

Mettler-Toledo (Thailand) Ltd.

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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

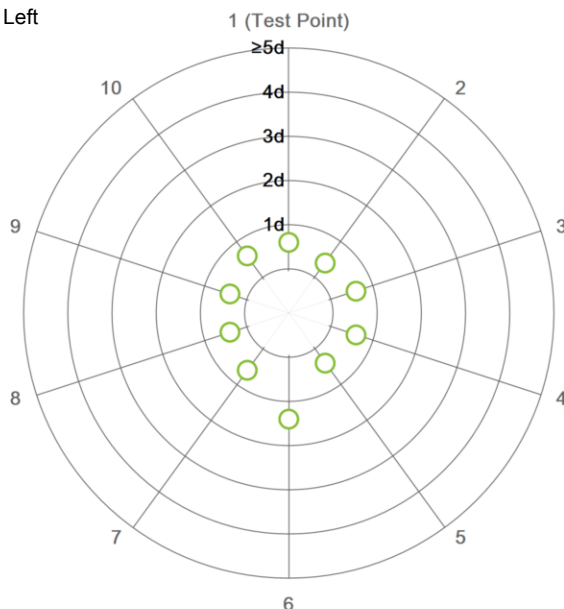
Repeatability

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.

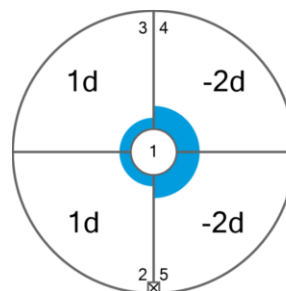
The results of this graph are based upon the absolute values of the differences from the mean value.

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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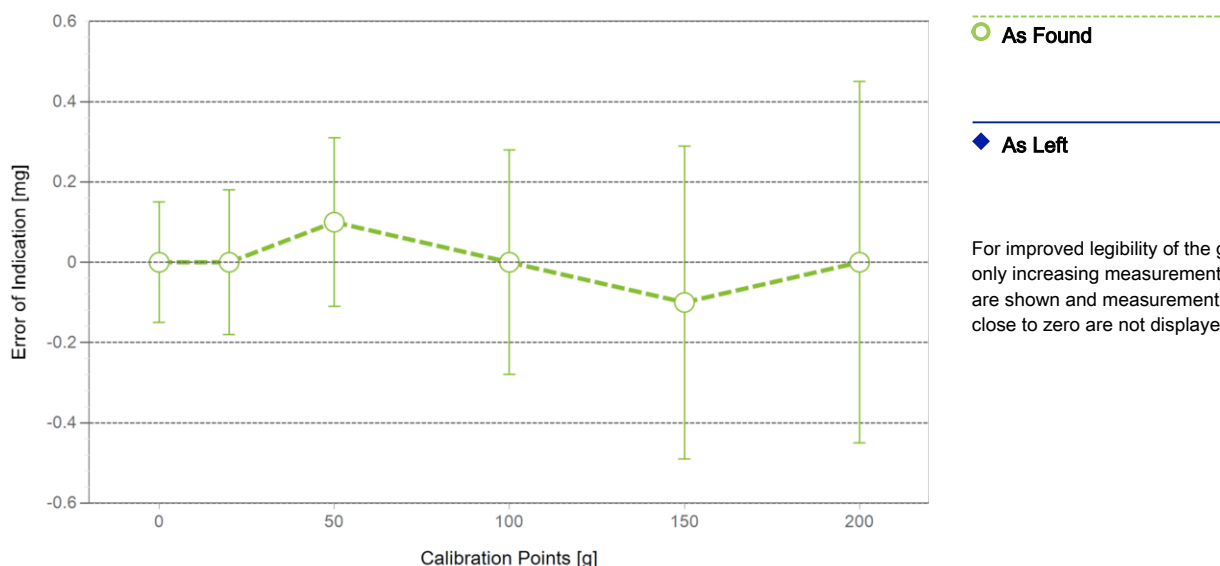
As Found

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

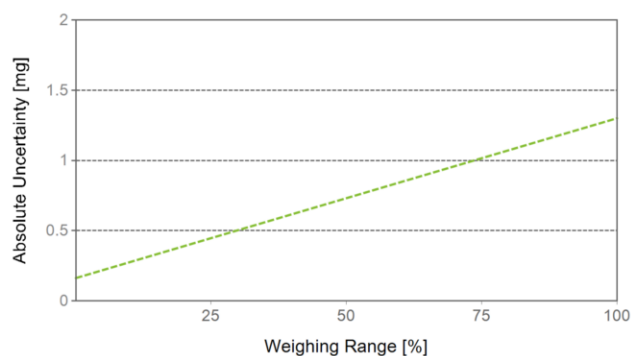
Linearization of Uncertainty Equation

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

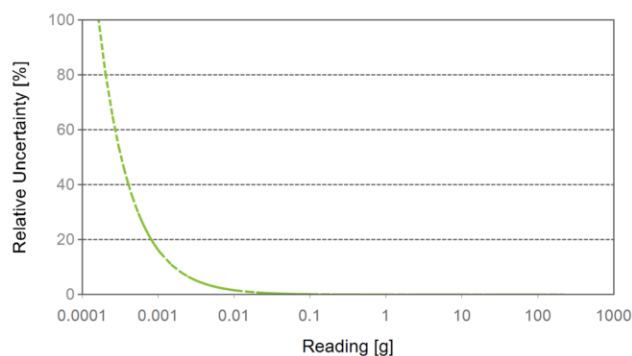
To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

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.

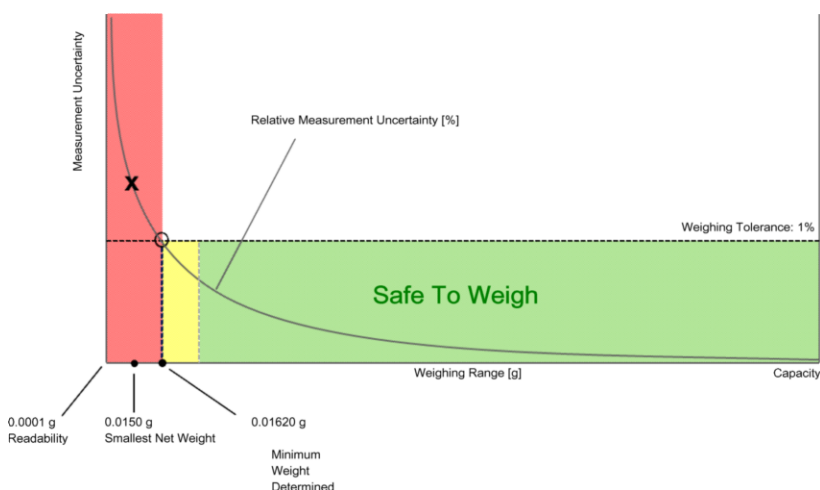
Process Requirements

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.



CLC
Accredited
ISO/IEC 17025

CALIBRATION LABORATORY Co., LTD.

