probe PT100

This certificate is traceable to SI unit

Standard ID : SRO-27-CC

Reference no. : 22-TMP-2217

Due Date : 28 Oct 23

Traceability : CLT(22-TMP-2217)
CLT(22-TMP-2217)

Calibrated by : Sutin

Issued Date : 21 Jun 23

FM-WI-TMP-002-004-CC-R06(14/09/64)P1/2

Approved by :
Dachdamrong Songchom

Central Laboratory (Thailand) Co., Ltd.
Calibration Service Center : No. 2179 Phaholyothin Road., Ladysao, Jatujak, Bangkok 10900 Thailand
Tel : (662) 940 5993 Ext. 263, 262, 217, 214 Fax : (662) 579 4877 E-mail : clt.calibration@gmail.com

CERTIFICATE OF CALIBRATION

Certificate No.: CO-1912001/22 Page 1 of total 3 pages

Customer
S.P.J. SCIENTIFIC COMPANY LIMITED
80 Soi Nakkhilaemthong 3, Thap Chang,
Saphansoong, Bangkok 10250 Thailand.

Equipment
Spectrophotometer
Manufacturer
HACH
Model
DR 3900
Serial No.
2106441
ID No.
-
Description
-

Environmental Conditions
Ambient Temperature: (20 ± 2) °C
Relative Humidity: (50 ± 10) %
Atmospheric Pressure: -

Calibration Location
Jayhawks Laboratory (CL&GL)
Received Date
19 December 2022
Calibration Date
19 December 2022

Date of Issue
20 December 2022

Checked by

Approved by

Representative of Managing Director

(Dr. Ekachai Puttiwong)

Act as Technical Manager

() (Krisyosil K.) () (Sakda Y.)
() (Patiphan K.) () (Onnapa P.)
() (Pongsak H.) () (Nitiphong K.)
() (Kanung C.) () (Nonthachai K.)
() (Pramong P.) () (Noppol P.)

This calibration certificate shall not be reproduced other than in full except with the prior written approval of the Thai Heart Calibration Co., Ltd.

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REV.02 02/24/21

CERTIFICATE CALIBRATION



NSC-TIS-TIS 17025
CALIBRATION 0125

Certificate No. 23-TMP-2125

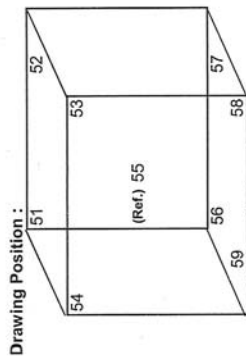
Page 2 of 2

Remark :
The quoted uncertainty include "Stability" and "Loading Effect"
(20% of Uniformity)

Stability :
One-half of the greatest maximum difference of measured temperatures at any one sensor.

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.

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



Results of Calibration :

Calibration Point (°C)	51	52	53	54	55	56	57	58	59
Average Standard Reading at each position (°C) (Ref.)	3.74	4.32	3.88	3.73	3.60	3.92	4.10	3.70	4.37
Error	-0.16	+0.32	-0.12	-0.31	-0.10	-0.04	+0.10	-0.30	+0.31
Uncertainty	1.36	1.41	1.33	1.34	1.50	1.14	1.30	1.40	1.41

MPE 0.32

วัดที่ 166
9.17/166

Setting *UUC (°C)	Reading *UUC Min (°C)	Reading *UUC Max (°C)	Equipment Uniformity (°C)	Stability (°C)	Over All Variation (°C)	Uncertainty (°C)
4.1	4.0	5.5	1.15	± 1.50	3.34	± 2.1

*UUC = Unit Under Calibration
Remark : This result of calibration was found accurate as shown on date and place of calibration only.

Approved by :
Dachdamrong Songchom

-- End of Report --

FM-WI-TMP-002-004-CC-R08(14/09/64)P22

Certificate No.: CO-1912001/22

Page 2 of total 3 pages

Reference Method:

- The calibration method used was CP-004 based on an in-house method.
- This certificate can be traceable to the national standards, which is realized the shown measurement units according to the International System of Units (SI Units).

Reference Standard Instruments:

Type	Model	Serial No.	Certificate No.	Due Date	Traceability
Holmium Glass Filter	RM-HG	34645	100503	Mar. 25, 2024	Starna
Didymium Glass Filter	RM-DG	11978	100499	Mar. 25, 2024	
Neutral Density Filter	RM-1N2N3N	11562	100582	Mar. 30, 2024	

Remark: This certificate is traceable to the International System of Unit (SI Unit) through:

- Starna Scientific Ltd.

Measurement Results:

Spectral Bandwidth : 5 nm, Scan Speed : -

1. Wavelength accuracy

Standard Wavelength (nm)	UUC Reading (nm)	Correction (nm)	Uncertainty (± nm)	Criteria
334.50	333	1.50	0.59	✓
537.00	536	1.00	0.59	✓
879.68	880	-0.32	0.59	✓

Note: $MPE = 1.5 \text{ nm}$

Criteria: $\text{Correction} + \text{Uncertainty} > MPE$ Pass
 $\text{Correction} + \text{Uncertainty} < MPE$ Pass

Remarks: * We do not provide correction for this wavelength.

