


เอกสารสอบเทียบเครื่องมือวัด

Mettler-Toledo (Thailand) Limited
272 Soi. Soonvijai 4, Bangkapi
Huaykwang, Bangkok 10310
THAILAND
www.mt.com



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 1 9 7 0 5 6 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/W003/16

This calibration certificate contains measurements for As Found and As Left calibrations.

The sensitivity/span of the weighing instrument was adjusted before As Found and As Left calibrations with a built-in weight.

	Temperature		Humidity	
As Found	Start: 26.2 °C	End: 26.9 °C	Start: 41.5 %	End: 42.4 %
As Left	Start: 26.9 °C	End: 26.5 °C	Start: 41.9 %	End: 41.3 %

As Found Calibration Date: 25-Aug-2020
As Left Calibration Date: 25-Aug-2020
Issue Date: 26-Aug-20

Calibrator:

Phithawat Kunavuti

Approved Signatory:

- ☐ Kassakorn Tassanachaisakul
☐ Santi Jitniyom
☒ Surachet Sukkate

Measurement Results

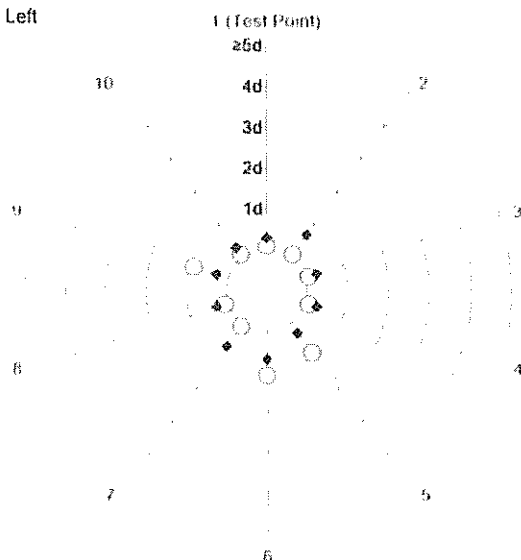
Repeatability

Test Load: 100 g

	As Found	As Left
1	99.9996 g	100.0001 g
2	99.9996 g	100.0000 g
3	99.9996 g	100.0001 g
4	99.9996 g	100.0001 g
5	99.9997 g	100.0001 g
6	99.9995 g	100.0000 g
7	99.9996 g	100.0000 g
8	99.9996 g	100.0001 g
9	99.9997 g	100.0001 g
10	99.9996 g	100.0001 g

Standard Deviation	0.00006 g	0.00005 g
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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.

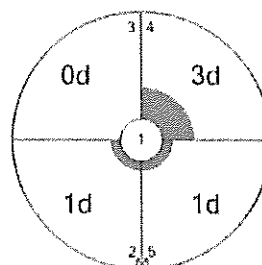
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

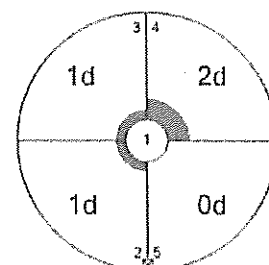
Test Load: 100 g

Position	As Found	As Left
1	99.9998 g	100.0000 g
2	99.9999 g	100.0001 g
3	99.9998 g	100.0001 g
4	99.9995 g	99.9998 g
5	99.9997 g	100.0000 g

Maximum Deviation	0.0003 g	0.0002 g
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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.

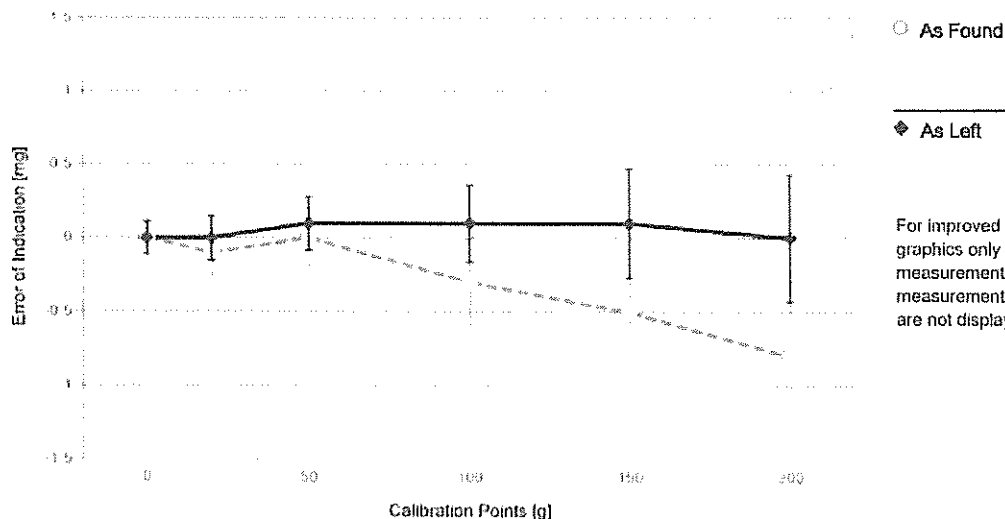
Error of Indication

As Found

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.0000 g	0.0000 g	0.0000 g	0.13 mg	2
2	0.0500 g	0.0500 g	0.0000 g	0.14 mg	2
3	0.1000 g	0.1000 g	0.0000 g	0.14 mg	2
4	0.5000 g	0.5000 g	0.0000 g	0.14 mg	2
5	1.0000 g	1.0000 g	0.0000 g	0.14 mg	2
6	10.0000 g	10.0000 g	0.0000 g	0.15 mg	2
7	20.0000 g	19.9999 g	-0.0001 g	0.16 mg	2
8	50.0000 g	50.0000 g	0.0000 g	0.20 mg	2
9	100.0000 g	99.9997 g	-0.0003 g	0.29 mg	2
10	150.0000 g	149.9995 g	-0.0005 g	0.42 mg	2
11	200.0000 g	199.9992 g	-0.0008 g	0.51 mg	2

As Left

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.0000 g	0.0000 g	0.0000 g	0.11 mg	2
2	0.0500 g	0.0500 g	0.0000 g	0.13 mg	2
3	0.1000 g	0.1000 g	0.0000 g	0.13 mg	2
4	0.5000 g	0.5000 g	0.0000 g	0.13 mg	2
5	1.0000 g	1.0000 g	0.0000 g	0.13 mg	2
6	10.0000 g	10.0000 g	0.0000 g	0.14 mg	2
7	20.0000 g	20.0000 g	0.0000 g	0.15 mg	2
8	50.0000 g	50.0001 g	0.0001 g	0.18 mg	2
9	100.0000 g	100.0001 g	0.0001 g	0.26 mg	2
10	150.0000 g	150.0001 g	0.0001 g	0.37 mg	2
11	200.0000 g	200.0000 g	0.0000 g	0.43 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.:	WS38	Date of Issue:	17-Mar-2020
Certificate Number:	166237	Calibration Due Date:	09-Sep-2021