2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



NSC-TISI-TIS 17025
CALIBRATION 0059
CLC

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : GRADUATED CYLINDER
MANUFACTURER : ISOLAB
MODEL / TYPE : 1000 ml
SERIAL NO. : 1538-57
CLID. NO. : 27141909
JOB CONTROL NO. : 210824078376

CUSTOMER : WATER INDEX & CONSULTANT CO., LTD.
229/7-8 SOI CHARANSANITWONG 95/1, CHARAN SANIT WONG RD.,
BANG-AOR, BANGPHLAT, BANGKOK 10700

DATE OF RECEIVED : 24 August 2021

DATE OF ISSUED : 06 September 2021

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

Calibrated By :

Prapaporn Khanchalee

Calibration Engineer

Approved By :

Mongkol Yotsoontorn

Authorized Signatory

06 September 2021



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

Certificate No. Q21078376

F3-011-04/01-12

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@clccalibration

REPORT OF CALIBRATION FOR

NOMENCLATURE : **GRADUATED CYLINDER**
MANUFACTURER : **ISOLAB**
MODEL / TYPE : **1000 ml**
SERIAL NO. : **1538-57**
DATE OF CALIBRATION : **28 August 2021**

ENVIRONMENT CONDITIONS :

Temperature : $(20 \pm 2.5) ^\circ\text{C}$

Relative Humidity : $(50 \pm 10) \% \text{ RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. **WI-305-84** based on **ASTM E542-01** as calibration guidelines.
The calibration was performed by using Electronic Balance, Thermo-hygrograph, Barometer and Thermometer which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Barometer, Barigo S/N.001.
2. Electronic Balance, Sartorius Model CPA3202S S/N.23908511.
3. Thermo-hygrograph, Isuzu Model 3-3126 S/N.30760420.
4. Thermometer, Brannan S/N. 1.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q21015815, Due Date 19 February 2022.
2. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q21027440, Due Date 24 March 2022.
3. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q21014606, Due Date 17 February 2022.
4. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q21022384, Due Date 11 March 2022.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor complies with the table which for a normal distribution corresponds to a coverage probability of approximately 95 %.
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2013)"

Certificate No. Q21078376

F3-011-04/01-12

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@clccalibration

CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : (X) without adjustment () adjustment

The calibration was performed by applied volume to the Device Under Calibration (DUC) . The actual volume readings from STD were reported in average of seven times measurements.

CALIBRATION DATA

CORRECTION OF VOLUME

DUC Test point (ml)	Actual volume (ml)	Correction (ml)	Uncertainty \pm (ml)	Coverage factor k
200	201.26	+1.26	0.07	2,00
400	401.76	+1.76	0.09	2,00
600	602.01	+2.01	0.17	2,00
800	801.98	+1.98	0.17	2,00
1000	1001.74	+1.74	0.17	2,00

Type of glassware : ☒ to Contain ☐ to Deliver

Note. The Scope of Accredited TISI Certificate No. 19C087/0655 Issue 1 Page 77 of 111

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

End of Certificate

Certificate No. Q21078376

F3-011-04/01-12

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@clccalibration

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : GRADUATED CYLINDER
MANUFACTURER : ISOLAB
MODEL / TYPE : 100 ml
SERIAL NO. : 3133-56
CLID. NO. : 27141910
JOB CONTROL NO. : 210824078375

CUSTOMER : WATER INDEX & CONSULTANT CO., LTD.
229/7-8 SOI CHARANSANITWONG 95/1, CHARAN SANIT WONG RD.,
BANG-AOR, BANGPHLAT, BANGKOK 10700

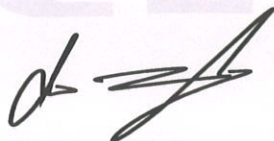
DATE OF RECEIVED : 24 August 2021

DATE OF ISSUED : 31 August 2021

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

Calibrated By :

Prapaporn Khanchalee
Calibration Engineer



Approved By :

Mongkol Yotsoontorn
Authorized Signatory

31 August 2021



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

Certificate No. Q21078375

F3-011-04/01-12

page 1 of 3



@clccalibration

REPORT OF CALIBRATION FOR

NOMENCLATURE : **GRADUATED CYLINDER**
MANUFACTURER : **ISOLAB**
MODEL / TYPE : **100 ml**
SERIAL NO. : **3133-56**
DATE OF CALIBRATION : **28 August 2021**

ENVIRONMENT CONDITIONS :

Temperature : $(20 \pm 2.5) ^\circ\text{C}$

Relative Humidity : $(50 \pm 10) \% \text{ RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. **WI-305-84** based on **ASTM E542-01** as calibration guidelines.
The calibration was performed by using Electronic Balance, Thermo-hygrograph, Barometer and Thermometer which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Barometer, Barigo S/N.001.
2. Electronic Balance, AND Model GF-600 S/N.14637938.
3. Thermo-hygrograph, Isuzu Model 3-3126 S/N.30760420.
4. Thermometer, Brannan S/N. 1.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q21015815, Due Date 19 February 2022.
2. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q21014605, Due Date 15 February 2022.
3. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q21014606, Due Date 17 February 2022.
4. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q21022384, Due Date 11 March 2022.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor complies with the table which for a normal distribution corresponds to a coverage probability of approximately 95 %.
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2013)"

Certificate No. Q21078375

F3-011-04/01-12

page 2 of 3



@clccalibration

CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : (X) without adjustment () adjustment

The calibration was performed by applied volume to the Device Under Calibration (DUC) . The actual volume readings from STD were reported in average of seven times measurements.

CALIBRATION DATA

CORRECTION OF VOLUME

DUC Test point (ml)	Actual volume (ml)	Correction (ml)	Uncertainty \pm (ml)	Coverage factor k
10	10.437	+0.437	0.012	2,00
50	50.355	+0.355	0.018	2,00
100	100.465	+0.465	0.035	2,00

Type of glassware : ☒ to Contain ☐ to Deliver

Note. The Scope of Accredited TISI Certificate No. 19C087/0655 Issue 1 Page 77 of 111

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

End of Certificate

Certificate No. Q21078375

F3-011-04/01-12

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@clccalibration

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VOLUMETRIC FLASK
MANUFACTURER : WITEG
MODEL / TYPE : 50 ml
SERIAL NO. : G17217-20
CLID. NO. : 272102003
JOB CONTROL NO. : 210824078377

CUSTOMER : WATER INDEX & CONSULTANT CO., LTD.
229/7-8 SOI CHARANSANITWONG 95/1, CHARAN SANIT WONG RD.,
BANG-AOR, BANGPHLAT, BANGKOK 10700

DATE OF RECEIVED : 24 August 2021

DATE OF ISSUED : 31 August 2021

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Calibrated By : Prapaporn Khanchalee
Calibration Engineer



Approved By : Mongkol Yotsoontorn
Authorized Signatory

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Certificate No. Q21078377

F3-011-04/01-12

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@clccalibration

REPORT OF CALIBRATION

FOR

NOMENCLATURE : **VOLUMETRIC FLASK**
MANUFACTURER : **WITEG**
MODEL / TYPE : **50 ml**
SERIAL NO. : **G17217-20**
DATE OF CALIBRATION : **28 August 2021**

ENVIRONMENT CONDITIONS :

Temperature : $(20 \pm 2.5) ^\circ\text{C}$

Relative Humidity : $(50 \pm 10) \% \text{RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. **WI-305-88** based on **ASTM E542-01** as calibration guidelines.
The calibration was performed by using Electronic Balance, Thermo-hygrograph, Barometer and Thermometer which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Barometer, Barigo S/N.001.
2. Electronic Balance, Sartorius Model CPA224S S/N.23908487.
3. Thermo-hygrograph, Isuzu Model 3-3126 S/N.30760420.
4. Thermometer, Brannan S/N. 1.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q21015815, Due Date 19 February 2022.
2. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q21024361, Due Date 16 March 2022.
3. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q21014606, Due Date 17 February 2022.
4. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q21022384, Due Date 11 March 2022.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor complies with the table which for a normal distribution corresponds to a coverage probability of approximately 95 %.
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Certificate No. Q21078377

F3-011-04/01-12

page 2 of 3



@clccalibration

CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : (X) without adjustment () adjustment

The calibration was performed by applied volume to the Device Under Calibration (DUC) . The actual volume readings from STD were reported in average of seven times measurements.

