

Mettler-Toledo (Thailand) Ltd.

846/4 - 846/5 Lasalle Rd., Bangna Tai Sub-District

Bangna District, Bangkok 10260

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MT-TH.ServiceSupport@mt.com



NSC-TISI-TIS 17025  
CALIBRATION 0062

## Accuracy Calibration Certificate

### Customer

**Company:** WATER INDEX & CONSULTANT CO., LTD.  
**Address:** 229/7-8 Soi Charansanitwong 95/1, Charansanitwong Rd., Bang-aor  
**City:** Bangphlat **Contact:** Nungruthai Sairat  
**Zip / Postal:** 10700  
**State / Province:** Bangkok  
**Order Number:**   
\* 0 3 3 2 5 4 7 8 0 4 \*

### Weighing Device

**Manufacturer:** Mettler Toledo **Instrument Type:** Weighing Instrument  
**Model:** MS204TS/00 **Asset Number:** 300EI7  
**Serial No.:** B724237367 **Terminal Model:** N/A  
**Building:** Office **Terminal Serial No.:** N/A  
**Floor:** 2 **Terminal Asset No.:** N/A  
**Room:** Laboratory

Range	Max. Capacity	Readability (d)
1	220 g	0.0001 g

### Procedure

**Calibration Guideline:** EURAMET cg-18 v. 4.0 (11/2015)  
**METTLER TOLEDO Work Instruction:** CP/W002/20

This calibration certificate contains measurements for As Found calibration. No As Left calibration was performed because the device was not modified after As Found calibration. Therefore, results for As Left correspond to As Found.

The sensitivity/span of the weighing instrument was adjusted before calibration with a built-in weight.

In accordance with EURAMET cg-18 (11/2015), the test loads were selected to reflect the specific use of the weighing device or to accommodate specific calibration conditions.

	Temperature		Humidity	
As Found	Start: 25.5 °C	End: 25.2 °C	Start: 43.8 %	End: 43.0 %

**As Found Calibration Date:** 12-Oct-2022  
**As Left Calibration Date:** N/A  
**Issue Date:** 13-Oct-2022

**Calibrator:**   
Suwicha Choykamchu

**Approved Signatory:**   
Technical Manager / Head of Calibration Center

## Measurement Results

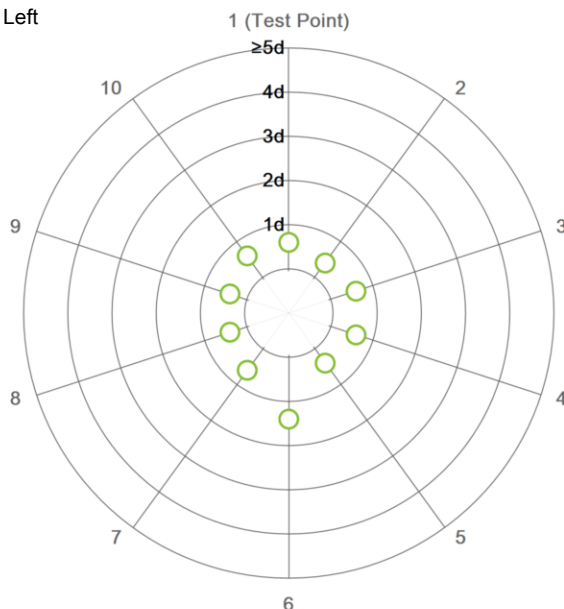
### Repeatability

Test Load: 100 g

	As Found	As Left
1	100.0001 g	N/A
2	100.0000 g	N/A
3	100.0001 g	N/A
4	100.0001 g	N/A
5	100.0000 g	N/A
6	99.9999 g	N/A
7	100.0001 g	N/A
8	100.0000 g	N/A
9	100.0000 g	N/A
10	100.0001 g	N/A

Standard Deviation	0.00007 g	N/A
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○ As Found  
◆ As Left



The "d" in the graph represents the readability of the range/interval in which the test was performed.

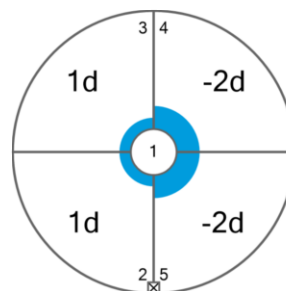
The results of this graph are based upon the absolute values of the differences from the mean value.

### Eccentricity

Test Load: 100 g

Position	As Found	As Left
1	100.0001 g	N/A
2	100.0002 g	N/A
3	100.0002 g	N/A
4	99.9999 g	N/A
5	99.9999 g	N/A

Maximum Deviation	0.0002 g	N/A
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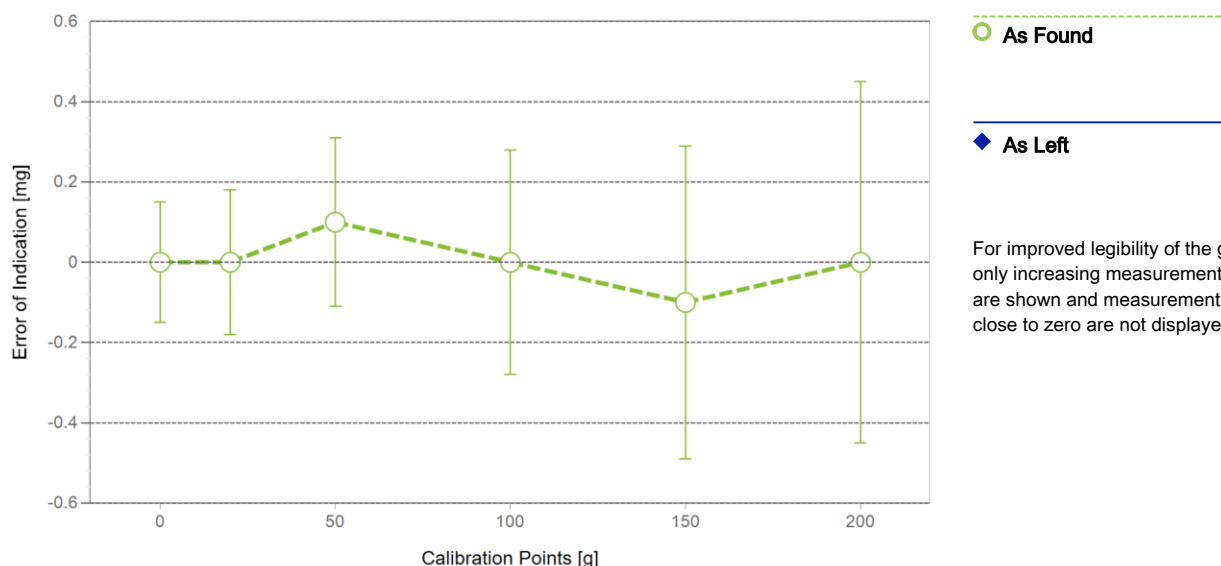
As Found

The "d" in the graph represents the readability of the range/interval in which the test was performed.

## Error of Indication

### As Found

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.0000 g	0.0000 g	0.0000 g	0.15 mg	2
2	0.0500 g	0.0500 g	0.0000 g	0.16 mg	2
3	0.1000 g	0.1000 g	0.0000 g	0.16 mg	2
4	0.5000 g	0.5000 g	0.0000 g	0.16 mg	2
5	1.0000 g	1.0000 g	0.0000 g	0.16 mg	2
6	10.0000 g	10.0001 g	0.0001 g	0.17 mg	2
7	20.0000 g	20.0000 g	0.0000 g	0.18 mg	2
8	50.0000 g	50.0001 g	0.0001 g	0.21 mg	2
9	100.0000 g	100.0000 g	0.0000 g	0.28 mg	2
10	150.0000 g	149.9999 g	-0.0001 g	0.39 mg	2
11	199.9999 g	199.9999 g	0.0000 g	0.45 mg	2



The uncertainty stated is the expanded uncertainty at calibration obtained by multiplying the standard combined uncertainty by the coverage factor  $k$  – which can be larger than 2 according to EURAMET cg-18. The value of the measurand lies within the assigned range of values with a probability of approximately 95%.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated.