Thermo Hygrometer

Equipment No.:	IN74	Date of Issue:	24-Jun-2020
Certificate Number:	20H1531	Calibration Due Date:	24-Jun-2021

Remarks

FACT adjustment functionality activated
Value of the built-in weight adjusted
Equipment condition: Good
Next calibration according to customer's procedure

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: $5 K$

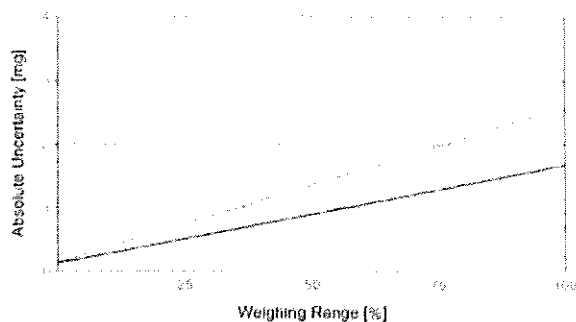
Linearization of Uncertainty Equation

	Range	As Found	As Left
1	0 g - 220 g	$U_1 = 0.14 \text{ mg} + 0.0111 \text{ mg/g} \cdot R$	$U_1 = 0.13 \text{ mg} + 0.00703 \text{ mg/g} \cdot R$

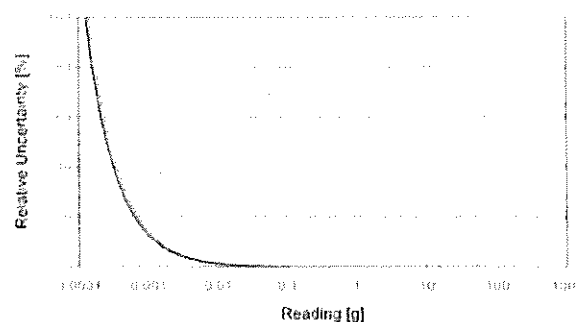
To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

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

Net Indication	As Found		As Left	
0.0220 g	0.14 mg	0.64%	0.13 mg	0.59%
0.2200 g	0.14 mg	0.065%	0.13 mg	0.060%
2.2000 g	0.16 mg	0.0075%	0.15 mg	0.0066%
22.0000 g	0.38 mg	0.0017%	0.28 mg	0.0013%
220.0000 g	2.6 mg	0.0012%	1.7 mg	0.00076%

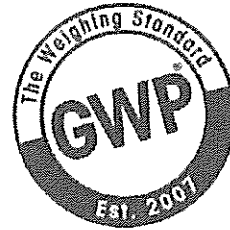


As Found



As Left

GWP® Certificate



As
Found



As
Left



The weighing device meets the given
process requirements.

The weighing device meets the given
process requirements.



The weighing device does not meet the given safety factor
requirements.

Tests Performed:



As Found



As Left

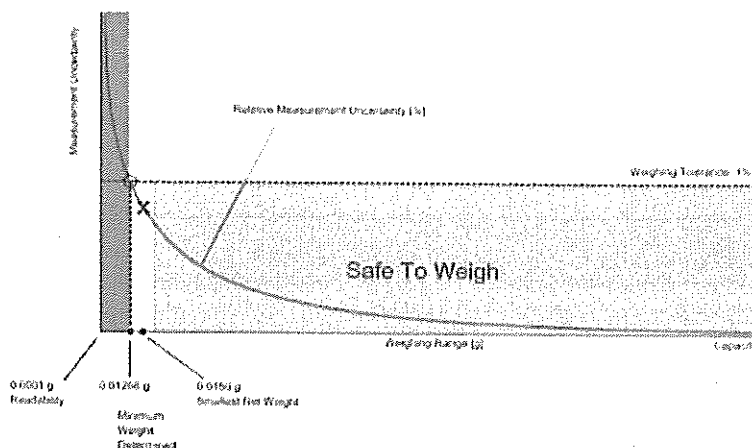
Process Requirements

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					
Tolerance	Safety Factor				
	1	2	3	5	10
0.1%	0.14141 g	0.28603 g	0.43397 g	0.74029 g	1.57300 g
0.2%	0.07031 g	0.14141 g	0.21331 g	0.35958 g	0.74029 g
0.5%	0.02803 g	0.05610 g	0.08447 g	0.14111 g	0.28603 g
1%	0.01400 g	0.02803 g	0.04209 g	0.07031 g	0.14141 g
2%	0.00700 g	0.01400 g	0.02101 g	0.03506 g	0.07031 g
5%	0.00280 g	0.00560 g	0.00840 g	0.01400 g	0.02803 g



Pass: The determined minimum weight meets the requirement for the smallest net weight.

As Left Minimum Weight Table

Minimum weights for different weighing tolerances and safety factors					
Tolerance	Safety Factor				
	1	2	3	5	10
0.1%	0.12739 g	0.25659 g	0.38765 g	0.65550 g	1.36058 g
0.2%	0.06347 g	0.12739 g	0.19176 g	0.32189 g	0.65550 g
0.5%	0.02533 g	0.05074 g	0.07622 g	0.12739 g	0.25659 g
1%	0.01266 g	0.02533 g	0.03803 g	0.06347 g	0.12739 g
2%	0.00633 g	0.01266 g	0.01899 g	0.03168 g	0.06347 g
5%	0.00253 g	0.00506 g	0.00759 g	0.01266 g	0.02533 g



Pass: The determined minimum weight meets the requirement for the smallest net weight.



The determined minimum weight does not meet the safety factor.