CALIBRATION DATA

CORRECTION OF VOLUME

DUC Test point (ml)	Actual volume (ml)	Correction (ml)	Uncertainty \pm (ml)	Coverage factor k
50	50.0404	+0.0404	0.0120	2,00

Type of glassware : ☒ to Contain ☐ to Deliver

Note. The Scope of Accredited TISI Certificate No. 19C087/0655 Issue 1 Page 78 of 111

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

End of Certificate

Certificate No. Q21078377

F3-011-04/01-12

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@clccalibration

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VOLUMETRIC FLASK
MANUFACTURER : WITEG
MODEL / TYPE : 100 ml
SERIAL NO. : 173618-4
CLID. NO. : 272102004
JOB CONTROL NO. : 210824078378

CUSTOMER : WATER INDEX & CONSULTANT CO., LTD.
229/7-8 SOI CHARANSANITWONG 95/1, CHARAN SANIT WONG RD.,
BANG-AOR, BANGPHLAT, BANGKOK 10700

DATE OF RECEIVED : 24 August 2021

DATE OF ISSUED : 31 August 2021

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

Calibrated By : Prapaporn Khanchalee
Calibration Engineer



Approved By : Mongkol Yotsoontorn
Authorized Signatory
31 August 2021



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

Certificate No. Q21078378

F3-011-04/01-12

page 1 of 3



@clccalibration

REPORT OF CALIBRATION FOR

NOMENCLATURE : VOLUMETRIC FLASK
MANUFACTURER : WITEG
MODEL / TYPE : 100 ml
SERIAL NO. : 173618-4
DATE OF CALIBRATION : 28 August 2021

ENVIRONMENT CONDITIONS :

Temperature : $(20 \pm 2.5) ^\circ\text{C}$

Relative Humidity : $(50 \pm 10) \% \text{RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. **WI-305-88** based on **ASTM E542-01** as calibration guidelines.
The calibration was performed by using Electronic Balance, Thermo-hygrograph, Barometer and Thermometer which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Barometer, Barigo S/N.001.
2. Electronic Balance, Sartorius Model CPA224S S/N.23908487.
3. Thermo-hygrograph, Isuzu Model 3-3126 S/N.30760420.
4. Thermometer, Brannan S/N. 1.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q21015815, Due Date 19 February 2022.
2. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q21024361, Due Date 16 March 2022.
3. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q21014606, Due Date 17 February 2022.
4. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q21022384, Due Date 11 March 2022.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor complies with the table which for a normal distribution corresponds to a coverage probability of approximately 95 %.
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2013)"

Certificate No. Q21078378

F3-011-04/01-12

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CALIBRATION LABORATORY Co., LTD.

2/10-11, 14, 55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230

Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



NSC-TISI-TIS 17025
CALIBRATION 0059
CLC

CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : (X) without adjustment () adjustment

The calibration was performed by applied volume to the Device Under Calibration (DUC) . The actual volume readings from STD were reported in average of seven times measurements.

CALIBRATION DATA

CORRECTION OF VOLUME

DUC Test point (ml)	Actual volume (ml)	Correction (ml)	Uncertainty \pm (ml)	Coverage factor k
100	100.0026	+0.0026	0.0190	2,00

Type of glassware : ☒ to Contain ☐ to Deliver

Note. The Scope of Accredited TISI Certificate No. 19C087/0655 Issue 1 Page 78 of 111

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

End of Certificate

Certificate No. Q21078378

F3-011-04/01-12

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@clccalibration

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VOLUMETRIC FLASK
MANUFACTURER : WITEG
MODEL / TYPE : 1000 ml
SERIAL NO. : 175618-2
CLID. NO. : 272001158
JOB CONTROL NO. : 210824078379

CUSTOMER : WATER INDEX & CONSULTANT CO., LTD.
229/7-8 SOI CHARANSANITWONG 95/1, CHARAN SANIT WONG RD.,
BANG-AOR, BANGPHLAT, BANGKOK 10700

DATE OF RECEIVED : 24 August 2021

DATE OF ISSUED : 31 August 2021

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

Calibrated By :

Prapaporn Khanchalee

Calibration Engineer



Approved By :

Mongkol Yotsoontorn

Authorized Signatory

31 August 2021



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

Certificate No. Q21078379

F3-011-04/01-12

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@clccalibration

REPORT OF CALIBRATION FOR

NOMENCLATURE : **VOLUMETRIC FLASK**
MANUFACTURER : **WITEG**
MODEL / TYPE : **1000 ml**
SERIAL NO. : **175618-2**
DATE OF CALIBRATION : **28 August 2021**

ENVIRONMENT CONDITIONS :

Temperature : $(20 \pm 2.5) ^\circ\text{C}$

Relative Humidity : $(50 \pm 10) \% \text{RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. **WI-305-88** based on **ASTM E542-01** as calibration guidelines.
The calibration was performed by using Electronic Balance, Thermo-hygrograph, Barometer and Thermometer which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Barometer, Barigo S/N.001.
2. Electronic Balance, Sartorius Model CPA3202S S/N.23908511.
3. Thermo-hygrograph, Isuzu Model 3-3126 S/N.30760420.
4. Thermometer, Brannan S/N. 1.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q21015815, Due Date 19 February 2022.
2. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q21027440, Due Date 24 March 2022.
3. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q21014606, Due Date 17 February 2022.
4. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q21022384, Due Date 11 March 2022.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor complies with the table which for a normal distribution corresponds to a coverage probability of approximately 95 %.
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2013)"

Certificate No. Q21078379

F3-011-04/01-12

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Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



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CALIBRATION 0059
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CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : (X) without adjustment () adjustment

The calibration was performed by applied volume to the Device Under Calibration (DUC) . The actual volume readings from STD were reported in average of seven times measurements.

CALIBRATION DATA

CORRECTION OF VOLUME

DUC Test point (ml)	Actual volume (ml)	Correction (ml)	Uncertainty \pm (ml)	Coverage factor k
1000	999.80	-0.20	0.14	2,00

Type of glassware : ☒ to Contain ☐ to Deliver

Note. The Scope of Accredited TISI Certificate No. 19C087/0655 Issue 1 Page 78 of 111

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

End of Certificate

Certificate No. Q21078379

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CERTIFICATE OF CALIBRATION FOR

NOMENCLATURE : MEASURING PIPETTE
MANUFACTURER : WITEG
MODEL / TYPE : 5 ml
SERIAL NO. : 184G62-10
CLID. NO. : 272001159
JOB CONTROL NO. : 210824078380

CUSTOMER : WATER INDEX & CONSULTANT CO., LTD.
229/7-8 SOI CHARANSANITWONG 95/1, CHARAN SANIT WONG RD.,
BANG-AOR, BANGPHLAT, BANGKOK 10700

DATE OF RECEIVED : 24 August 2021

DATE OF ISSUED : 30 August 2021

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

Calibrated By :

Prapaporn Khanchalee

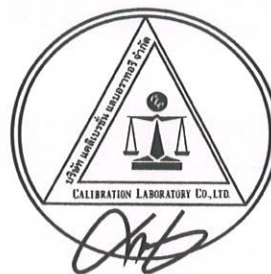
Calibration Engineer

Approved By :

Mongkol Yotsoontorn

Authorized Signatory

30 August 2021



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

Certificate No. Q21078380

F3-011-04/01-12

page 1 of 3



@clccalibration

REPORT OF CALIBRATION FOR

NOMENCLATURE : **MEASURING PIPETTE**
MANUFACTURER : **WITEG**
MODEL / TYPE : **5 ml**
SERIAL NO. : **184G62-10**
DATE OF CALIBRATION : **26 August 2021**

ENVIRONMENT CONDITIONS :

Temperature : $(20 \pm 2.5) ^\circ\text{C}$

Relative Humidity : $(50 \pm 10) \% \text{ RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. **WI-305-89** based on **ASTM E542-01** as calibration guidelines.
The calibration was performed by using Electronic Balance, Thermo-hygrograph, Barometer and Thermometer which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Barometer, Barigo S/N.001.
2. Electronic Balance, Sartorius Model CPA224S S/N.23908487.
3. Thermo-hygrograph, Isuzu Model 3-3126 S/N.30760420.
4. Thermometer, Brannan S/N. 1.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q21015815, Due Date 19 February 2022.
2. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q21024361, Due Date 16 March 2022.
3. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q21014606, Due Date 17 February 2022.
4. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q21022384, Due Date 11 March 2022.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor complies with the table which for a normal distribution corresponds to a coverage probability of approximately 95 %.
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2013)"

Certificate No. **Q21078380**

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@clccalibration

CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : (X) without adjustment () adjustment

The calibration was performed by applied volume to the Device Under Calibration (DUC) . The actual volume readings from STD were reported in average of seven times measurements.