## Test Equipment

All weights used for metrological testing are traceable to national or international standards. The weights were calibrated and certified by an accredited calibration laboratory.

### Weight Set 1: OIML E2

Weight Set No.:	WS03	Date of Issue:	21-Sep-2021
Certificate Number:	175498	Calibration Due Date:	14-Mar-2023

### Weight Set 2: OIML E2

Weight Set No.:	WS70	Date of Issue:	21-Oct-2021
Certificate Number:	C142784702	Calibration Due Date:	19-Mar-2023

### Thermo Hygrometer

Equipment No.:	IN285	Date of Issue:	23-May-2022
Certificate Number:	22H1059	Calibration Due Date:	15-May-2023

## Remarks

FACT adjustment functionality activated

Equipment condition: Good

Next calibration according to customer's procedure

Calibration data not decide by calibration laboratory

### End of Accredited Section

The information below and any attachments to this calibration certificate are not part of the accredited calibration.



## Measurement Uncertainty of the Weighing Instrument in Use

Stated is the expanded uncertainty with  $k=2$  in use. The formula shall be used for the estimation of the uncertainty under consideration of the errors of indication. The value  $R$  represents the net load indication in the unit of measure of the device.

Temperature coefficient for the evaluation of the measurement uncertainty in use:  $1.5 \cdot 10^{-6} / K$

Temperature range on site for the evaluation of the measurement uncertainty in use: 3 K

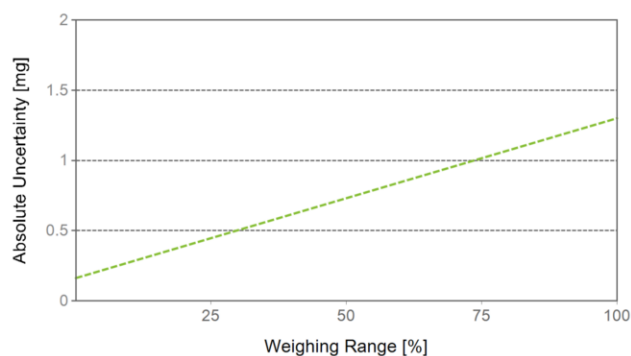
### Linearization of Uncertainty Equation

Range			As Found	As Left
	d	Max		
1	0.0001 g	220 g	$U_1 = 0.16 \text{ mg} + 0.00518 \text{ mg/g} \cdot R$	N/A

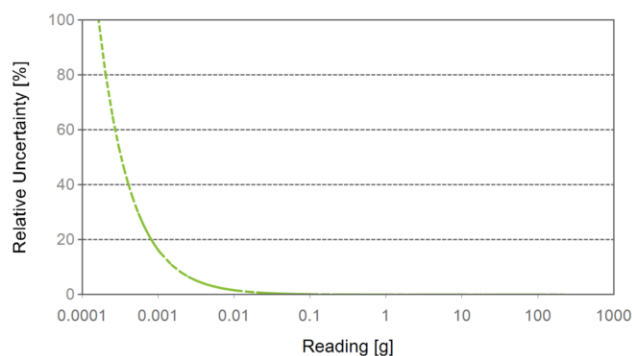
To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

### Absolute and Relative Measurement Uncertainty in Use for Various Net Indications (Examples)

Net Indication	As Found		As Left	
0.0220 g	0.16 mg	0.73%	N/A	N/A
0.2200 g	0.16 mg	0.073%	N/A	N/A
2.2000 g	0.17 mg	0.0078%	N/A	N/A
22.0000 g	0.27 mg	0.0012%	N/A	N/A
220.0000 g	1.3 mg	0.00059%	N/A	N/A



As Found



As Left

# GWP® Certificate



As  
Found



As  
Left



The weighing device does not meet the given process requirements.

The weighing device does not meet the given process requirements.

Tests Performed:



As Found



As Left



No adjustments/modifications made. As Left results correspond to As Found.

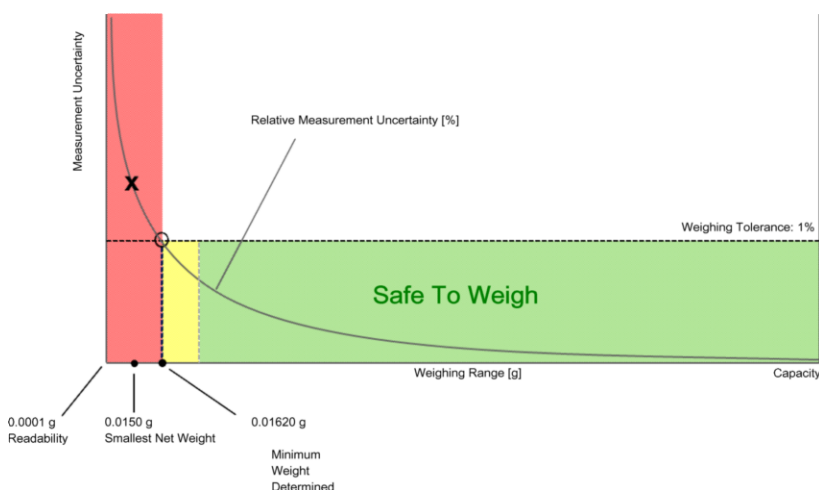
## Process Requirements

Weighing Tolerance: 1%

Smallest Net Weight: 0.0150 g

Safety Factor: 2

### Safe Weighing Range



While the values in this graph reflect the actual calibration results, the measurement uncertainty curves are simply a visual representation. This graph reflects As Left testing, unless only As Found was performed.

# Minimum Weight

## As Found Minimum Weight Table

Minimum weights for different weighing tolerances and safety factors					
	Safety Factor				
Tolerance	1	2	3	5	10
0.1%	0.16278 g	0.32725 g	0.49346 g	0.83118 g	1.70775 g
0.2%	0.08118 g	0.16278 g	0.24480 g	0.41014 g	0.83118 g
0.5%	0.03242 g	0.06491 g	0.09746 g	0.16278 g	0.32725 g
1%	0.01620 g	0.03242 g	0.04866 g	0.08118 g	0.16278 g
2%	0.00810 g	0.01620 g	0.02431 g	0.04054 g	0.08118 g
5%	0.00324 g	0.00648 g	0.00972 g	0.01620 g	0.03242 g



Fail: The determined minimum weight does not meet the requirement for the smallest net weight.

## As Left Minimum Weight Table

Minimum weights for different weighing tolerances and safety factors					
	Safety Factor				
Tolerance	1	2	3	5	10
0.1%	0.16278 g	0.32725 g	0.49346 g	0.83118 g	1.70775 g
0.2%	0.08118 g	0.16278 g	0.24480 g	0.41014 g	0.83118 g
0.5%	0.03242 g	0.06491 g	0.09746 g	0.16278 g	0.32725 g
1%	0.01620 g	0.03242 g	0.04866 g	0.08118 g	0.16278 g
2%	0.00810 g	0.01620 g	0.02431 g	0.04054 g	0.08118 g
5%	0.00324 g	0.00648 g	0.00972 g	0.01620 g	0.03242 g



Fail: The determined minimum weight does not meet the requirement for the smallest net weight.

At these net minimum weight values, the measurement uncertainty of the weighing device is equal to or less than 1/1 (no safety factor), 1/2, 1/3, 1/5, or 1/10 of the required tolerance. The values are calculated with  $k = 2$  and based on the linear formula of the measurement uncertainty of the weighing device in use.

The safety factor for As Found is always 1. This implies no safety factor. As Found testing looks at the behavior of the instrument from the past until test occurred. For the past, it is necessary to know that the tolerance was met, but not the safety factor. The safety factor is a proactive measure to apply for future measurements.

### Notes on minimum weight values in above table:

1. If "N/A" is shown above, no appropriate value could be calculated.
2. METTLER TOLEDO is not responsible for the definition of the process requirements.