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	0.00006 g*	N/A	0.00005 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*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	0.0003 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	-0.0001 g	0.0100 g	0.0200 g	0.0500 g	0.1000 g	0.2000 g	0.5000 g
50.0000 g	0.0000 g	0.0250 g	0.0500 g	0.1250 g	0.2500 g	0.5000 g	1.2500 g
100.0000 g	-0.0003 g	0.0500 g	0.1000 g	0.2500 g	0.5000 g	1.0000 g	2.5000 g
150.0000 g	-0.0005 g	0.0750 g	0.1500 g	0.3750 g	0.7500 g	1.5000 g	3.7500 g
200.0000 g	-0.0008 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	0.0001 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
200.0000 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

Calibration Laboratory
Mettler-Toledo (Thailand) Limited
272 Soi Soenvijai 4, Bangkok
Huaykwang, Bangkok 10310
THAILAND
www.mt.com

METTLER TOLEDO

Certificate Number : CCM-0538-20-C

CERTIFICATE OF CALIBRATION

Customer


Company : WATER INDEX & CONSULTANT CO., LTD.
Address : 229/7-B Soi Charan Sanit Wong 95/1, Charan Sanit Wong Road
City : Bangkok, Bangkok
Zip/Postal : BANGKOK 10700
Customer ID : 301612380
Work Order No. : 220436957

Device

Object / Equipment : Weights set 1 g - 200 g
Calibration : Conventional Mass
Serial No. : ---
Comment : Recalibration.
Manufacturer : METTLER TOLEDO
Type / Model : F1
ID No. : ---
(Provide by customer)

Environment Conditions

Ambient Temperature : $(22 \pm 2) ^\circ \text{C}$
Atmospheric Pressure : $(1010 \pm 10) \text{ hPa}$
Calibration procedure : In-house method : CP/M001/02 based on OIML R 111-1 : 2004(E)
Relative Humidity : $(50 \pm 10) \%$
Mean air density : $(1.2 \pm 0.3) \text{ kg/m}^3$

Date of Receipt : August 24, 2020
Date of Calibration : August 28, 2020
Calibrated By : Gawin Thananthong.
Approved by : 
Approved Signatory
☒ Sunida Jaroenyot.
☐ Surachet Sukkate.
Date of Issued : August 31, 2020

Measurement results, measurement uncertainties with confidence interval and measurement procedure are listed on the following pages and form part of the certificate

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NSC-TISI-TIS 17025
CALIBRATION 0062

Calibration Laboratory
Mettler-Toledo (Thailand) Limited
272 Soi Soonvijai 4, Bangkok
Huaykwang, Bangkok 10310
THAILAND
www.mt.com

METTLER TOLEDO Service

Certificate Number : CCM-0538-20-C

Device

Object / Equipment : Weights set 1 g - 200 g

Manufacturer : METTLER TOLEDO

Calibration : Conventional Mass

Type / Model : F1

Serial No. : ---

ID No. : ---

(Provide by customer)

Data Sheet Conventional Mass Value

Nominal Value	Marking	Conventional Mass	Uncertainty	OIML Error
1 g	14011022	1 g + 0.017 mg	0.030 mg	± 0.10 mg
10 g	14011353	10 g - 0.145 mg	0.060 mg	± 0.20 mg
100 g	11119461	100 g - 0.25 mg	0.16 mg	± 0.5 mg
200 g		200 g - 0.18 mg	0.30 mg	± 1.0 mg

Condition of calibrated object : Weights are in good condition

Result of calibration : ☒ Before Adjustment ☐ After Adjustment

Data Sheet Conventional Mass Value

Nominal Value	Marking	Conventional Mass	Uncertainty	OIML Error
1 g	14011022	1 g + 0.017 mg	0.030 mg	± 0.10 mg
10 g	14011353	10 g + 0.004 mg	0.060 mg	± 0.20 mg
100 g	11119461	100 g - 0.25 mg	0.16 mg	± 0.5 mg
200 g		200 g - 0.18 mg	0.30 mg	± 1.0 mg

Condition of calibrated object : Weights are in good condition

Result of calibration : ☐ Before Adjustment ☒ After Adjustment

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



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METTLER TOLEDO Service

Certificate Number : CCM-0538-20-C

Device

Object / Equipment :	Weights set 1 g - 200 g	Manufacturer :	METTLER TOLEDO
Calibration :	Conventional Mass	Type / Model :	F1
Serial No. :	---	ID No. :	---

(Provide by customer)

Calibration Object

Material :	Stainless steel	Density :	(7950 ± 140) kg/m ³
Case :	Contained in a wooden and plastic box.		

Measurement method

The calibration was performed by comparison with the reference weights of the Calibration Center in air by using the substitution weighing method (ABA) on a mass comparator, the conventional mass values were determined.

The conventional density of the weights : 8000 kg/m³

The calibration was performed by using Calibration Laboratory's in-house calibration method # CP/M001/02

Reference standards instrument :

Instrument	OIML Class	Model	Serial No./Control No.	Certificate No.	Due Date
Standard weight set METTLER TOLEDO	E2	1 mg - 1 kg MCL026Dot		160602	Mar 18, 2021
Mass Comparator		MT5	M94145	TH2020-017-041920-ACC-TH	Apr 18, 2021
Mass Comparator		AX1005	1121332056	TH2020-019-041920-ACC-TH	Apr 18, 2021

Measurement Uncertainty

The given extended measurement uncertainty is the standard uncertainty of the measurement multiplied by an extension factor $k = 2$, which corresponds to a confidence level of about 95% for a normal distribution.

The standard uncertainty was calculated according to the publication "Expression of the uncertainty of measurement in calibration", Doc. EA-4/02, from the components of uncertainty of the reference, of the calibration procedure and environmental conditions as well as of the short-term effects of the measured object. Except calculation of the standard uncertainty due to magnetism (Uma) in case weight don't accordance with the requirement OIML Recommendations.

Traceability

The measurement is traceable to national standards, which realize the physical units of measurement (SI).

- Swiss Federal Office of Metrology and Accreditation (METAS), through Mettler-Toledo GmbH, Switzerland (SCS032)
- Swiss Federal Office of Metrology and Accreditation (METAS), through Calibration Lab MT-TH Calibration No.0062)

END OF REPORT



CALIBRATION LABORATORY CO., LTD.

2/10-11,14,55 Soi Prasert Manukit 29 Yeak 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



Supplement to Calibration Certificate No. Q20071064

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : GRADUATED CYLINDER
MANUFACTURER : WITEG
MODEL / TYPE : 50 ml
SERIAL NO. : N/A [198G62-3]
CLID. NO. : 272001155
JOB CONTROL NO. : 200818071064

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

DATE OF RECEIVED : 18 August 2020

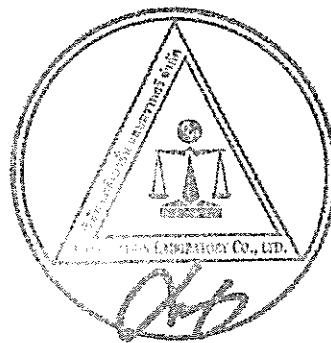
DATE OF ISSUED : 27 August 2020

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

27 August 2020



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. Q20071064A1

F3-012-04/01-12

page 1 of 3



@clccalibration



CALIBRATION LABORATORY Co., LTD.