CALIBRATION DATA

CORRECTION OF VOLUME

DUC Test point (ml)	Actual volume (ml)	Correction (ml)	Uncertainty \pm (ml)	Coverage factor k
1.5	1.4993	-0.0007	0.0028	2,00
3.5	3.4952	-0.0048	0.0029	2,00
5	4.9875	-0.0125	0.0029	2,00

Type of glassware : ☐ to Contain ☒ to Deliver

Note. The Scope of Accredited TISI Certificate No. 19C087/0655 Issue 1 Page 79 of 111

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

End of Certificate

Certificate No. Q21078380

F3-011-04/01-12

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CALIBRATION 0059
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CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : MEASURING PIPETTE
MANUFACTURER : WITEG
MODEL / TYPE : 10 ml
SERIAL NO. : 185G63-10
CLID. NO. : 272001160
JOB CONTROL NO. : 210824078381

CUSTOMER : WATER INDEX & CONSULTANT CO., LTD.
229/7-8 SOI CHARANSANITWONG 95/1, CHARAN SANIT WONG RD.,
BANG-AOR, BANGPHLAT, BANGKOK 10700

DATE OF RECEIVED : 24 August 2021

DATE OF ISSUED : 30 August 2021

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

Calibrated By :

Prapaporn Khanchalee

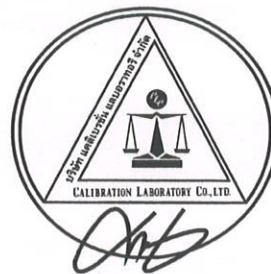
Calibration Engineer

Approved By :

Mongkol Yotsoontorn

Authorized Signatory

30 August 2021



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

Certificate No. Q21078381

F3-011-04/01-12

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@clccalibration

REPORT OF CALIBRATION FOR

NOMENCLATURE : **MEASURING PIPETTE**
MANUFACTURER : **WITEG**
MODEL / TYPE : **10 ml**
SERIAL NO. : **185G63-10**
DATE OF CALIBRATION : **26 August 2021**

ENVIRONMENT CONDITIONS :

Temperature : $(20 \pm 2.5) ^\circ\text{C}$

Relative Humidity : $(50 \pm 10) \% \text{ RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. **WI-305-89** based on **ASTM E542-01** as calibration guidelines.
The calibration was performed by using Electronic Balance, Thermo-hygrograph, Barometer and Thermometer which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Barometer, Barigo S/N.001.
2. Electronic Balance, Sartorius Model CPA224S S/N.23908487.
3. Thermo-hygrograph, Isuzu Model 3-3126 S/N.30760420.
4. Thermometer, Brannan S/N. 1.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q21015815, Due Date 19 February 2022.
2. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q21024361, Due Date 16 March 2022.
3. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q21014606, Due Date 17 February 2022.
4. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q21022384, Due Date 11 March 2022.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor complies with the table which for a normal distribution corresponds to a coverage probability of approximately 95 %.
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2013)"

Certificate No. Q21078381



CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : (X) without adjustment () adjustment

The calibration was performed by applied volume to the Device Under Calibration (DUC) . The actual volume readings from STD were reported in average of seven times measurements.

CALIBRATION DATA

CORRECTION OF VOLUME

DUC Test point (ml)	Actual volume (ml)	Correction (ml)	Uncertainty \pm (ml)	Coverage factor k
3.5	3.5082	+0.0082	0.0029	2,00
5	5.0037	+0.0037	0.0029	2,00
7	7.0005	+0.0005	0.0039	2,00
10	9.9959	-0.0041	0.0039	2,00

Type of glassware : ☐ to Contain ☒ to Deliver

Note. The Scope of Accredited TISI Certificate No. 19C087/0655 Issue 1 Page 79 of 111

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

End of Certificate

Certificate No. Q21078381

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@clccalibration

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : MEASURING PIPETTE
MANUFACTURER : WITEG
MODEL / TYPE : 25 ml
SERIAL NO. : 186-G19-10
CLID. NO. : 272001161
JOB CONTROL NO. : 210824078382

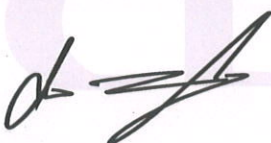
CUSTOMER : WATER INDEX & CONSULTANT CO., LTD.
229/7-8 SOI CHARANSANITWONG 95/1, CHARAN SANIT WONG RD.,
BANG-AOR, BANGPHLAT, BANGKOK 10700

DATE OF RECEIVED : 24 August 2021

DATE OF ISSUED : 30 August 2021

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

Calibrated By : Prapaporn Khanchalee
Calibration Engineer



Approved By : Mongkol Yotsoontorn
Authorized Signatory

30 August 2021



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

Certificate No. Q21078382

F3-011-04/01-12

page 1 of 3



@clccalibration

REPORT OF CALIBRATION FOR

NOMENCLATURE : **MEASURING PIPETTE**
MANUFACTURER : **WITEG**
MODEL / TYPE : **25 ml**
SERIAL NO. : **186-G19-10**
DATE OF CALIBRATION : **26 August 2021**

ENVIRONMENT CONDITIONS :

Temperature : $(20 \pm 2.5) ^\circ\text{C}$ **Relative Humidity** : $(50 \pm 10) \% \text{ RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. **WI-305-89** based on **ASTM E542-01** as calibration guidelines.

The calibration was performed by using Electronic Balance, Thermo-hygrograph, Barometer and Thermometer which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Barometer, Barigo S/N.001.
2. Electronic Balance, Sartorius Model CPA224S S/N.23908487.
3. Thermo-hygrograph, Isuzu Model 3-3126 S/N.30760420.
4. Thermometer, Brannan S/N. 1.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q21015815, Due Date 19 February 2022.
2. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q21024361, Due Date 16 March 2022.
3. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q21014606, Due Date 17 February 2022.
4. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q21022384, Due Date 11 March 2022.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor complies with the table which for a normal distribution corresponds to a coverage probability of approximately 95 %.

It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2013)"

Certificate No. Q21078382

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NSC-TISI-TIS 17025
CALIBRATION 0059
CLC

CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : (X) without adjustment () adjustment

The calibration was performed by applied volume to the Device Under Calibration (DUC) . The actual volume readings from STD were reported in average of seven times measurements.