# Measurement Results

## Results Summary

	Repeatability	Eccentricity	Error of Indication
As Found	✓	✓	✓
As Left	⚠	✓	✓

✓ = Passed

✗ = Failed

⚠ = Safety Factor not met

## Repeatability

Test Load: 100 g

Tolerance	Control Limit	As Found		As Left	
		Std. Deviation	Result	Std. Deviation	Result
0.1%	N/A	0.00007 g*	N/A	0.00007 g*	N/A
0.2%	N/A		N/A		N/A
0.5%	N/A		N/A		N/A
1%	0.00008 g		✓		⚠
2%	0.00015 g		✓		✓
5%	0.00038 g		✓		✓

\*The calculated standard deviation value is below the rounding error of the balance. The  $0.41 \cdot d$  rule is used for the assessment of this repeatability test and the calculation of the minimum weight.

The weighing tolerance is met if the standard deviation is less than or equal to the corresponding control limit.

## Eccentricity

Test Load: 100 g

Tolerance	Control Limit	As Found		As Left	
		Deviation	Result	Deviation	Result
0.1%	0.0500 g	0.0002 g	✓	0.0002 g	✓
0.2%	0.1000 g		✓		✓
0.5%	0.2500 g		✓		✓
1%	0.5000 g		✓		✓
2%	1.0000 g		✓		✓
5%	2.5000 g		✓		✓

The weighing tolerance is met if the deviation is less than or equal to the corresponding control limit.

**Error of Indication****As Found**

		Control limits for various weighing tolerances					
Reference Value	Error	0.1%	0.2%	0.5%	1%	2%	5%
0.0000 g	0.0000 g	N/A	N/A	N/A	N/A	N/A	N/A
20.0000 g	0.0000 g	0.0100 g	0.0200 g	0.0500 g	0.1000 g	0.2000 g	0.5000 g
50.0000 g	0.0001 g	0.0250 g	0.0500 g	0.1250 g	0.2500 g	0.5000 g	1.2500 g
100.0000 g	0.0000 g	0.0500 g	0.1000 g	0.2500 g	0.5000 g	1.0000 g	2.5000 g
150.0000 g	-0.0001 g	0.0750 g	0.1500 g	0.3750 g	0.7500 g	1.5000 g	3.7500 g
199.9999 g	0.0000 g	0.1000 g	0.2000 g	0.5000 g	1.0000 g	2.0000 g	5.0000 g
Result		✓	✓	✓	✓	✓	✓

**As Left**

		Control limits for various weighing tolerances					
Reference Value	Error	0.1%	0.2%	0.5%	1%	2%	5%
0.0000 g	0.0000 g	N/A	N/A	N/A	N/A	N/A	N/A
20.0000 g	0.0000 g	0.0100 g	0.0200 g	0.0500 g	0.1000 g	0.2000 g	0.5000 g
50.0000 g	0.0001 g	0.0250 g	0.0500 g	0.1250 g	0.2500 g	0.5000 g	1.2500 g
100.0000 g	0.0000 g	0.0500 g	0.1000 g	0.2500 g	0.5000 g	1.0000 g	2.5000 g
150.0000 g	-0.0001 g	0.0750 g	0.1500 g	0.3750 g	0.7500 g	1.5000 g	3.7500 g
199.9999 g	0.0000 g	0.1000 g	0.2000 g	0.5000 g	1.0000 g	2.0000 g	5.0000 g
Result		✓	✓	✓	✓	✓	✓

The weighing tolerance is met if the error (of indication) for each test point is less than or equal to the corresponding control limit for that particular weighing tolerance. Results at or close to the zero point cannot be assessed.



NSC-TISI-TIS 17025  
CALIBRATION 0062

## METTLER TOLEDO

Mettler Toledo (Thailand) Limited

846/4-846/5 Lasalle Road, Bang Na Tai Sub-District, Bangna District,

BANGKOK 10260

Tel : 0 2723 0300

Fax : 0 2719 6479

http://www.mt.com

### CERTIFICATE OF CALIBRATION

Certificate Number:



\* C C P H - 0 0 9 1 - 2 2 - C \*

#### Customer

Company: WATER INDEX & CONSULTANT CO., LTD.

Address: 229/7-8 Soi Charansanitwong 95/1, Charansanitwong Rd.,

City: Bang-aor, Bangphlat

Province/Postal: BANGKOK 10700

Customer ID: 301612380

Order No.:



\* 0 3 7 0 2 1 4 4 3 8 \*

#### Device

Equipment: pH Meter

Model: SD20

Firmware Version: 1.0.1.111010

Resolution: 0.1 mV ; 0.001 pH

pH Electrode Model: InLab Expert Pro-ISM

Range: ---

pH Electrode Serial No.: 2256471

Manufacturer: METTLER TOLEDO

Serial No.:



\* C 2 3 8 8 3 1 4 3 1 \*

ID No.:

(Provide by customer)

#### Laboratory Test Conditions

Ambient Temperature: ( 25 ± 2 ) ° C

Relative Humidity: ( 55 ± 15 ) %

Water Temperature: ( 25 ± 0.1 ) ° C

Location: Chemical Laboratory room

Calibration procedure: In-house method : CP/C001/20 based on direct measurement by using standard voltage calibrator  
and certified reference material (CRM)

Comment: pH Meter is in good condition.

Initial Calibration

Without adjustment the mV

Date of Receipt: 20-Oct-22

Date of Calibration: 20-Oct-22

Issue Date: 20-Oct-22

\*Next Date:  
(Provide by customer)

Calibrated By: Sookjai Sriwsait

Approved by:

Approved Signatory

☒ Surachet Sukkate

☐ Sookjai Sriwsait

The contents of this certificate may be published or reproduced or passed to a third party only full except with the prior written approval  
of the calibration center, Mettler-toledo (Thailand) Ltd.



NSC-TISI-TIS 17025  
CALIBRATION 0062

## METTLER TOLEDO Service

Mettler Toledo (Thailand) Limited

846/4-846/5 Lasalle Road, Bang Na Tai Sub-District, Bangna District,  
BANGKOK 10260

Tel: 0 2723 0300

Fax: 0 2719 6479

http://www.mt.com

### Laboratory Test Equipments

Certificate Number: CCPH-0091-22-C

<u>Instrument</u>		<u>Model</u>	<u>Control No.</u>	<u>Certificate No.</u>	<u>Due date</u>
Voltage Calibrator		2000MN	ANA91	E1U221411	02-Apr-23
Liquid in Glass Thermometer		ASTM 90C-86	ANA131	221487	17-Apr-23

<u>Material</u>		<u>Lot No.</u>	<u>Control No.</u>	<u>Certificate No.</u>	<u>Expire date</u>
Buffer Solution	4.008	801281	-	PH016.L5	10-Mar-23
Buffer Solution	6.865	835339	-	PH217.L5	19-Aug-24
Buffer Solution	10.008	801285	-	PH220.L5	15-Mar-23

**Traceability:** The measurement is traceable to national standards, which realize the physical unit of measurement (SI).