2/10-11,14, 55 Soi Prasert Manukit 29 Yeak 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



REPORT OF CALIBRATION FOR

NOMENCLATURE : GRADUATED CYLINDER
MANUFACTURER : WITEG
MODEL / TYPE : 50 ml
SERIAL NO. : N/A [198G62-3]
DATE OF CALIBRATION : 21 August 2020

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

Liquid-in Glass Thermometer 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. Liquid-in Glass Thermometer, Brannan S/N. 1.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q20020444, Due Date 09 March 2021.
2. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q20031363, Due Date 08 April 2021.
3. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q20018100, Due Date 28 February 2021.
4. The measurements are traceable to International System of Units (SI), through Technology Promotion Association (Thailand-Japan). Certificate No. 201501, Due Date 23 April 2021.

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. Q20071064

F3-011-04/01-12

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@clccalibration



CALIBRATION LABORATORY Co., LTD.

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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
10	10.0903	+0.0903	0.0120	2,00
30	30.1034	+0.1034	0.0180	2,00
50	50.1052	+0.1052	0.0180	2,00

Type of glassware : ☒ to Contain ☐ to Deliver

Note. N/A = No Assignment

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

End of Certificate

Certificate No. Q20071064

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



NSQ-TIS-17025
CALIBRATION 0059
CLC

Supplement to Calibration Certificate No. Q20071065

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : GRADUATED CYLINDER
MANUFACTURER : ISOLAB
MODEL / TYPE : 100 ml
SERIAL NO. : 3133-56
CLID. NO. : 27141910
JOB CONTROL NO. : 200818071065

CUSTOMER : 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 : 18 August 2020

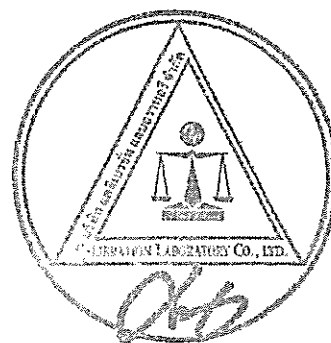
DATE OF ISSUED : 27 August 2020

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

27 August 2020



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. Q20071065A1

F3-012-04/01-12

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NSC-TISI-TIS 17025
CALIBRATION 0659
CLC

REPORT OF CALIBRATION FOR

NOMENCLATURE : GRADUATED CYLINDER
MANUFACTURER : ISOLAB
MODEL / TYPE : 100 ml
SERIAL NO. : 3133-56
DATE OF CALIBRATION : 21 August 2020

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

Liquid-in Glass Thermometer 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. Liquid-in Glass Thermometer, Brannan S/N. 1.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q20020444, Due Date 09 March 2021.
2. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q20018099, Due Date 27 February 2021.
3. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q20018100, Due Date 28 February 2021.
4. The measurements are traceable to International System of Units (SI), through Technology Promotion Association (Thailand-Japan). Certificate No. 201501, Due Date 23 April 2021.

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. Q20071065

F3-011-04/01-12

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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
10	10.447	+0.447	0.013	2,00
50	50.442	+0.442	0.018	2,00
100	100.463	+0.463	0.035	2,00

Type of glassware : ☒ to Contain ☐ to Deliver

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

End of Certificate

Certificate No. Q20071065

F3-011-04/01-12

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Supplement to Calibration Certificate No. Q20071066

CERTIFICATE OF CALIBRATION FOR

NOMENCLATURE : VOLUMETRIC FLASK
MANUFACTURER : ISOLAB
MODEL / TYPE : 50 ml
SERIAL NO. : G17217-12
CLID. NO. : 272001156
JOB CONTROL NO. : 200818071066

CUSTOMER : 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 : 18 August 2020

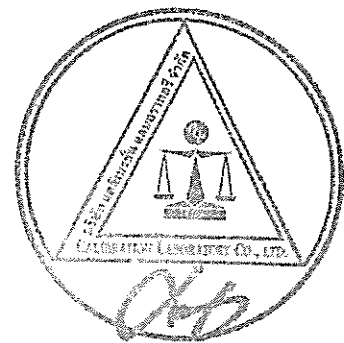
DATE OF ISSUED : 27 August 2020

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

27 August 2020



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. Q20071066A1

F3-012-04/01-12

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REPORT OF CALIBRATION FOR

NOMENCLATURE : VOLUMETRIC FLASK
MANUFACTURER : ISOLAB
MODEL / TYPE : 50 ml
SERIAL NO. : G17217-12
DATE OF CALIBRATION : 21 August 2020

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 Liquid-in Glass Thermometer 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. Liquid-in Glass Thermometer, Brannan S/N. 1.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q20020444, Due Date 09 March 2021.
2. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q20031363, Due Date 08 April 2021.
3. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q20018100, Due Date 28 February 2021.
4. The measurements are traceable to International System of Units (SI), through Technology Promotion Association (Thailand-Japan). Certificate No. 201501, Due Date 23 April 2021.

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. Q20071066

F3-011-04/01-12

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2/10-11,14,55 Soi Prasert Manukit 29 Yeak 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
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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
50	49.9860	-0.0140	0.0120	2,00

Type of glassware : ☒ to Contain ☐ to Deliver

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

End of Certificate

Certificate No. Q20071066

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Supplement to Calibration Certificate No. Q20071067

CERTIFICATE OF CALIBRATION FOR

NOMENCLATURE : VOLUMETRIC FLASK
MANUFACTURER : WITEG
MODEL / TYPE : 100 ml
SERIAL NO. : 173618-2
CLID. NO. : 272001157
JOB CONTROL NO. : 200818071067

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

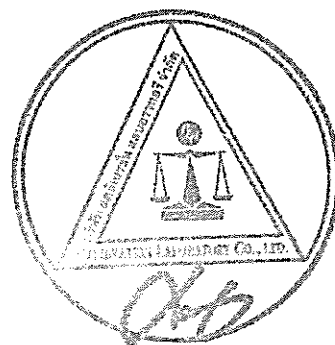
DATE OF RECEIVED : 18 August 2020

DATE OF ISSUED : 27 August 2020

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
27 August 2020



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. Q20071067A1

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



REPORT OF CALIBRATION FOR

NOMENCLATURE : VOLUMETRIC FLASK
MANUFACTURER : WITEG
MODEL / TYPE : 100 ml
SERIAL NO. : 173618-2
DATE OF CALIBRATION : 21 August 2020

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

Liquid-in Glass Thermometer 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. Liquid-in Glass Thermometer, Brannan S/N. 1.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q20020444, Due Date 09 March 2021.
2. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q20031363, Due Date 08 April 2021.
3. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q20018100, Due Date 28 February 2021.
4. The measurements are traceable to International System of Units (SI), through Technology Promotion Association (Thailand-Japan). Certificate No. 201501, Due Date 23 April 2021.