CALIBRATION DATA

CORRECTION OF VOLUME

DUC Test point (ml)	Actual volume (ml)	Correction (ml)	Uncertainty \pm (ml)	Coverage factor k
10	10.0039	+0.0039	0.0039	2,00
20	20.0058	+0.0058	0.0066	2,00
25	25.0100	+0.0100	0.0066	2,00

Type of glassware : ☐ to Contain ☒ to Deliver

Note. The Scope of Accredited TISI Certificate No. 19C087/0655 Issue 1 Page 79 of 111

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

End of Certificate

Certificate No. Q21078382

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CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : BURETTE
MANUFACTURER : WITEG
MODEL / TYPE : 10 ml
SERIAL NO. : 287G63-1
CLID. NO. : 272001162
JOB CONTROL NO. : 210824078383

CUSTOMER : WATER INDEX & CONSULTANT CO., LTD.
229/7-8 SOI CHARANSANITWONG 95/1, CHARAN SANIT WONG RD.,
BANG-AOR, BANGPHLAT, BANGKOK 10700

DATE OF RECEIVED : 24 August 2021

DATE OF ISSUED : 30 August 2021

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

Calibrated By : Prapaporn Khanchalee
Calibration Engineer

Approved By : Mongkol Yotsoontorn
Authorized Signatory

30 August 2021



This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the
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Certificate No. Q21078383

F3-011-04/01-12

page 1 of 3



@clccalibration

REPORT OF CALIBRATION FOR

NOMENCLATURE : BURETTE
MANUFACTURER : WITEG
MODEL / TYPE : 10 ml
SERIAL NO. : 287G63-1
DATE OF CALIBRATION : 26 August 2021

ENVIRONMENT CONDITIONS :

Temperature : $(20 \pm 2.5) ^\circ\text{C}$

Relative Humidity : $(50 \pm 10) \% \text{ RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. **WI-305-86** based on **ASTM E542-01** as calibration guidelines.

The calibration was performed by using Electronic Balance, Thermo-hygrograph, Barometer and Thermometer which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Barometer, Barigo S/N.001.
2. Electronic Balance, Sartorius Model CPA224S S/N.23908487.
3. Thermo-hygrograph, Isuzu Model 3-3126 S/N.30760420.
4. Thermometer, Brannan S/N. 1.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q21015815, Due Date 19 February 2022.
2. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q21024361, Due Date 16 March 2022.
3. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q21014606, Due Date 17 February 2022.
4. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q21022384, Due Date 11 March 2022.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor complies with the table which for a normal distribution corresponds to a coverage probability of approximately 95 %.

It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2013)"

Certificate No. **Q21078383**

F3-011-04/01-12





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CALIBRATION LABORATORY Co., LTD.

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Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



NSC-TISI-TIS 17025
CALIBRATION 0059
CLC

CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : (X) without adjustment () adjustment

The calibration was performed by applied volume to the Device Under Calibration (DUC) . The actual volume readings from STD were reported in average of seven times measurements.

CALIBRATION DATA

CORRECTION OF VOLUME

DUC Test point (ml)	Actual volume (ml)	Correction (ml)	Uncertainty \pm (ml)	Coverage factor k
5	4.9983	-0.0017	0.0038	2,00
10	10.0019	+0.0019	0.0042	2,00

Type of glassware : ☐ to Contain ☒ to Deliver

Note. The Scope of Accredited TISI Certificate No. 19C087/0655 Issue 1 Page 77 of 111

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

End of Certificate

Certificate No. Q21078383

F3-011-04/01-12

page 3 of 3



@clccalibration

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : BURETTE
MANUFACTURER : WITEG
MODEL / TYPE : 50 ml
SERIAL NO. : 189G63-2
CLID. NO. : 272001163
JOB CONTROL NO. : 210824078384

CUSTOMER : WATER INDEX & CONSULTANT CO., LTD.
229/7-8 SOI CHARANSANITWONG 95/1, CHARAN SANIT WONG RD.,
BANG-AOR, BANGPHLAT, BANGKOK 10700

DATE OF RECEIVED : 24 August 2021

DATE OF ISSUED : 30 August 2021

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

Calibrated By : Prapaporn Khanchalee
Calibration Engineer



Approved By : Mongkol Yotsoontorn
Authorized Signatory
30 August 2021



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

Certificate No. Q21078384

F3-011-04/01-12

page 1 of 3



@clccalibration

REPORT OF CALIBRATION FOR

NOMENCLATURE : **BURETTE**
MANUFACTURER : **WITEG**
MODEL / TYPE : **50 ml**
SERIAL NO. : **189G63-2**
DATE OF CALIBRATION : **26 August 2021**

ENVIRONMENT CONDITIONS :

Temperature : $(20 \pm 2.5) ^\circ\text{C}$

Relative Humidity : $(50 \pm 10) \% \text{ RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. **WI-305-86** based on **ASTM E542-01** as calibration guidelines.

The calibration was performed by using Electronic Balance, Thermo-hygrograph, Barometer and Thermometer which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Barometer, Barigo S/N.001.
2. Electronic Balance, Sartorius Model CPA224S S/N.23908487.
3. Thermo-hygrograph, Isuzu Model 3-3126 S/N.30760420.
4. Thermometer, Brannan S/N. 1.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q21015815, Due Date 19 February 2022.
2. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q21024361, Due Date 16 March 2022.
3. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q21014606, Due Date 17 February 2022.
4. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q21022384, Due Date 11 March 2022.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor complies with the table which for a normal distribution corresponds to a coverage probability of approximately 95 %.

It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2013)"

Certificate No. **Q21078384**

F3-011-04/01-12

page 2 of 3



@clccalibration



CLC
Accredited
ISO/IEC 17025

CALIBRATION LABORATORY Co., LTD.

2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230

Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



NSC-TISI-TIS 17025
CALIBRATION 0059
CLC

CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : (X) without adjustment () adjustment

The calibration was performed by applied volume to the Device Under Calibration (DUC) . The actual volume readings from STD were reported in average of seven times measurements.

CALIBRATION DATA

CORRECTION OF VOLUME

DUC Test point (ml)	Actual volume (ml)	Correction (ml)	Uncertainty \pm (ml)	Coverage factor k
20	19.9745	-0.0255	0.0066	2,00
50	49.9998	-0.0002	0.0110	2,00

Type of glassware : ☐ to Contain ☒ to Deliver

Note. The Scope of Accredited TISI Certificate No. 19C087/0655 Issue 1 Page 77 of 111

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

CLC

End of Certificate

Certificate No. Q21078384

F3-011-04/01-12

page 3 of 3



@clccalibration

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : GRADUATED CYLINDER
MANUFACTURER : WITEG
MODEL / TYPE : 50 ml
SERIAL NO. : 198G63
CLID. NO. : 272102005
JOB CONTROL NO. : 210824078385

CUSTOMER : WATER INDEX & CONSULTANT CO., LTD.
229/7-8 SOI CHARANSANITWONG 95/1, CHARAN SANIT WONG RD.,
BANG-AOR, BANGPHLAT, BANGKOK 10700

DATE OF RECEIVED : 24 August 2021

DATE OF ISSUED : 31 August 2021

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

Calibrated By :

Prapaporn Khanchalee

Calibration Engineer



Approved By :

Mongkol Yotsoontorn

Authorized Signatory

31 August 2021



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

Certificate No. Q21078385

F3-011-04/01-12

page 1 of 3



@clccalibration

REPORT OF CALIBRATION FOR

NOMENCLATURE : **GRADUATED CYLINDER**
MANUFACTURER : **WITEG**
MODEL / TYPE : **50 ml**
SERIAL NO. : **198G63**
DATE OF CALIBRATION : **28 August 2021**

ENVIRONMENT CONDITIONS :

Temperature : $(20 \pm 2.5) ^\circ\text{C}$

Relative Humidity : $(50 \pm 10) \% \text{ RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. **WI-305-84** based on **ASTM E542-01** as calibration guidelines.
The calibration was performed by using Electronic Balance, Thermo-hygrograph, Barometer and Thermometer which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Barometer, Barigo S/N.001.
2. Electronic Balance, Sartorius Model CPA224S S/N.23908487.
3. Thermo-hygrograph, Isuzu Model 3-3126 S/N.30760420.
4. Thermometer, Brannan S/N. 1.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q21015815, Due Date 19 February 2022.
2. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q21024361, Due Date 16 March 2022.
3. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q21014606, Due Date 17 February 2022.
4. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q21022384, Due Date 11 March 2022.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor complies with the table which for a normal distribution corresponds to a coverage probability of approximately 95 %.
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2013)"

Certificate No. Q21078385

F3-011-04/01-12

page 2 of 3



@clccalibration

CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : (X) without adjustment () adjustment

The calibration was performed by applied volume to the Device Under Calibration (DUC) . The actual volume readings from STD were reported in average of seven times measurements.