59-61-92

Calibrated by Kittipong
REV.02 02/24/21

FE-169

Certificate No.: CO-1912001/22

Page 3 of total 3 pages

Measurement Results (Cont.):

2. Photometric Accuracy

Visible Region

Wavelength (nm)	Standard Value (A)	UUC Reading (A)	Correction (A)	Uncertainty (± A)	Criteria
420	1.0572	1.052	0.0052	0.0030	✓
	0.7481	0.744	0.0041	0.0029	✓
	0.5529	0.549	0.0039	0.0030	✓
440	1.0353	1.029	0.0063	0.0030	✓
	0.7311	0.726	0.0051	0.0029	✓
	0.5432	0.538	0.0052	0.0029	✓
465	0.9650	0.964	0.0010	0.0030	✓
	0.6749	0.674	0.0009	0.0029	✓
	0.4937	0.492	0.0017	0.0029	✓
546.1	0.9959	0.995	0.0009	0.0030	✓
	0.6850	0.684	0.0010	0.0029	✓
	0.5082	0.507	0.0012	0.0029	✓
590	1.0356	1.034	0.0016	0.0029	✓
	0.7147	0.713	0.0017	0.0029	✓
	0.5369	0.535	0.0019	0.0029	✓
635	0.9878	0.988	-0.0002	0.0030	✓
	0.6826	0.681	0.0016	0.0030	✓
	0.5216	0.520	0.0016	0.0029	✓

UUC : Unit Under Calibration.

The above reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.

Note: $MPE = 0 - 0.5 \text{ Abs}$

Criteria: $\text{Correction} + \text{Uncertainty} > MPE$ Pass
 $\text{Correction} + \text{Uncertainty} < MPE$ Pass

Remarks: * We do not provide correction for this wavelength.

- End of Certificate -

59-61-92

Calibrated by Kittipong
REV.02 02/24/21

FE-169

CERTIFICATE CALIBRATION

CENTRAL LABORATORY (THAILAND) CO., LTD.
http://www.centralabthai.com



CERTIFICATE of CALIBRATION

Certificate No. 23-TMP-2128

Page 1 of 2

Equipment: Water Bath
Manufacturer: Memmert
Model: WTB24
Serial No: LD21.0340
ID No: SPJ-TE-050
Location: Fume Hood
Customer name: S.P.J. SCIENTIFIC COMPANY LIMITED

Customer Address: 80 Soi Nakkhilaemthong 3, Thab Chang, Saphansong, Bangkok 10250

Received no.: CAHO23/01261-006

Received Date: 20 Jun 23

Calibration Date: 20 Jun 23

Condition of calibration results:

1. This calibration method was calibrated by insert 5 standard PT100 or 5 standard TC type T into this Bath of equipment and test according to WI-TMP-001-CC.
2. This certificate is traceable to SI Unit through National Institute of Metrology (Thailand) NIMT.
3. This Temperature Scale is based on ITS-90
4. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of approximately 95% the uncertainty evaluation has been carried out in accordance with UKAS M3003 requirements.
5. This calibration certificate may not be reproduced other than in full except with the permission of CLT Calibration Laboratory.

Environment Condition:

Temperature: 28 °C to 29 °C
Humidity: 64 %RH to 66 %RH

Condition of Calibration: Good

Description: Calibration Result without Adjustment

Reference Standard: Standard ID: SRO-05-CC
Agilent Data Logger
Agilent Multiplexer Module
IPT Probe
Reference no.: 23-TMP-0992
23-TMP-0992
Due Date: 13 Mar 24
13 Mar 24
Traceability: CLT(23-TMP-0992)
CLT(23-TMP-0992)

This certificate is traceable to SI unit

Calibrated by: Sutin
Issued Date: 21 Jun 23

Approved by: Dachdamrong Songchom

FM-WI-TMP-001-004-CC-R05(23/09/04)P2

Central Laboratory (Thailand) Co., Ltd.

Calibration Service Center : No. 2179 Phaholyothin Road, Laddym, Bangkok 10900 Thailand
Tel : (662) 940 5993 Ext. 263, 262, 217, 214 Fax : (662) 579 4877 E-mail : clt.calibration@gmail.com

CERTIFICATE CALIBRATION



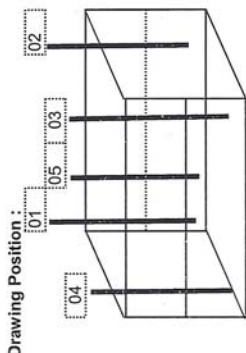
CENTRAL LABORATORY (THAILAND) CO., LTD.
http://www.centralabthai.com



REPORT of CALIBRATION

Certificate No. 23-TMP-2128

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Drawing Position:

Remark:
The quoted uncertainty include "Stability" and "Loading Effect" (20% of Uniformity)

Stability:
One-half of the greatest maximum difference of measured temperatures at any one sensor.

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.

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

Results of Calibration:

Calibration Point (°C)	01	02	03	04	05
65.0	65.22	64.92	64.96	65.20	65.15
85.0	85.11	84.77	84.67	85.10	84.91
65°C Error	0.22	-0.04	-0.04	0.20	0.15
Error Uniform	0.26	0.34	0.30	0.46	0.34
85°C Error	0.11	-0.23	-0.33	0.10	-0.09
Error Uniform	0.29	0.41	0.41	0.56	0.54
	✓	✓	✓	✓	✓

Setting *UUC (°C)	Reading *UUC Min (°C)	Reading *UUC Max (°C)	Uniformity (°C)	Stability (°C)	Over All Variation (°C)	Uncertainty (°C)
65.2	65.2	65.2	0.45	± 0.20	0.65	± 0.26
85.0	85.0	85.0	0.91	± 0.41	1.28	± 0.48

Verified by
mmw007
86/9/166

*UUC = Unit Under Calibration
Remark : This result of calibration was found accurate as shown on date and place of calibration only.

Approved by:

Dachdamrong Songchom

~ End of Report ~

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