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. Q20071067

F3-011-04/01-12

page 2 of 3



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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
100	99.9484	-0.0516	0.0190	2,00

Type of glassware : ☒ to Contain ☐ to Deliver

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

End of Certificate

Certificate No. Q20071067

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



Supplement to Calibration Certificate No. Q20071068

CERTIFICATE OF CALIBRATION FOR

NOMENCLATURE : VOLUMETRIC FLASK
MANUFACTURER : WITEG
MODEL / TYPE : 1000 ml
SERIAL NO. : 175618-2
CLID. NO. : 272001158
JOB CONTROL NO. : 200818071068

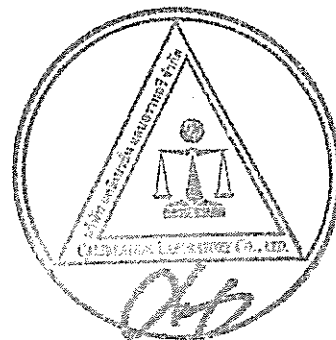
CUSTOMER : WATER INDEX & CONSULTANT CO., LTD.
229/7-8 SOI CHARAN SANIT WONG 95/1,
CHARAN SANIT WONG RD., BANG-AOR, BANGPHLAT, BANGKOK 10700

DATE OF RECEIVED : 18 August 2020

DATE OF ISSUED : 27 August 2020

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
27 August 2020

This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the
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Certificate No. Q20071068A1

F3-012-04/01-12

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REPORT OF CALIBRATION FOR

NOMENCLATURE : VOLUMETRIC FLASK
MANUFACTURER : WITEG
MODEL / TYPE : 1000 ml
SERIAL NO. : 175618-2
DATE OF CALIBRATION : 21 August 2020

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

Liquid-in Glass Thermometer 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. Liquid-in Glass Thermometer, Brannan S/N. 1.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q20020444, Due Date 09 March 2021.
2. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q20034622, Due Date 21 April 2021.
3. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q20018100, Due Date 28 February 2021.
4. The measurements are traceable to International System of Units (SI), through Technology Promotion Association (Thailand-Japan). Certificate No. 201501, Due Date 23 April 2021.

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. Q20071068

F3-011-04/01-12

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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	999.81	-0.19	0.14	2,00

Type of glassware : ☒ to Contain ☐ to Deliver

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

End of Certificate

Certificate No. Q20071068

F3-011-04/01-12

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NSC-TISI-TIS 17025
CALIBRATION 0059
CLC

Supplement to Calibration Certificate No. Q20071069

CERTIFICATE OF CALIBRATION FOR

NOMENCLATURE : MEASURING PIPETTE
MANUFACTURER : WITEG
MODEL / TYPE : 5 ml
SERIAL NO. : 184G62-10
CLID. NO. : 272001159
JOB CONTROL NO. : 200818071069

CUSTOMER : 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 : 18 August 2020

DATE OF ISSUED : 27 August 2020

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

27 August 2020



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. Q20071069A1

F3-012-04/01-12

page 1 of 3



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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



REPORT OF CALIBRATION FOR

NOMENCLATURE : MEASURING PIPETTE
MANUFACTURER : WITEG
MODEL / TYPE : 5 ml
SERIAL NO. : 184G62-10
DATE OF CALIBRATION : 20 August 2020

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

Liquid-in Glass Thermometer 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. Liquid-in Glass Thermometer, Brannan S/N. 1.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q20020444, Due Date 09 March 2021.
2. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q20031363, Due Date 08 April 2021.
3. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q20018100, Due Date 28 February 2021.
4. The measurements are traceable to International System of Units (SI), through Technology Promotion Association (Thailand-Japan). Certificate No. 201501, Due Date 23 April 2021.

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. Q20071069

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



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	1.4989	-0.0011	0.0028	2,00
3.5	3.4947	-0.0053	0.0029	2,00
5	4.9878	-0.0122	0.0029	2,00

Type of glassware : ☐ to Contain ☒ to Deliver

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

End of Certificate

Certificate No. Q20071069

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



Supplement to Calibration Certificate No. Q20071070

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : MEASURING PIPETTE
MANUFACTURER : WITEG
MODEL / TYPE : 10 ml
SERIAL NO. : 185G63-10
CLID. NO. : 272001160
JOB CONTROL NO. : 200818071070

CUSTOMER : 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 : 18 August 2020

DATE OF ISSUED : 27 August 2020

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

27 August 2020



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. Q20071070A1

F3-012-04/01-12

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@clecalibration

REPORT OF CALIBRATION FOR

NOMENCLATURE	:	MEASURING PIPETTE
MANUFACTURER	:	WITEG
MODEL / TYPE	:	10 ml
SERIAL NO.	:	185G63-10
DATE OF CALIBRATION	:	20 August 2020

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 Liquid-in Glass Thermometer 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. Liquid-in Glass Thermometer, Brannan S/N. 1.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q20020444, Due Date 09 March 2021.
2. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q20031363, Due Date 08 April 2021.
3. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q20018100, Due Date 28 February 2021.
4. The measurements are traceable to International System of Units (SI), through Technology Promotion Association (Thailand-Japan). Certificate No. 201501, Due Date 23 April 2021.

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. Q20071070

F3-011-04/01-12





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NSG-TISI-TIS 17025
CALIBRATION 0056
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
3.5	3.5090	+0.0090	0.0029	2,00
5	5.0045	+0.0045	0.0029	2,00
7	7.0008	+0.0008	0.0039	2,00
10	9.9963	-0.0037	0.0039	2,00

Type of glassware : ☐ to Contain ☒ to Deliver

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

End of Certificate

Certificate No. Q20071070

F3-011-04/01-12

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NSC-TISI-TIS 17025
CALIBRATION 0059
CLC

Supplement to Calibration Certificate No. Q20071071

CERTIFICATE OF CALIBRATION FOR

NOMENCLATURE : MEASURING PIPETTE
MANUFACTURER : WITEG
MODEL / TYPE : 25 ml
SERIAL NO. : 186-G19-10
CLID. NO. : 272001161
JOB CONTROL NO. : 200818071071

CUSTOMER : 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 : 18 August 2020

DATE OF ISSUED : 27 August 2020

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

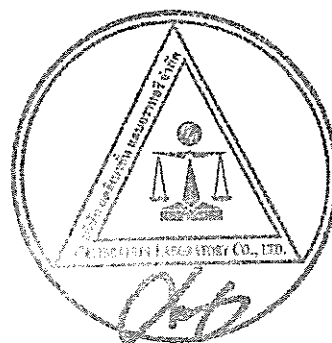
Calibrated By :

Prapaporn Khanchalee
Calibration Engineer

Approved By :

Mongkol Yotsoontorn
Authorized Signatory

27 August 2020



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. Q20071071A1

F3-012-04/01-12

page 1 of 3



@clccalibration



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REPORT OF CALIBRATION FOR

NOMENCLATURE : MEASURING PIPETTE
MANUFACTURER : WITEG
MODEL / TYPE : 25 ml
SERIAL NO. : 186-G19-10
DATE OF CALIBRATION : 20 August 2020

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

Liquid-in Glass Thermometer 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. Liquid-in Glass Thermometer, Brannan S/N. 1.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q20020444, Due Date 09 March 2021.
2. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q20031363, Due Date 08 April 2021.
3. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q20018100, Due Date 28 February 2021.
4. The measurements are traceable to International System of Units (SI), through Technology Promotion Association (Thailand-Japan). Certificate No. 201501, Due Date 23 April 2021.