CALIBRATION DATA

CORRECTION OF VOLUME

DUC Test point (ml)	Actual volume (ml)	Correction (ml)	Uncertainty \pm (ml)	Coverage factor k
10	9.9172	-0.0828	0.0120	2,00
30	29.9463	-0.0537	0.0180	2,00
50	49.9888	-0.0112	0.0180	2,00

Type of glassware : ☒ to Contain ☐ to Deliver

Note. The Scope of Accredited TISI Certificate No. 19C087/0655 Issue 1 Page 77 of 111

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

End of Certificate

Certificate No. Q21078385

F3-011-04/01-12

page 3 of 3



@clccalibration



Inctech Metrological Center Co.Ltd.

39/1 Soi 82, Sukhapiban 5 Rd., O ngoen,

Saimai, Bangkok 10220, Thailand

Tel. (662) 909-8820 (Auto 10 lines) www.imcinstrument.com



Calibration Cert. # 3884.01
ISO/IEC 17025

Certificate of Calibration

Certificate No. : MT21-5731

Page : 1 of 2

Customer : Water Index & Consultant Co., Ltd.

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

Description : Hot Air Oven

Manufacturer : Memmert

Model : SM400

Serial No. : B4921010

Identification No. : ID146E94

Calibration Place : Customer Laboratory

Order No. : 2689/21

Received date : Sep 28, 2021

Calibration date : Oct 14, 2021

Environment Condition :

Temperature : (25+/-10) °C

Humidity : (50+/-30) %RH

Calibration Method : Calibration were conducted using In-house calibration procedure *CP-MT-006* According to comparison with LXI Data Acquisition Switch Unit with sensor. The calibration methods based on DKD-R5-7 guidelines for calibration of climatic chamber edition 07:2009.

Reference Standard Instruments :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
LXI Data Acquisition Switch Unit with Sensor	34972A	MY49020096	MT20-7636	Dec 10, 2021

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

Traceability : This measurement are traceable to the International System of Unit (SI), through
National Institute of Metrology Thailand (NIMT)

The reported uncertainty of measurement was base on standard uncertainty multiplied by coverage factor $k = 2$,
providing a level of confidence of not less than 95%



Calibrated by : Mr.Jiraphan Sreebannasarn

Issue date : Nov 04, 2021

Approved by :

(Mr.Panuwat Phuklan)

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**Inctech Metrological Center Co.Ltd.**

39/1 Soi 82, Sukhapiban 5 Rd., O ngoen,

Saimai, Bangkok 10220, Thailand

Tel. (662) 909-8820 (Auto 10 lines) www.imcinstrument.com

Calibration Cert. # 3884.01
ISO/IEC 17025

Certificate No. : MT21-5731

Page : 2 of 2

Function : Temperature measurement

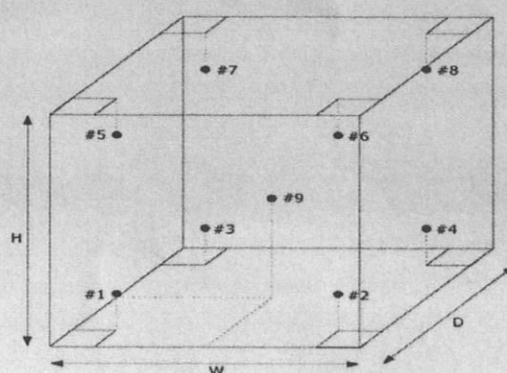
Result : Without adjustment

Calibration point : 104, 110, 120, 150, 180 °C

Resolution : 0.1 °C

Calibration point (°C)	Temperature of UUC* at each position (°C)									Uncertainty of measurement (+/- °C)
	Ch.1	Ch.2	Ch.3	Ch.4	Ch.5	Ch.6	Ch.7	Ch.8	Ch.9	
104	104.204	104.292	104.279	104.272	104.414	104.360	104.291	104.277	104.157	0.44
110	110.246	110.283	110.310	110.277	110.432	110.414	110.293	110.285	110.153	0.44
120	120.438	120.186	120.160	120.207	120.205	120.370	120.148	120.183	120.312	0.44
150	149.927	149.488	149.465	149.754	149.758	149.515	149.619	149.435	149.786	0.44
180	181.145	180.298	181.160	180.261	180.214	180.210	180.290	180.263	180.283	0.44

Setting temperature (°C)	Indicating Temperature (°C)	Measured stability (+/- °C)	Measured uniformity (°C)	Overall variation (°C)
104.0	104.0	0.11	0.54	0.54
110.0	110.0	0.13	0.54	0.54
118.0	118.0	0.13	0.43	0.58
140.0	140.0	0.12	0.48	0.78
179.0	179.0	0.15	1.1	1.3



- #1 Lower Left Front
- #2 Lower Right Front
- #3 Lower Left Rear
- #4 Lower Right Rear
- #5 Upper Left Front
- #6 Upper Right Front
- #7 Upper Left Rear
- #8 Upper Right Rear
- #9 Geometric Center

Front view**UUC*** = Unit under calibration**Uniformity** = Maximum and Minimum difference of measured temperature at any probes and the measured temperature at the reference and same time.**Overall Variation** = Difference of temperature value between the maximum and minimum any time.**Stability** = One half of the maximum difference of measured temperatures at any one probe.

-oOo-



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. : 21-1003-006

Issue Date : 30 October 2021

Work Order No. : 21/1003

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 : 14 October 2021

Date of Calibration : 14 October 2021

Instrument Details : Description : pH meter
Manufacturer : Mettler Toledo
Model : Seven Compact
Serial No. : B614308589
ID No. : N/A
Resolution : 0.01 pH
Location : 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 : Area Monitoring between 15°C to 40°C

Humidity : Area Monitoring between 30%RH to 85%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 : Mr. Kritsada Kaewwangpa
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

Phone : 0-2408-8474 Fax : 0-2408-8477 <http://www.crystalcal.com> Email : info@crystalcal.com



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Salathammasop, Thawewatthana, Bangkok 10170 Thailand

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**CERTIFICATE OF CALIBRATION**

Certificate No. : 21-1003-006

Issue Date : 30 October 2021

Work Order No. : 21/1003

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	081020	23 August 2022
1.2 Buffer Solution pH 7.00	TRM-S-2034	020221	8 April 2022
1.3 Buffer Solution pH 10.00	TRM-S-2031	091020	23 August 2022

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** : On-site**Result of Calibration**

Function : pH Measurement

Performing Three buffer standard curve using buffer nominal pH (4, 7, 10)

STD buffer solution pH @ 25°C	Average indicator reading pH	Uncertainty (±) pH	Coverage factor k
4.01	4.02	0.012	2.00
7.01	7.01	0.012	2.00
10.00	10.02	0.012	2.00

Description of electrode

Brand : Mettler Toledo Model : N/A Serial No. : 30014096
Type : Combination Electrode Range : 0 to 14 pH

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

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 : 30 October 2021
Certificate No. : 21-1003-007
Work Order No. : 21/1003

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 : 14 October 2021

Date of Calibration : 14 October 2021

Instrument Details : Description : Digital Thermometer with sensor
Manufacturer : Mettler toledo
Model : Seven Compact
Serial No. : B614308589
ID No. : N/A
Resolution : 0.1 °C
Location : 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 : Area Monitoring between 15°C to 40°C
Humidity : Area Monitoring between 30%RH to 85%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. Kritsada Kaewwangpa
Calibration Engineer

Approved by : 
(Mr. Anuwat Yaklermjit)
Laboratory Manager

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CERTIFICATE OF CALIBRATION

Issue Date : 30 October 2021

Certificate No. : 21-1003-007

Work Order No. : 21/1003

Details of Calibration

1. Reference Standards Instrument

Instrument	Model	Serial No. / ID No.	Certification	Due Date
Thermometer Readout	1523	3490561	21-970-007	15-Oct-2022
Industrial Thermometer Standard (iPRT)	5627A	973798	21-970-007	15-Oct-2022

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

3. Condition of equipment : Used

4. Calibration site : On-Site

Result of Calibration

Calibration result : Without Adjustment

Calibration point (°C)	STD. Value (°C)	UUC Reading (°C)	Correction value (°C)	Uncertainty ± (°C)
20	19.9782	20.0	- 0.0218	0.10
25	24.9860	25.0	- 0.0140	0.10
30	29.9957	30.0	- 0.0043	0.10

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

Immersion Depth : 130 mm

ID No. : N/A

S/N No. : 30014096

UUC : Unit Under Calibration.