- National Institute of Metrology (NIMT), Thailand through NA Caltechologies Co., Ltd. (Calibration No. 0289)

- Physikalisch-technische Bundesanstalt (PTB) through Technology Promotion Association (Thailand - Japan) (Calibration No. 0008)

- CPA chem (through primary measurement method: Harned cell using calibrated thermometer, barometer, and nanovoltmeter. Accredited laboratory ISO/IEC 17025 and ISO/IEC 17034)

### Measuring Results

#### 1. DC Voltage measurement

pH Meter Serial No: C238831431

Nominal Value	Standard Voltage Input	Average Measured Value			Uncertainty	Coverage factor
pH	mV	mV	Error (mV)	pH	mV	k
0.00	414.12	414.1	0.0	0.00	0.065	2.00
4.00	177.48	177.5	0.0	4.00	0.065	2.00
7.00	0.00	0.0	0.0	7.00	0.065	2.00
10.00	-177.48	-177.5	0.0	10.00	0.065	2.00
14.00	-414.12	-414.1	0.0	14.00	0.065	2.00

Note: -Test pH/mV sensor input at high impedance is Passed

#### 2. pH electrode measurement

pH electrode Serial No: 2256471

☒ Segment

Offset 1 (mV) 8.9

Offset 2 (mV) 9.0

Slope 1(%) 98.9

Slope 2(%) 97.2

Standard Buffer Solution pH (25 °C)	Average Measured Value		Uncertainty	Coverage factor
	pH	Error (pH)	pH	k
4.008	3.989	-0.019	0.016	2.00
6.865	6.874	0.009	0.016	2.00
10.008	10.007	-0.001	0.11	2.00

**Conformity Statement:** The tolerance limit of the pH meter and electrode are provide by manufacturer.

This certificate document with out decision from calibration laboratory.

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor k= 2, providing a level of confidence of approximately 95%.

The calibration result apply only the above calibrated item and was found accurate as shown on date and place of calibration only.

END OF REPORT





CRYSTAL CALIBRATION SALES AND SERVICE CO., LTD.

45/48 Soi Salathammasop31, Salathammasop Rd.,  
Salathammasop, Thawewatthana, Bangkok 10170 Thailand

Tel : 0-2408-8474-5 Fax : 0-2408-8477 Email : info@crystalcal.com www.crystalcal.com



## CERTIFICATE OF CALIBRATION

Certificate No. : 22-1582-002

Issue Date : 8 December 2022

Work Order No. : 22/1582

Customer Name : Water Index & Consultant Co., Ltd.  
229/8 Soi Charan Sanit Wong 95/1 Charan Sanit Wong Rd.,  
Bang-Aor, Bangphlat, Bangkok 10700

Date of Received : 29 November 2022

Date of Calibration : 29 November 2022

Instrument Details : Description : Temperature Controlled Enclosures [Refrigerator]  
Manufacturer : S-Cool  
Model : SSM163T  
Serial No. : 144201410  
ID No. : N/A  
Resolution : 0.1 °C  
Location : Laboratory

Calibration Method : This instrument was calibrated by insert standard thermometer into the chamber according to calibration procedure no. CWI-T-10 follow up to TLAS G-20-1/02-08 (E) : Guidelines for Calibration and Checks of Temperature Controlled Enclosures.

Environmental Conditions :

Temperature : Area Monitoring between 15°C to 40°C


Humidity : Area Monitoring between 30%RH to 85%RH

Line Voltage : Area Monitoring 220 VAC  $\pm$  10%

Traceability of Measurement :

This certificate of calibration documents the traceability to national standard, which realize the unit of measurement according to the International system of Units (SI) and The temperature scale in use at this laboratory is The International Temperature scale of 1990.

Calibrated by : Mr.Sirisak Hankongkaew  
Calibration Engineer

Approved by :   
( Mr. Anuwat Yaklermjit )  
Laboratory Manager

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CRYSTAL CALIBRATION SALES AND SERVICE CO., LTD.

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## CERTIFICATE OF CALIBRATION

Issue Date : 8 December 2022

Certificate No. : 22-1582-002

Work Order No. : 22/1582

### Details of Calibration

#### 1. Reference Standards Instrument

Instrument	Model	Serial No./Ins No.	Certificate No.	Due Date
Data Acquisition unit	34972A	MY57006241	22-1146-008	02 September 2023
Sensor type	RTD	RTD# 201-209	22-1146-008	02 September 2023

#### 2. Certificate traceble

: This certificate traceable to The International System of Unit refer to  
Crystal Calibration Sales and Service Co., Ltd. , NAC Calibration No. 0260

#### 3. Condition of item

: Used

#### 4. Calibration site

: On - Site

#### 5. Result of Calibration

: Without adjustment

#### 6. Evaluate Condition

: **Time Constant** : - Hour 33 Minute At cal. point 3 °C  
**Air vent** : Off  
**Fan speed status** : Fixed Fan Speed

#### 7. Calibration note

: The results reported in this certificate refer to the condition of instrument on  
the process into the steady state of chamber

#### 8. Sensors Installation Diagram

: When ; Sensor installation location in Chamber @ Working Space  
A = Distance between sensor and wall of chamber is 10 cm

#### 9. Dimensions of chamber

: W = 1.1 m ; D = 0.4 m ; H = 1.2 m

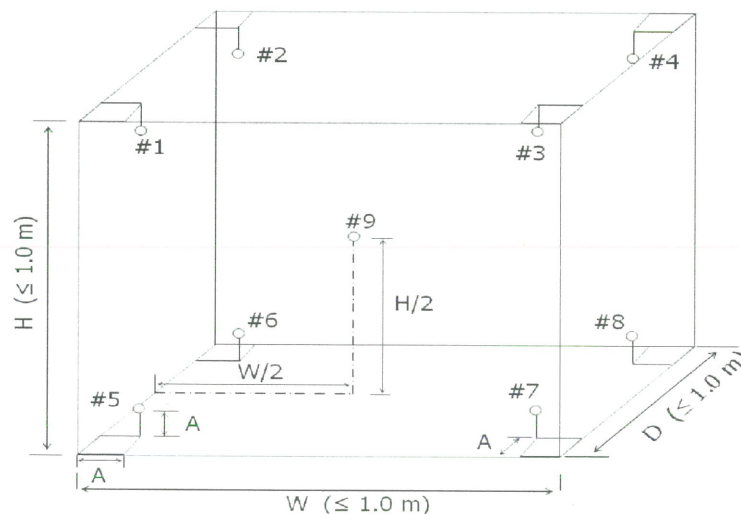


Diagram of Chamber



## CERTIFICATE OF CALIBRATION

Issue Date : 8 December 2022

Certificate No. : 22-1582-002

Work Order No. : 22/1582

### Result of Temperature Distribution and Performance Check

Table1 : Reporting of Temperature Distribution

Calibration point (°C)	Average Measured Temperature (°C) @ Sensor No. (Sensor No.9 is REF)									Uncertainty ± (°C)
	#1	#2	#3	#4	#5	#6	#7	#8	#9	
3.0	3.38	3.40	3.56	3.84	3.34	3.52	2.86	3.03	2.89	0.66

Table 2 : Reporting of Performance check

Indicator Set Point (°C)	Indicator Reading (°C)			Stability ± (°C)	Uniformity (°C)	Overall variation (°C)
	MAX	MIN	Average			
3.0	3.0	3.0	3.0	0.47	1.27	1.37

### Note

Customer would like to find internal temperature in chamber and this report customer request and accepted in certificate

The reference sensor is preferably located of the geometric center of chamber

The measured temperature data readout by software "Benchlink Datalogger 3"

The quoted uncertainty include " Stability " and " Loading effect (20% of Temp 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 or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady state conditions.

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

Indicating Temperature - the average reading of indicating device that forms the integral part of the enclosure.

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

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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## CERTIFICATE OF CALIBRATION

Issue Date : 8 December 2022  
Certificate No. : 22-1582-003  
Work Order No. : 22/1582

Customer Name : Water Index & Consultant Co., Ltd.  
229/8 Soi Charan Sanit Wong 95/1 Charan Sanit Wong Rd.,  
Bang-Aor, Bangphlat, Bangkok 10700

Date of Received : 29 November 2022

Date of Calibration : 29 November 2022

Instrument Details : Description : Temperature Controlled Enclosures [Refrigerator]  
Manufacturer : Accuplus  
Model : i250  
Serial No. : 1250402-0110-0303  
ID No. : N/A  
Resolution : 0.1 °C  
Location : Laboratory

Calibration Method : This instrument was calibrated by insert standard thermometer into the chamber according to calibration procedure no. CWI-T-10 follow up to TLAS G-20-1/02-08 (E) : Guidelines for Calibration and Checks of Temperature Controlled Enclosures.