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. Q20071071

F3-011-04/01-12

page 2 of 3



@clc calibration



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NSC-TISU-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	10.0042	+0.0042	0.0039	2,00
20	20.0068	+0.0068	0.0066	2,00
25	25.0108	+0.0108	0.0066	2,00

Type of glassware : ☐ to Contain ☒ to Deliver

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

End of Certificate

Certificate No. Q20071071

F3-011-04/01-12

page 3 of 3



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Supplement to Calibration Certificate No. Q20071072

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : BURETTE
MANUFACTURER : WITEG
MODEL / TYPE : 10 ml
SERIAL NO. : 287G63-1
CLID. NO. : 272001162
JOB CONTROL NO. : 200818071072

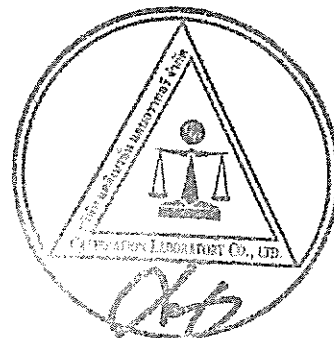
CUSTOMER : WATER INDEX & CONSULTANT CO., LTD.
229/7-8 SOI CHARAN SANIT WONG 95/1,
CHARAN SANIT WONG RD., BANG-AOR, BANGPHLAT, BANGKOK 10700

DATE OF RECEIVED : 18 August 2020

DATE OF ISSUED : 27 August 2020

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
27 August 2020

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. Q20071072A1

F3-012-04/01-12

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@clcalibration

REPORT OF CALIBRATION FOR

NOMENCLATURE : BURETTE
MANUFACTURER : WITEG
MODEL / TYPE : 10 ml
SERIAL NO. : 287G63-1
DATE OF CALIBRATION : 20 August 2020

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

Liquid-in Glass Thermometer 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. Liquid-in Glass Thermometer, Brannan S/N. 1.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q20020444, Due Date 09 March 2021.
2. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q20031363, Due Date 08 April 2021.
3. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q20018100, Due Date 28 February 2021.
4. The measurements are traceable to International System of Units (SI), through Technology Promotion Association (Thailand-Japan). Certificate No. 201501, Due Date 23 April 2021.

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. Q20071072

F3-011-04/01-12





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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
5	4.9979	-0.0021	0.0038	2,00
10	10.0021	+0.0021	0.0042	2,00

Type of glassware : ☐ to Contain ☒ to Deliver

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

End of Certificate

Certificate No. Q20071072

F3-011-04/01-12

page 3 of 3



clcalibration



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Supplement to Calibration Certificate No. Q20071073

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : BURETTE
MANUFACTURER : WITEG
MODEL / TYPE : 50 ml
SERIAL NO. : 189G63-2
CLID. NO. : 272001163
JOB CONTROL NO. : 200818071073

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

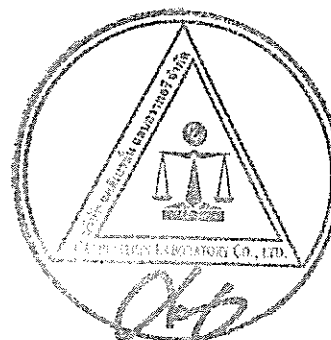
DATE OF RECEIVED : 18 August 2020

DATE OF ISSUED : 27 August 2020

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
27 August 2020



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. Q20071073A1

F3-012-04/01-12

page 1 of 3



@clccalibration

REPORT OF CALIBRATION FOR

NOMENCLATURE : BURETTE
MANUFACTURER : WITEG
MODEL / TYPE : 50 ml
SERIAL NO. : 189G63-2
DATE OF CALIBRATION : 20 August 2020

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

Liquid-in Glass Thermometer 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. Liquid-in Glass Thermometer, Brannan S/N. 1.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q20020444, Due Date 09 March 2021.
2. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q20031363, Due Date 08 April 2021.
3. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q20018100, Due Date 28 February 2021.
4. The measurements are traceable to International System of Units (SI), through Technology Promotion Association (Thailand-Japan). Certificate No. 201501, Due Date 23 April 2021.

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. Q20071073

F3-011-04/01-12





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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
20	19.9744	-0.0256	0.0066	2,00
50	49.9990	-0.0010	0.0110	2,00

Type of glassware : ☐ to Contain ☒ to Deliver

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

End of Certificate

Certificate No. Q20071073

F3-011-04/01-12

page 3 of 3



@clccalibration



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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 : 29 September 2020 Certificate No. : 20-981-003
Work Order No. : 20/981

Customer Name : Water Index & Consultal Co.,Ltd.
229/7-8 Soi Charn Sanit Wong 95/1, Charn Sait Wong Rd.,
Bang-Aor. Bangphlat Bangkok 10700

Date of Received : 8 September 2020
Date of Calibration : 8 September 2020

Instrument Details : Description : Temperature Controlled Enclosures [Incubator]
Manufacturer : Accuplus
Model : i250
Serial No. : 1250402-0110-0303
ID No. : N/A
Resolution : 0.1 °C
Location : Water Index & Consultal Co.,Ltd.