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. : 21-1003-008

Issue Date : 30 October 2021

Work Order No. : 21/1003

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 : 14 October 2021

Date of Calibration : 17 October 2021

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 : 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

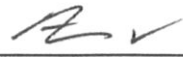
Temperature : Area Monitoring between 15°C to 40°C

Humidity : Area Monitoring between 30%RH to 85%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. Sitthisak Tonglim
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**

Certificate No. : 21-1003-008

Issue Date : 30 October 2021

Work Order No. : 21/1003

Details of Calibration**1. Reference Standards Instrument**

Instrument	Model	Serial No. / ID No.	Certification	Due Date
Thermometer Readout	1586A	2827002	QR21-1944	7-Sep-2022
Platinum Resistance Thermometers (PRT)	56188	967446	QR21-1944	7-Sep-2022

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

3. Condition of equipment : Used

4. Calibration site : On-Site

Result of Calibration

Calibration result : Without Adjustment

Sensor ID TC-K-01 Connected with channel T2

Calibration point (°C)	STD. Value (°C)	UUC Reading (°C)	Correction value (°C)	Uncertainty ± (°C)
0	0.003	0.1	- 0.097	0.60
3	3.007	3.1	- 0.093	0.60
20	20.012	20.1	- 0.088	0.60

Sensor ID TC-K-02 Connected with channel T2

Calibration point (°C)	STD. Value (°C)	UUC Reading (°C)	Correction value (°C)	Uncertainty ± (°C)
0	0.013	0.1	- 0.087	0.60
150	150.003	150.1	- 0.097	0.60

Sensor ID TC-K-01 Connected with channel T1

Calibration point (°C)	STD. Value (°C)	UUC Reading (°C)	Correction value (°C)	Uncertainty ± (°C)
0	-0.016	0.1	+ 0.116	0.60
380*	380.178	380.5	+ 0.322	0.75

Note : (*) not accreditation TISI

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

Sheath Material : Stainless Steel

ID No. : N/A

S/N No. : N/A

Immersion Depth : 130 mm

Dimension of Sensor : AWG 30

Length : 2 metres (TC-K-02)

UUC : Unit Under Calibration.

Dimension of Sensor : 3 mm

Length : 350mm (TC-K-01)

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%.



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. : 21-1003-009

Issue Date : 30 October 2021

Work Order No. : 21/1003

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 : 14 October 2021

Date of Calibration : 16 October 2021

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 : Miss Koollanut Mala
Calibration Engineer

Approved by : 
(Mr. Anuwat Yaklermjit)
Laboratory Manager

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Salathammasop, Thawewatthana, Bangkok 10170 Thailand

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



CERTIFICATE OF CALIBRATION

Issue Date : 30 October 2021

Certificate No. : 21-1003-009

Work Order No. : 21/1003

Details of Calibration

1. Reference Standards Instrument

Instrument	Serial No.	ID No.	Certification	Due Date
1.1 Chilled Mirror Hygrometer	157151 / 157152	CHM-01	TH-0069-21	07 July 2022
1.2 Digital Thermometer with RTD	15000016 / RTD-11	DTM-03	21-970-005	22 October 2022

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 Measurement : Without Adjustment

Resolution of UUC : 0.1 °C

Calibration Point (°C)	Average Standard Reading (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty ± (°C)
22	22.03	21.9	+ 0.13	0.30
25	25.03	24.9	+ 0.13	0.30
28	28.05	27.9	+ 0.15	0.30

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	50.20	52.0	- 1.80	1.2
60	60.35	62.0	- 1.65	1.4
70	70.39	71.0	- 0.61	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

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%.



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CERTIFICATE OF CALIBRATION

Certificate No. : 21-1003-010

Issue Date : 30 October 2021

Work Order No. : 21/1003

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 : 14 October 2021

Date of Calibration : 16 October 2021

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 $55\%\text{RH} \pm 20\%\text{RH}$

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 : Miss Koollanut Mala
Calibration Engineer

Approved by : 
(Mr. Anuwat Yaklermjit)
Laboratory Manager

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**CERTIFICATE OF CALIBRATION**

Certificate No. : 21-1003-010

Issue Date : 30 October 2021

Work Order No. : 21/1003

Details of Calibration**1. Reference Standards Instrument**

Instrument	Serial No.	ID No.	Certification	Due Date
1.1 Chilled Mirror Hygrometer	157151 / 157152	CHM-01	TH-0069-21	07 July 2022
1.2 Digital Thermometer with RTD	15000016 / RTD-11	DTM-03	21-970-005	22 October 2022

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 Measurement** : Without Adjustment

Resolution of UUC : 0.1 °C

Calibration Point (°C)	Average Standard Reading (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty ± (°C)
20	20.04	19.9	+ 0.14	0.30
25	25.06	24.8	+ 0.26	0.30
30	30.08	29.7	+ 0.38	0.30

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	40.27	40.0	+ 0.27	1.2
50	50.18	50.0	+ 0.18	1.2
60	60.44	60.0	+ 0.44	1.4

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

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. : 21-1003-005

Issue Date : 25 October 2021

Work Order No. : 21/1003

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 : 20 October 2021

Date of Calibration : 20 October 2021

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 : Service Room

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. Kritsada Kaewwangpa
Calibration Engineer

Approved by : 
(Mr. Anuwat Yaklermjit)
Laboratory Manager

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CERTIFICATE OF CALIBRATION

Issue Date : 25 October 2021

Certificate No. : 21-1003-005

Work Order No. : 21/1003

Details of Calibration

1. Reference Standards Instrument

Instrument	Model	Serial No./Ins No.	Certificate No.	Due Date
Data Acquisition unit	34972A	MY49024826	20-1162-015	25 November 2021
Sensor type	RTD	RTD#101-109	20-1162-015	25 November 2021

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 36 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

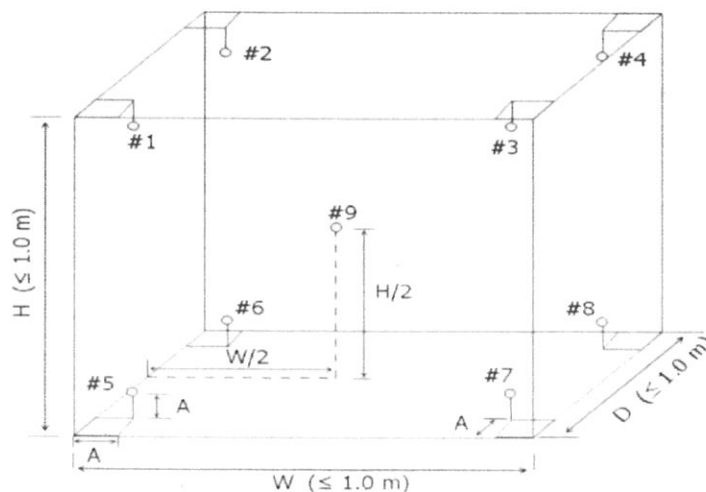


Diagram of Chamber

Handwritten signature



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CERTIFICATE OF CALIBRATION

Issue Date : 25 October 2021

Certificate No. : 21-1003-005

Work Order No. : 21/1003

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	20.39	20.00	19.98	19.77	20.11	19.70	19.68	19.84	19.67	0.33