Environmental Conditions :

Temperature : Area Monitoring between 15°C to 40°C  
Humidity : Area Monitoring between 30%RH to 85%RH  
Line Voltage : Area Monitoring 220 VAC  $\pm$  10%

Traceability of Measurement :

This certificate of calibration documents the traceability to national standard, which realize the unit of measurement according to the International system of Units (SI) and The temperature scale in use at this laboratory is The International Temperature scale of 1990.

Calibrated by : Mr.Sirisak Hankongkaew  
Calibration Engineer

Approved by :   
( Mr. Anuwat Yaklermjit )  
Laboratory Manager

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# CRYSTAL CALIBRATION SALES AND SERVICE CO., LTD.

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Tel : 0-2408-8474-5 Fax : 0-2408-8477 Email : info@crystalcal.com www.crystalcal.com



## CERTIFICATE OF CALIBRATION

Issue Date : 8 December 2022

Certificate No. : 22-1582-003

Work Order No. : 22/1582

### Details of Calibration

#### 1. Reference Standards Instrument

Instrument	Model	Serial No./Ins No.	Certificate No.	Due Date
Data Acquisition unit	34972A	MY57006241	22-1146-008	02 September 2023
Sensor type	RTD	RTD# 101-109	22-1146-008	02 September 2023

#### 2. Certificate traceble

: This certificate traceable to The International System of Unit refer to  
Crystal Calibration Sales and Service Co., Ltd. , NAC Calibration No. 0260

#### 3. Condition of item

: Used

#### 4. Calibration site

: On - Site

#### 5. Result of Calibration

: Without adjustment

#### 6. Evaluate Condition

: **Time Constant** : - Hour 33 Minute At cal. point 20 °C  
**Air vent** : Off  
**Fan speed status** : Fixed Fan Speed

#### 7. Calibration note

: The results reported in this certificate refer to the condition of instrument on  
the process into the steady state of chamber

#### 8. Sensors Installation Diagram

: When ; Sensor installation location in Chamber @ Working Space  
A = Distance between sensor and wall of chamber is 10 cm

#### 9. Dimensions of chamber

: W = 0.5 m ; D = 0.5 m ; H = 0.9 m

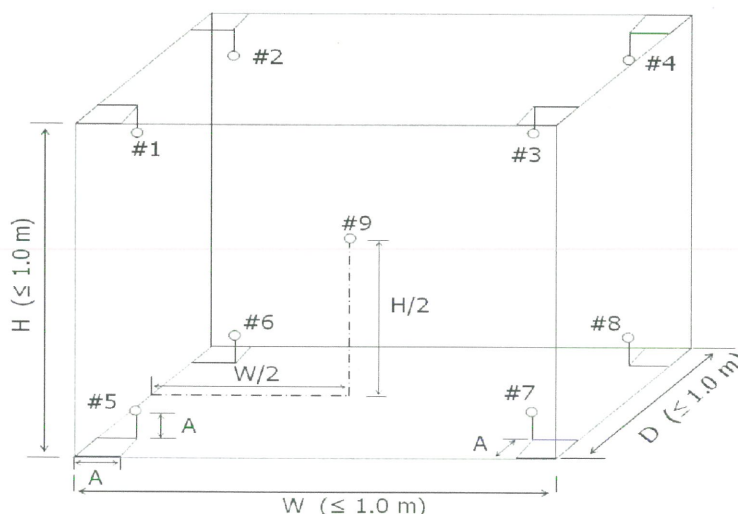


Diagram of Chamber



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## CERTIFICATE OF CALIBRATION

Issue Date : 8 December 2022

Certificate No. : 22-1582-003

Work Order No. : 22/1582

### Result of Temperature Distribution and Performance Check

Table1 : Reporting of Temperature Distribution

Calibration point (°C)	Average Measured Temperature (°C) @ Sensor No. (Sensor No.9 is REF)									Uncertainty ± (°C)
	#1	#2	#3	#4	#5	#6	#7	#8	#9	
20.0	20.37	19.93	19.91	19.80	19.99	19.59	19.75	19.88	19.70	0.40

Table 2 : Reporting of Performance check

Indicator Set Point (°C)	Indicator Reading (°C)			Stability ± (°C)	Uniformity (°C)	Overall variation (°C)
	MAX	MIN	Average			
20.0	20.0	20.0	20.0	0.25	0.85	0.95

### Note

Customer would like to find internal temperature in chamber and this report customer request and accepted in certificate

The reference sensor is preferably located of the geometric center of chamber

The measured temperature data readout by software "Benchlink Datalogger 3"

The quoted uncertainty include " Stability " and " Loading effect (20% of Temp 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 or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady state conditions.

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

Indicating Temperature - the average reading of indicating device that forms the integral part of the enclosure.

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

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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## CERTIFICATE OF CALIBRATION

Certificate No. : 22-1582-004

Issue Date : 8 December 2022

Work Order No. : 22/1582

Customer Name : Water Index & Consultant Co., Ltd.  
229/8 Soi Charan Sanit Wong 95/1 Charan Sanit Wong Rd.,  
Bang-Aor, Bangphlat, Bangkok 10700

Date of Received : 29 November 2022

Date of Calibration : 29 November 2022

Instrument Details : Description : Temperature Controlled Enclosures [Hot Air Oven]  
Manufacturer : Memmert  
Model : SM400  
Serial No. : B4921010  
ID No. : ID146E94  
Resolution : 0.1 °C  
Location : Laboratory

Calibration Method : This instrument was calibrated by insert standard thermometer into the chamber according to calibration procedure no. CWI-T-10 follow up to TLAS G-20-1/02-08 (E) : Guidelines for Calibration and Checks of Temperature Controlled Enclosures.

Environmental Conditions :

Temperature : Area Monitoring between 15°C to 40°C


Humidity : Area Monitoring between 30%RH to 85%RH

Line Voltage : Area Monitoring 220 VAC  $\pm$  10%

Traceability of Measurement :

This certificate of calibration documents the traceability to national standard, which realize the unit of measurement according to the International system of Units (SI) and The temperature scale in use at this laboratory is The International Temperature scale of 1990.

Calibrated by : Mr.Sirisak Hankongkaew  
Calibration Engineer

Approved by :   
( Mr. Anuwat Yaklermjit )  
Laboratory Manager

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# CERTIFICATE OF CALIBRATION

Issue Date : 8 December 2022

Certificate No. : 22-1582-004

Work Order No. : 22/1582

## Details of Calibration

### 1. Reference Standards Instrument

Instrument	Model	Serial No./Ins No.	Certificate No.	Due Date
Data Acquisition unit	34972A	MY57006241	22-1146-008	02 September 2023
Sensor type	RTD	RTD# 301-309	22-1146-008	02 September 2023
Data Acquisition unit	34972A	MY57001206	22-829-005	26 June 2023
Sensor type	TC Type T	TC# 301-309	22-829-005	26 June 2023

2. Certificate traceable : This certificate traceable to The International System of Unit refer to  
Crystal Calibration Sales and Service Co., Ltd. , NAC Calibration No. 0260

3. Condition of item : Used

4. Calibration site : On - Site

5. Result of Calibration : Without adjustment

6. Evaluate Condition : Time Constant : - Hour 33 Minute At cal. point 104 °C  
Air vent : Off  
Fan speed status : Fixed Fan Speed

7. Calibration note : The results reported in this certificate refer to the condition of instrument on  
the process into the steady state of chamber

8. Sensors Installation Diagram : When ; Sensor installation location in Chamber @ Working Space  
A = Distance between sensor and wall of chamber is 10 cm