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	: Minimum	29 °C	Maximum	30 °C
Humidity	: Minimum	59 %	Maximum	63 %
Line Voltage	: Minimum	221 VAC	Maximum	223 VAC

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. Thinnakorn prasitimate
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 : 29 September 2020

Certificate No. : 20-981-003

Work Order No. : 20/981

Details of Calibration

1. Reference Standards Instrument

Instrument	Model	Serial No./Ins No.	Certificate No.	Due Date
Data Acquisition unit	34972A	MY57001206	20-113-025	06 March 2021
Sensor type	RTD	RTD#201-209	20-113-025	06 March 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

: New

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

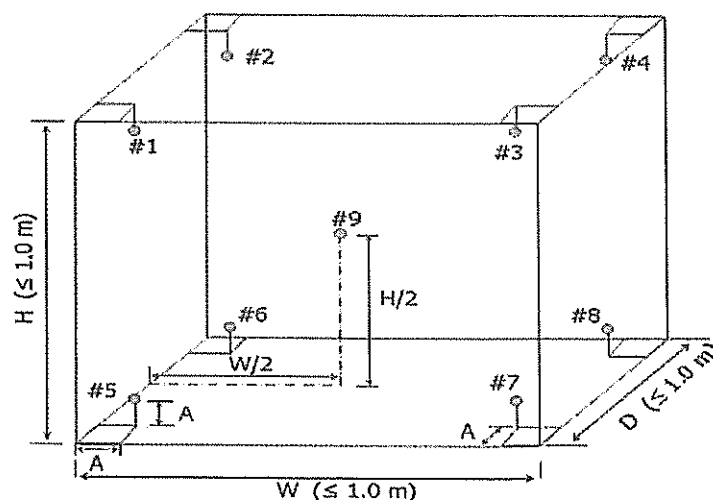


Diagram of Chamber

[Signature]



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CERTIFICATE OF CALIBRATION

Issue Date : 29 September 2020

Certificate No. : 20-981-003

Work Order No. : 20/981

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	20.30	20.27	20.36	20.25	20.19	20.25	20.19	20.24	20.09	0.57

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	19.5	19.9	0.24	0.57	0.61

Note

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.

[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

Issue Date : 29 September 2020
Certificate No. : 20-981-004
Work Order No. : 20/981

Customer Name : Water Index & Consultal Co.,Ltd.
229/7-8 Soi Charn Sanit Wong 95/1, Charn Sait Wong Rd.,
Bang-Aor. Bangphlat Bangkok 10700

Date of Received : 8 September 2020

Date of Calibration : 8 September 2020

Instrument Details : Description : Temperature Controlled Enclosures [Refrigerator]
Manufacturer : S-COOL
Model : SSM163T
Serial No. : 144201410
ID No. : N/A
Resolution : 0.1 °C
Location : Water Index & Consultal Co.,Ltd.

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	: Minimum	36 °C	Maximum	36 °C
Humidity	: Minimum	62 %	Maximum	65 %
Line Voltage	: Minimum	221 VAC	Maximum	223 VAC

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. Thinnakorn prasitamate
Calibration Engineer

Approved by : 
(Mr. Anuwat Yaklermjit)
Laboratory Manager

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Crystal Calibration Sales and Service Co., Ltd.

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Salathammassop, 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 : 29 September 2020

Certificate No. : 20-981-004

Work Order No. : 20/981

Details of Calibration

1. Reference Standards Instrument

Instrument	Model	Serial No./Ins No.	Certificate No.	Due Date
Data Acquisition unit	34972A	MY49024826	19-799-001	23 November 2020
Sensor type	RTD	RTD#301-309	19-799-001	23 November 2020

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 : New

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 = 1.2 m ; D = 0.4 m ; H = 1.2 m

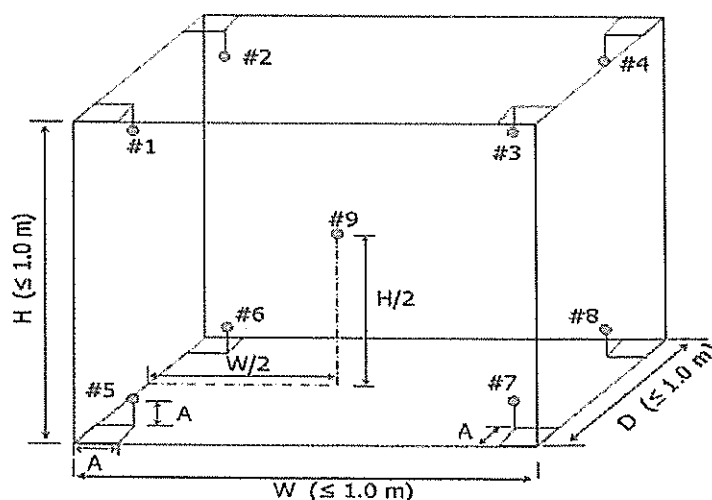


Diagram of Chamber



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CERTIFICATE OF CALIBRATION

Issue Date : 29 September 2020

Certificate No. : 20-981-004

Work Order No. : 20/981

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	3.31	3.33	2.91	3.40	3.67	3.33	3.10	3.05	2.82	0.30

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	0.05	0.89	0.92

Note

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. : 20-981-005

Issue Date : 29 September 2020

Work Order No. : 20/981

Customer Name : Water Index & Consultal Co.,Ltd.
229/7-8 Soi Charn Sanit Wong 95/1, Charn Sait Wong Rd.,
Bang-Aor. Bangphlat Bangkok 10700

Date of Received : 8 September 2020

Date of Calibration : 9 September 2020

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 Chemical Calibration Laboratory

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

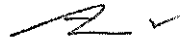
Environmental Condition

Temperature	: Minimum	22.2 °C	Maximum	23.1 °C
Humidity	: Minimum	49.3 %	Maximum	52.3 %

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. Wuttinun Yindeepot
Calibration Engineer

Approved by : 
(Mr. Anuwat Yaklermjit)
Laboratory Manager

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CERTIFICATE OF CALIBRATION

Issue Date : 29 September 2020

Certificate No. : 20-981-005

Work Order No. : 20/981

Details of Calibration

1. Reference Standards Instrument

Instrument	Model	Serial No. / ID No.	Certification	Due Date
Thermometer Readout	15B6A	2827002	QR20-1332	2-Sep-2021
Platinum Resistance Thermometers (PRT)	5618B	967446	QR20-1332	2-Sep-2021

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

3. Condition of equipment : New

4. Calibration site : Permanent

Result of Calibration

Calibration result : Without Adjustment

Sensor ID T-01 Connected Ch 1 Diameter 3mm , L:350 mm.

Calibration point (°C)	STD. Value (°C)	UUC* Reading (°C)	Correction value (°C)	Uncertainty ± (°C)
0	0.011	0.1	- 0.089	0.60
380*	380.063	380.0	+ 0.063	1.2

Sensor ID T-02 Connected Ch 2 diameter AWG no. 30

Calibration point (°C)	STD. Value (°C)	UUC* Reading (°C)	Correction value (°C)	Uncertainty ± (°C)
0	0.0113	0.1	- 0.089	0.60
3	3.0117	3.1	- 0.088	0.60
20	20.0097	20.1	- 0.090	0.60

Sensor ID T-03 Connected Ch 2 diameter AWG no. 30

Calibration point (°C)	STD. Value (°C)	UUC* Reading (°C)	Correction value (°C)	Uncertainty ± (°C)
0	0.0113	0.1	- 0.089	0.60
150	150.0203	150.3	- 0.280	0.60

Note : UUC* : Unit Under Calibration.