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	0.16	0.87	0.99

Note

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

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

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

The quoted uncertainty includes "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. : 21-1003-004

Issue Date : 25 October 2021

Work Order No. : 21/1003

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 : 20 October 2021

Date of Calibration : 20 October 2021

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

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. Kritsada Kaewwangpa
Calibration Engineer

Approved by : 
(Mr. Anuwat Yaklermjit)
Laboratory Manager

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CERTIFICATE OF CALIBRATION

Issue Date : 25 October 2021

Certificate No. : 21-1003-004

Work Order No. : 21/1003

Details of Calibration

1. Reference Standards Instrument

Instrument	Model	Serial No./Ins No.	Certificate No.	Due Date
Data Acquisition unit	34972A	MY49024826	20-1162-015	25 November 2021
Sensor type	RTD	RTD#201-209	20-1162-015	25 November 2021

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 36 Minute At cal. point 4 °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 = 1.2 m ; D = 0.4 m ; H = 1.2 m

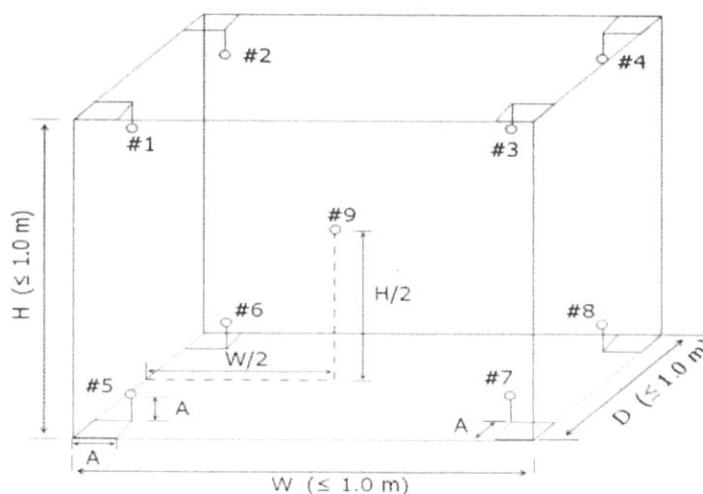


Diagram of Chamber



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CERTIFICATE OF CALIBRATION

Issue Date : 25 October 2021

Certificate No. : 21-1003-004

Work Order No. : 21/1003

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
	#1	#2	#3	#4	#5	#6	#7	#8	#9	
	± (°C)									
3.0	3.92	3.87	4.10	3.66	4.26	4.18	2.97	2.90	2.81	0.41

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	0.04	1.51	1.53

Note

Calibrate items it good condition 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%.

CALIBRATION REPORT



Cert. Number
BTC-T-23/64


Page 1 of 3 pages

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Date of Issue 30 October 2021

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

Approved Signatory


P.Prasitamate

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 : 14 October 2021

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.

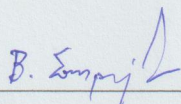
Tractability Information

Reference Standards Description	Serial Number	Certificate Number	Cal. Date	Dule Date.
<input type="checkbox"/> STD Thermometer with Probe, PRT	B3C038/02709, Ch1	PSL-T 430/63	1-7/April/2020	8/April/2021

Equipment Description	Serial Number	Certificate Number	Cal. Date	Dule Date.
Data logger With Probe (TC-K- 01-10)	MY49020096	BTC-T-001-64	20/April/2021	19/April/2022
	Maker: Agilent	Model: 34972A	Make in USA	

This certification is traceable to the International System of Unit through the reference standard laboratory of In-house CMT 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) Industrial Metrology and Testing Service Centre (Laboratories was Accreditation by TISI According to ITS ISO / IEC 17025)

Calibrated By:



(Mr. Boonlue Somprajob)

Date of Calibration : 14 October 2021

CALIBRATION REPORT

Issued By B.T.METROLOGY CO.,LTD.

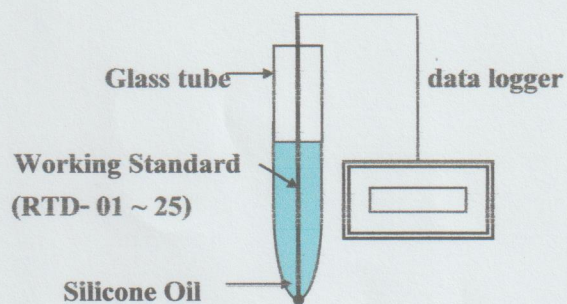
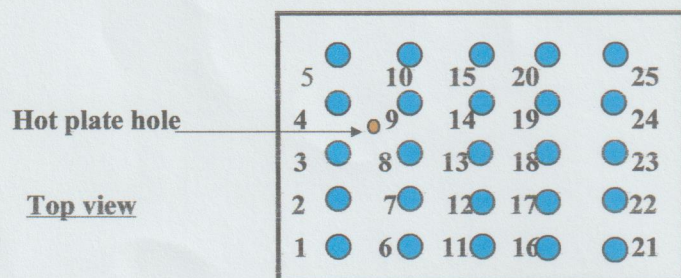
Date of Issue 23 October 2021



Cert. Number
BTC-T-23/64

Page 2 of 3 pages

Appendix A.



Calibrated By:

(Mr. Boonlue Somprajob)

Date of Calibration : 14 October 2021

CALIBRATION REPORT



Cert. Number
BTC-T-23/64

Page 3 of 3 pages

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Date of Issue 23 October 2021

Hole No. (Position)	Max (°C)	Min (°C)	Mid-Range (°C)	Difference (°C)	Uncertainty of measurement (\pm °C)
1	149.9	149.9	149.90	0.00	0.70
2	149.8	149.7	149.75	0.10	
3	149.7	149.6	149.65	0.10	
4	149.8	149.7	149.75	0.10	
5	149.8	149.7	149.75	0.10	
6	149.2	149.0	149.10	0.20	
7	149.8	149.6	149.70	0.20	
8	149.8	149.6	149.70	0.20	
9	149.5	149.3	149.40	0.20	
10	149.5	149.4	149.45	0.10	
11	150.2	150.1	150.15	0.10	
12	150.6	150.5	150.55	0.10	
13	150.5	150.4	150.45	0.10	
14	150.2	150.0	150.10	0.20	
15	149.9	149.8	149.85	0.10	
16	149.8	149.7	149.75	0.10	
17	149.8	149.6	149.70	0.20	
18	150.1	149.9	150.00	0.20	
19	149.1	149.0	149.00	0.10	
20	149.7	149.4	149.55	0.30	
21	149.9	149.8	149.85	0.10	
22	149.7	149.5	149.60	0.20	
23	149.8	149.6	149.70	0.20	
24	149.5	149.4	149.45	0.10	
25	149.2	149.1	149.15	0.10	
Hot plate hole	149.2	149.1	149.15	0.70	

Calibrated By:

(Mr. Boonlue Somprajob)

Date of Calibration : 14 October 2021

CALIBRATION REPORT

Issued By B.T.METROLOGY CO.,LTD.
Date of Issue 23 October 2021



Cert. Number
BTC-T-23/64
Page 4 of 3 pages

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	150.1-150.0	149.7	150.6	149.0	0.3	1.4	1.6

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 : 14 October 2021