9. Dimensions of chamber : W = 0.4 m ; D = 0.36 m ; H = 0.4 m

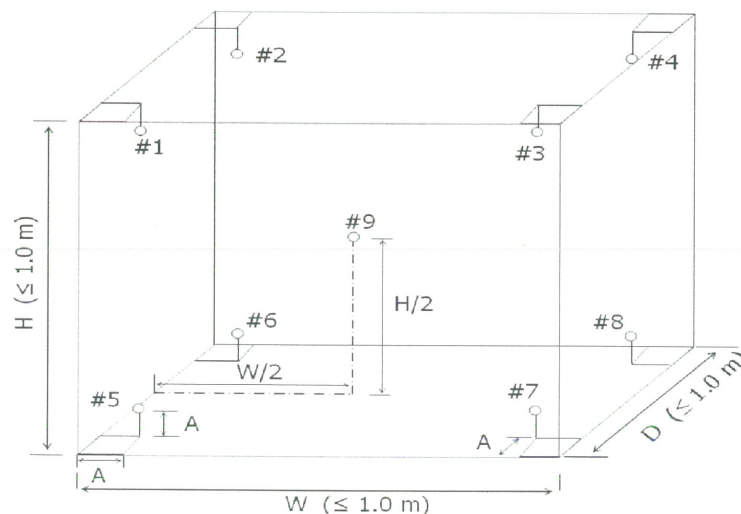


Diagram of Chamber



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## CERTIFICATE OF CALIBRATION

Issue Date : 8 December 2022

Certificate No. : 22-1582-004

Work Order No. : 22/1582

### Result of Temperature Distribution and Performance Check

Table1 : Reporting of Temperature Distribution

Calibration point (°C)	Average Measured Temperature (°C) @ Sensor No. (Sensor No.9 is REF)									Uncertainty ± (°C)
	#1	#2	#3	#4	#5	#6	#7	#8	#9	
104.0	104.19	104.53	104.42	104.53	104.41	104.61	104.18	104.45	104.38	0.33
110.0	110.23	110.57	110.49	110.58	110.45	110.69	110.20	110.49	110.38	0.33
120.0	120.40	120.52	120.39	120.58	120.24	120.67	120.07	120.42	120.58	0.65
150.0	150.67	150.08	150.08	150.26	150.26	149.99	150.14	149.62	149.87	1.1
180.0	181.39	181.00	181.19	180.94	180.91	180.84	180.84	180.47	180.35	1.2

Table 2 : Reporting of Performance check

Indicator Set Point (°C)	Indicator Reading (°C)			Stability ± (°C)	Uniformity (°C)	Overall variation (°C)
	MAX	MIN	Average			
104.0	104.0	104.0	104.0	0.20	0.53	0.80
110.0	110.0	110.0	110	0.19	0.55	0.82
120.0	120.0	120.0	120.0	0.22	0.68	0.83
150.0	150.0	150.0	150.0	0.25	0.98	1.22
180.0	180.0	180.0	180.0	0.45	1.54	1.56

### Note

Customer would like to find internal temperature in chamber and this report customer request and accepted in certificate

The reference sensor is preferably located of the geometric center of chamber

The measured temperature data readout by software "Benchlink Datalogger 3"

The quoted uncertainty include " Stability " and " Loading effect (20% of Temp 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 or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady state conditions.

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

Indicating Temperature - the average reading of indicating device that forms the integral part of the enclosure.

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

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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## CERTIFICATE OF CALIBRATION

Certificate No. : 22-1582-005

Issue Date : 8 December 2022

Work Order No. : 22/1582

Customer Name : Water Index & Consultant Co., Ltd  
229/7-8 Soi Charan Sanit Wong 95/1, Charan Sanit Wong Rd.,  
Bang-aor, Bangphlat, Bangkok 10700

Date of Received : 25 November 2022

Date of Calibration : 29 November 2022

Instrument Details : Description : Digital Thermo hygrometer  
Manufacturer : Digicon  
Model : Th-02A  
Serial No. : 1718B0744383  
ID No. : N/A  
Location : Humidity and Temperature Laboratory

Calibration Method : This instrument was calibrated by comparison of indication with Standard Chilled Mirror Hygrometer and Standard Thermometer into Temperature and Humidity Chamber controller according to calibration procedure no. CWI-H-01

### Environmental Condition

Temperature : Laboratory Control at  $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$

Humidity : Laboratory Control at  $55\%RH \pm 20\%RH$

### Traceability of Measurement

: This certificate of calibration documents the traceability to national standard, which realize the unit of measurement according to the International system of Units (SI) and The temperature scale in use at this laboratory is The International Temperature scale of 1990.

Calibrated by : Mr. Sirisak Hankongkaew  
Calibration Engineer

Approved by :

  
( Mr. Anuwat Yaklermjit )  
Laboratory Manager

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## CERTIFICATE OF CALIBRATION

Certificate No. : 22-1582-005

Issue Date : 8 December 2022

Work Order No. : 22/1582

### Details of Calibration

#### 1. Reference Standards Instrument

Instrument	Serial No.	Certification	Due Date
1.1 Chilled Mirror Hygrometer	157966 / 157152	TH-0078-22	02 August 2023
1.2 Digital Thermometer with RTD	15000016 / RTD-11	22-1388-012	20 October 2023

2. Certificate traceable : This certificate traceable to The International System of Unit refer to  
No. 1.1 National Institute of Metrology (Thailand), NAC Calibration No. 0144  
No. 1.2 Crystal Calibration Sales and Service Co., Ltd. , NAC Calibration No. 0260

3. Condition of item : Used

4. Calibration location : Permanent

### Result of Calibration

1. Temperature Measuremen : Without Adjustment

Resolution of UUC : 0.1 °C

Calibration Point (°C )	Average Standard Reading (°C )	UUC Reading (°C)	Correction (°C )	Uncertainty ± (°C )
20	20.08	19.8	+ 0.28	0.40
25	25.04	24.7	+ 0.34	0.40
30	29.95	29.7	+ 0.25	0.40

2. Humidity Measurement : Without Adjustment

Resolution of UUC : 1 %RH

Calibration Point ( %RH )	Calculated Standard Reading ( %RH )	UUC Reading ( %RH )	Correction ( %RH )	Uncertainty ± ( %RH )
40	40.34	39	+ 1.34	1.5
50	50.21	49	+ 1.21	1.5
60	60.48	59	+ 1.48	1.8

Note : 1. Process calibration humidity measurement Reference temperature control at 25°C

2. Calculated STD humidity refer to dew-point temperature and convert to humidity by magnus's Equation

3. Calibrate items it good condition and this report customer request and accepted in certificate

*Handwritten signature*

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

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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## CERTIFICATE OF CALIBRATION

Certificate No. : 22-1582-006

Issue Date : 8 December 2022

Work Order No. : 22/1582

Customer Name : Water Index & Consultant Co., Ltd  
229/7-8 Soi Charan Sanit Wong 95/1, Charan Sanit Wong Rd.,  
Bang-aor, Bangphlat, Bangkok 10700

Date of Received : 25 November 2022

Date of Calibration : 29 November 2022

Instrument Details : Description : Digital Thermo hygrometer  
Manufacturer : Digicon  
Model : Th-02A  
Serial No. : 1718B0744392  
ID No. : N/A  
Location : Humidity and Temperature Laboratory

Calibration Method : This instrument was calibrated by comparison of indication with Standard Chilled Mirror Hygrometer and Standard Thermometer into Temperature and Humidity Chamber controller according to calibration procedure no. CWI-H-01

### Environmental Condition

Temperature : Laboratory Control at  $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$

Humidity : Laboratory Control at  $55\%\text{RH} \pm 20\%\text{RH}$

### Traceability of Measurement

: This certificate of calibration documents the traceability to national standard, which realize the unit of measurement according to the International system of Units (SI) and The temperature scale in use at this laboratory is The International Temperature scale of 1990.

Calibrated by : Mr. Sirisak Hankongkaew  
Calibration Engineer

Approved by :

  
( Mr. Anuwat Yaklermjit )  
Laboratory Manager

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## CERTIFICATE OF CALIBRATION

Certificate No. : 22-1582-006

Issue Date : 8 December 2022

Work Order No. : 22/1582

### Details of Calibration

#### 1. Reference Standards Instrument

Instrument	Serial No.	Certification	Due Date
1.1 Chilled Mirror Hygrometer	157966 / 157152	TH-0078-22	02 August 2023
1.2 Digital Thermometer with RTD	15000016 / RTD-11	22-1388-012	20 October 2023

2. Certificate traceable : This certificate traceable to The International System of Unit refer to  
No. 1.1 National Institute of Metrology (Thailand), NAC Calibration No. 0144  
No. 1.2 Crystal Calibration Sales and Service Co., Ltd. , NAC Calibration No. 0260

3. Condition of item : Used

4. Calibration location : Permanent

### Result of Calibration

1. Temperature Measuremen : Without Adjustment

Resolution of UUC : 0.1 °C

Calibration Point (°C )	Average Standard Reading (°C )	UUC Reading (°C)	Correction (°C )	Uncertainty ± (°C )
22	22.014	21.9	+ 0.11	0.40
25	25.035	25.2	+ 0.16	0.40
28	28.037	28.1	+ 0.06	0.40

2. Humidity Measurement : Without Adjustment

Resolution of UUC : 1 %RH

Calibration Point ( %RH )	Calculated Standard Reading ( %RH )	UUC Reading ( %RH )	Correction ( %RH )	Uncertainty ± ( %RH )
50	50.24	51	- 0.76	1.5
60	60.37	61	- 0.63	1.5
70	70.25	72	- 1.75	2.0

Note : 1. Process calibration humidity measurement Reference temperature control at 25°C

2. Calculated STD humidity refer to dew-point temperature and convert to humidity by magnus's Equation

3. Calibrate items it good condition and this report customer request and accepted in certificate

*Handwritten signature*

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

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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## CERTIFICATE OF CALIBRATION

Certificate No. : 22-1582-007

Work Order No. : 22/1582

Issue Date : 8 December 2022

Customer Name : Water Index & Consultant Co., Ltd  
229/7-8 Soi Charan Sanit Wong 95/1, Charan Sanit Wong Rd.,  
Bang-aor, Bangphlat, Bangkok 10700

Date of Received : 25 November 2022

Date of Calibration : 29 November 2022

Instrument Details : Description : Digital Thermometer with TC type K  
Manufacturer : CHY  
Model : 502  
Serial No. : 56000360  
ID No. : N/A  
Resolution : 0.1 °C  
Location : Temperature and Humidity Calibration Laboratory

Calibration Method : This instrument was calibrated by comparison of indication with Standard Thermometer into calibration bath temperature controller according to calibration procedure no. CWI-T-09


### Environmental Condition

Temperature : Laboratory Control at 23°C ± 3°C  
Humidity : Laboratory Control at 55%RH ± 20%RH

### Traceability of Measurement

: This certificate of calibration documents the traceability to national standard, which realize the unit of measurement according to the International system of Units (SI) and The temperature scale in use at this laboratory is The International Temperature scale of 1990.

Calibrated by : Mr. Sirisak Hankongkaew  
Calibration Engineer

Approved by :   
( Mr. Anuwat Yaklermjit )  
Laboratory Manager

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## CERTIFICATE OF CALIBRATION

Issue Date : 8 December 2022

Certificate No. : 22-1582-007

Work Order No. : 22/1582

### Details of Calibration

#### 1. Reference Standards Instrument

Instrument	Model	Serial No. / ID No.	Certification	Due Date
Thermometer Readout	1586A	28270002	22-1787-006	5-Jan-2024
Platinum Resistance Thermometers (PRT)	5618B	967446	22-1787-006	5-Jan-2024
Thermometer Readout	1529	B6C635	PSL-T 1174/65	7-Sep-2023
Platinum Resistance Thermometers (PRTs)	5609	02701	PSL-T 1174/65	7-Sep-2023

2. Certificate traceable : This certificate traceable to The International System of Unit (SI unit)

3. Condition of equipment : Used

4. Calibration site : Permanent

### Result of Calibration

Calibration result : Without Adjustment

Connected CH T2 TC wire Type K #30 AWG Immersion Depth : 130 mm

Calibration point (°C)	STD. Value (°C)	UUC Reading (°C)	Correction value (°C)	Uncertainty ± (°C)
0	0.003	0.1	- 0.0970	0.65
3	3.008	3.3	- 0.2920	0.65
20	20.006	20.2	- 0.1940	0.65

Connected CH T2 TC wire Type K #30 AWG Immersion Depth : 130 mm

Calibration point (°C)	STD. Value (°C)	UUC Reading (°C)	Correction value (°C)	Uncertainty ± (°C)
0	0.006	0.1	- 0.0940	0.65
150	150.040	150.1	- 0.0600	0.65

Connected CH T1 Probe Type K Diameter 3mm , L: Immersion Depth : 130 mm

Calibration point (°C)	STD. Value (°C)	UUC Reading (°C)	Correction value (°C)	Uncertainty ± (°C)
0	0.002	0.2	- 0.1980	0.65
380*	380.052	380.2	- 0.1480	0.80

Note : (\*) not accredit TISI

Calibrate items it good condition and this report customer request and accepted in certificate

UUC : Unit Under Calibration.

The quoted uncertainty include Inhomogeneity of thermocouple (UUC)

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

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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## CERTIFICATE OF CALIBRATION

Certificate No. : 22-1582-008

Issue Date : 8 December 2022

Work Order No. : 22/1582

Customer Name : Water Index & Consultant Co., Ltd  
229/7-8 Soi Charan Sanit Wong 95/1, Charan Sanit Wong Rd.,  
Bang-aor, Bangphlat, Bangkok 10700

Date of Received : 25 November 2022

Date of Calibration : 29 November 2022

Instrument Details : Description : pH meter  
Manufacturer : Mettler Toledo  
Model : Seven Compact  
Serial No. : N/A  
ID No. : B614308589  
Resolution : 0.01 pH  
Location : Temperature and Chemical Calibration Laboratory

Calibration Method : This instrument was calibrated by in-house calibration procedure no. CWI-C-02 based on direct measurement by using standard voltage calibrator and certified reference material (CRM)

### Environmental Condition

Temperature : Laboratory Control at  $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$

Humidity : Laboratory Control at  $55\%\text{RH} \pm 20\%\text{RH}$

### Traceability of Measurement

: This certificate of calibration documents the traceability to national standard, which realize the unit of measurement according to the International system of Units (SI)

Calibrated by : Miss Suchiraporn Paraksa  
Calibration Engineer

Approved by :

( Mr. Anuwat Yaklermjit )  
Laboratory Manager

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Crystal Calibration Sales and Service Co., Ltd.

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## CERTIFICATE OF CALIBRATION

Issue Date : 8 December 2022

Certificate No. : 22-1582-008

Work Order No. : 22/1582

### Details of Calibration

#### 1. Reference Standards Material

Certified Reference Material	CRM Code	Lot no.	Expire Date
1.1 Buffer Solution pH 4.00	TRM-S-2027	030822	25 October 2023
1.2 Buffer Solution pH 7.00	TRM-S-2034	300522	1 March 2023
1.3 Buffer Solution pH 10.00	TRM-S-2031	230822	23 October 2023

#### 2. This certificate is traceable to the international system of unit (SI Unit)

- 2.1 Instrument No. 2.1 traceable to : Nation Institute of Metrology (Thailand)  
2.2 Instrument No. 2.2 traceable to : Nation Institute of Metrology (Thailand)  
2.3 Instrument No. 2.3 traceable to : Nation Institute of Metrology (Thailand)

3. Condition of item : Used

4. Calibration location : Permanent

### Result of Calibration

Function : pH Measurement

Performing Three buffer standard curve using buffer nominal pH ()

STD buffer solution pH @ 25°C	Average indicator reading pH	Uncertainty ( $\pm$ ) pH	Coverage factor $k$
4.01	3.99	0.012	2.00
7.01	7.01	0.012	2.00
10.00	10.01	0.012	2.00

**Note :** Calibrate items it good condition and this report customer request and accepted in certificate

Av

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

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%.





CRYSTAL CALIBRATION SALES AND SERVICE CO., LTD.

45/48 Soi Salathammasop31, Salathammasop Rd.,

Salathammasop, Thawewatthana, Bangkok 10170 Thailand

Tel : 0-2408-8474-5 Fax : 0-2408-8477 Email : info@crystalcal.com www.crystalcal.com



## CERTIFICATE OF CALIBRATION

Certificate No. : 22-1582-009

Issue Date : 8 December 2022

Work Order No. : 22/1582

Customer Name : Water Index & Consultant Co., Ltd  
229/7-8 Soi Charan Sanit Wong 95/1, Charan Sanit Wong Rd.,  
Bang-aor, Bangphlat, Bangkok 10700

Date of Received : 25 November 2022

Date of Calibration : 29 November 2022

Instrument Details : Description : Digital Thermometer with probe  
Manufacturer : Mettler Toledo  
Model : Seven Compact  
Serial No. : B614308589  
ID No. : N/A  
Resolution : 0.1 °C  
Location : Temperature and Humidity Calibration Laboratory

Calibration Method : This instrument was calibrated by comparison of indication with Standard Thermometer into calibration bath temperature controller according to calibration procedure no. CWI-T-09

### Environmental Condition


Temperature : Laboratory Control at 23°C ± 3°C

Humidity : Laboratory Control at 55%RH ± 20%RH

### Traceability of Measurement

: This certificate of calibration documents the traceability to national standard, which realize the unit of measurement according to the International system of Units (SI) and The temperature scale in use at this laboratory is The International Temperature scale of 1990.

Calibrated by : Mr. Sirisak Hankongkaew  
Calibration Engineer

Approved by :   
( Mr. Anuwat Yaklermjit )  
Laboratory Manager

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Crystal Calibration Sales and Service Co., Ltd.

45/48 Salathammasop 31, Salathammasop Rd., Salathammasop, Thawewatthana, Bangkok 10170

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## CERTIFICATE OF CALIBRATION

Certificate No. : 22-1582-009

Issue Date : 8 December 2022

Work Order No. : 22/1582

### Details of Calibration

#### 1. Reference Standards Instrument

Instrument	Model	Serial No. / ID No.	Certification	Due Date
Thermometer Readout	1586A	28270002	22-1787-006	5-Jan-2024
Platinum Resistance Thermometers (PRT)	5618B	967446	22-1787-006	5-Jan-2024

2. Certificate traceable : This certificate traceable to The International System of Unit (SI unit)

3. Condition of equipment : Used

4. Calibration site : Permanent

### Result of Calibration

Calibration result : Without Adjustment

Electrode with pH meter combined probe

Immersion Depth : 130 mm

Calibration point (°C)	STD. Value (°C)	UUC Reading (°C)	Correction value (°C)	Uncertainty ± (°C)
20	20.022	20	+ 0.0220	0.30
25	25.035	25	+ 0.0350	0.30
30	30.033	30	+ 0.0330	0.30

### Note :

Calibrate items it good condition and this report customer request and accepted in certificate


UUC : Unit Under Calibration.

The quoted uncertainty include Inhomogeneity of thermocouple (UUC)

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

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%.

# CALIBRATION REPORT

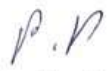
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Date of Issue 12 November 2022

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

Approved Signatory

  
P.Prasitimat

Customer : Water Index & Consultant Co., Ltd

Address : 229/7-8 Soi Charan Sanit Wong 95/1, Charan Sanit Wong Rd., Bang-aor. Bangphlat, Bangkok 10700

Date of Received : 25 October 2022

Instrument – Description : COD REACTOR

Id. Number : 134E02

Manufacturer : Lovibond

Model Number : BT125SC

Serial Number : 0980/2426

**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  $60 \pm 10\% \text{ Rh}$

**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.


## Tractability Information

Instrument Description	Serial Number	Certificate Number	Cal. Date	Due. Date
STD Thermometer with Probe, PRT	08000086	22-166-005	1/March/2022	2/March/2023
Equipment Description	Serial Number	Certificate Number	Cal. Date	Dule Date.
Data logger With Probe (RTD : 01-30)	MY49020096	BTC-T-001-65	1/April/2022	31/March/2023
	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 Crystal Calibration Sales and Service Co.,Ltd, No. Calibration 0260.(Laboratories was Accreditation by TISI According to ITS ISO / IEC 17025)

Calibrated By:



(Mr. Boonlue Somprajob)

Date of Calibration : 25 October 2022

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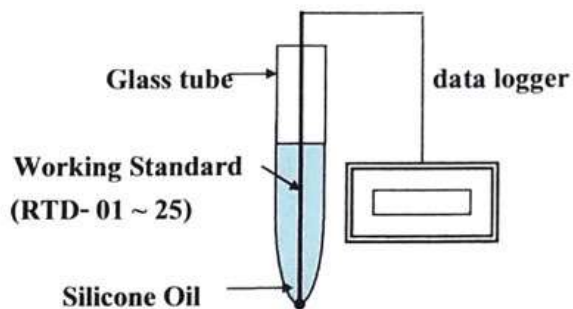
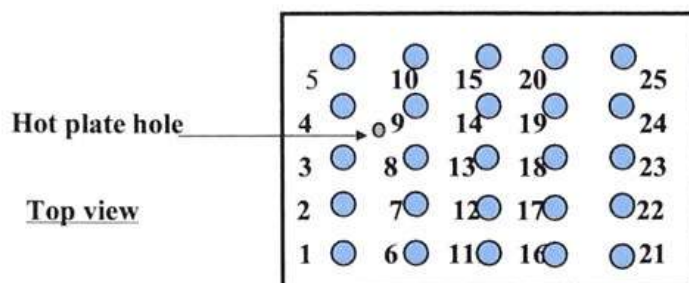
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## Appendix A.



Calibrated By:

(Mr. Boonlue Somprajob)

Date of Calibration : 25 October 2022

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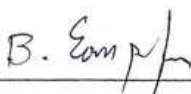
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Hole No. (Position)	Max (°C)	Min (°C)	Mid-Range (°C)	Difference (°C)	Uncertainty of measurement ( $\pm$ °C)
1	149	148.9	148.95	0.10	0.66
2	148.9	148.8	148.85	0.10	
3	148.8	148.7	148.75	0.10	
4	148.9	148.8	148.85	0.10	
5	148.9	148.8	148.85	0.10	
6	149.3	149.1	149.2	0.20	
7	149.9	149.7	149.8	0.20	
8	149.9	149.7	149.8	0.20	
9	148.6	148.4	148.5	0.20	
10	148.6	148.5	148.55	0.10	
11	150.3	150.2	150.25	0.10	
12	150.7	150.6	150.65	0.10	
13	150.6	150.5	150.55	0.10	
14	150.3	150.1	150.2	0.20	
15	149	148.9	148.95	0.10	
16	148.9	148.8	148.85	0.10	
17	148.9	148.7	148.8	0.20	
18	150.2	150	150.1	0.20	
19	149.1	149.1	149.1	0.00	
20	149.8	149.5	149.65	0.30	
21	149	148.9	148.95	0.10	
22	148.8	148.6	148.7	0.20	
23	149.9	149.7	149.8	0.20	
24	148.5	148.4	148.45	0.10	
25	149.3	149.2	149.25	0.10	
Hot plate hole	150.3	149.7	150.0	0.60	

Calibrated By:



(Mr. Boonlue Somprajob)

Date of Calibration : 25 October 2022

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# CALIBRATION REPORT



Cert. Number

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Date of Issue 12 November 2022

UUC		Average Measured Temperature * (°C)	Measured Temperature		Measured Variation		
Setting (°C)	Reading (°C)		Max (°C)	Min (°C)	Stability (±°C)	Uniformity (°C)	Overall (°C)
150.0	150.0	149.3	150.7	148.4	0.3	2.1	2.3

**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:

(Mr. Boonlue Somprajob)

Date of Calibration : 25 October 2022

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