(*) Not TISI Accredited

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%.

--END--

PAGE 2/2



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CERTIFICATE OF CALIBRATION

Issue Date : 29 September 2020
Certificate No. : 20-981-006
Work Order No. : 20/981

Customer Name : Water Index & Consultal Co.,Ltd.
229/7-8 Soi Charn Sanit Wong 95/1, Charn Sait Wong Rd.,
Bang-Aor. Bangphlat Bangkok 10700

Date of Received : 8 September 2020

Date of Calibration : 10 September 2020

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	: Minimum	21.3	°C	Maximum	22.3	°C
Humidity	: Minimum	55.3	%	Maximum	59.3	%

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.

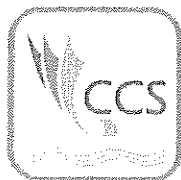
Calibrated by : Mr. Wuttinun Yindeepot
Calibration Engineer

Approved by :

(Mr. Anuwat Yaklermjit)
Laboratory Manager

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CERTIFICATE OF CALIBRATION

Issue Date : 29 September 2020

Certificate No. : 20-981-006

Work Order No. : 20/981

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-0042-20	03 July 2021
1.2 Digital Thermometer with RTD	15000016 / RTD-11	DTM-03	20-567-001	09 June 2021

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 : New

4. Calibration site : 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	20.038	19.9	+ 0.138	0.30
25	25.054	24.8	+ 0.254	0.30
30	30.077	29.7	+ 0.377	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	40.23	40	+ 0.23	1.2
50	50.14	50	+ 0.14	1.2
60	60.40	60	+ 0.40	1.4

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

2. Uncertainty of Humidity measurement was include temperature dependency test at 25 °C ± 1 °C

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

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 : 29 September 2020

Certificate No. : 20-981-007

Work Order No. : 20/981

Customer Name : Water Index & Consultal Co.,Ltd.
229/7-8 Soi Charn Sanit Wong 95/1, Charn Sait Wong Rd.,
Bang-Aor. Bangphlat Bangkok 10700

Date of Received : 8 September 2020

Date of Calibration : 10 September 2020

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	: Minimum	21.3	°C	Maximum	22.3	°C
Humidity	: Minimum	55.3	%	Maximum	59.3	%

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. Wuttinun Yindeepot
Calibration Engineer

Approved by :

(Mr. Anuwat Yaklermjit)
Laboratory Manager

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CERTIFICATE OF CALIBRATION

Issue Date : 29 September 2020

Certificate No. : 20-981-007

Work Order No. : 20/981

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-0042-20	03 July 2021
1.2 Digital Thermometer with RTD	15000016 / RTD-11	DTM-03	20-567-001	09 June 2021

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

: New

4. Calibration site

: Permanent

Result of Calibration

1. Temperature Measuremen : Without Adjustnment

Resolution of UUC : 0.1 °C

Calibration Point (°C)	Average Standard Reading (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty ± (°C)
20	20.038	19.9	+ 0.138	0.30
25	25.054	24.8	+ 0.254	0.30
28	30.077	29.7	+ 0.377	0.30

2. Humidity Measurement

: Without Adjustnment

Resolution of UUC : 1 %RH

Calibration Point (%RH)	Calculated Standard Reading (%RH)	UUC Reading (%RH)	Correction (%RH)	Uncertainty ± (%RH)
50	50.14	49	+ 1.14	1.2
60	60.40	59	+ 1.40	1.4
70	70.35	69	+ 1.35	1.8

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

2. Uncertainty of Humidity measurement was include temperature dependency test at 25 °C ± 1 °C

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

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%.

--END--

PAGE 2/2



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Calibration Cert. # 3884.01
ISO/IEC 17025

Certificate of Calibration

Certificate No. : MC20-2431

Page : 1 of 2

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

Description : pH Meter

Manufacturer : Mettler Toledo

Model : Seven Compact

Serial No. : B614308589

Identification No. : N/A

Calibration Place : Customer Laboratory

Order No. : 2904/20

Received date : Sep 08, 2020

Calibration date : Sep 08, 2020

Environment Condition :

Temperature : (25+/-10) °C

Humidity : (50+/-30) %RH

Calibration Method : Calibration were conducted using In-house calibration procedure *CP-MC-001* According to direct with Standard Thermometer and Standard Buffer Solution at 25 °C. The calibration methods based on ISO 10523 Water quality - Determination of pH, NIST : 1994.
Calibration were conducted using In-house calibration procedure *CP-MT-001* According to comparison with Standard Digital Thermometer with 2 PRT.
The calibration methods based on ITS-90.

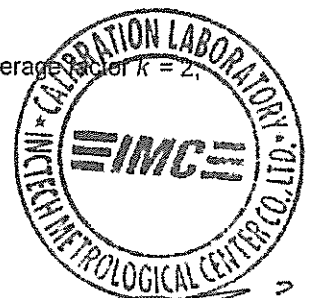
Reference Standard Instruments :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
Digital Thermometer	EFT-4	EFT42020033	MT20-4107	May 12, 2021
Standard Digital Thermometer	UM RTD	2002Z Z38 0073A	MT19-7353	Dec 17, 2020
<u>Instrument</u>	<u>Model</u>	<u>Lot No.</u>	<u>Expired Date.</u>	
Standard Buffer Solution (4 pH)	104025	418F1	Jun 28, 2021	
Standard Buffer Solution (7 pH)	107025	M719B1	Feb 28, 2021	
Standard Buffer Solution (10 pH)	1100525C	1125C20C2	Mar 28, 2022	

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.Yuttakorn Jamneansri

Issue date : Sep 24, 2020

Approved by :

(Mr.Panuwat Phuklan)

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Calibration Cert. # 3884.01
ISO/IEC 17025

Certificate No. : MC20-2431

Page : 2 of 2

Function : pH measurement (Electrode)
 Calibration point : 4, 7, 10 pH
 Probe S/N : N/A

Result : Without adjustment

Resolution : 0.01 pH

Standard Buffer (pH)	UUC* reading (pH)	UUC* correction (pH)	Uncertainty of measurement (+/- pH)
4.00	4.00	0.00	0.017
7.00	7.01	-0.01	0.017
10.00	10.02	-0.02	0.017

Function : Temperature measurement
 Calibration point : 20, 25, 30 °C

Result : Without adjustment

Resolution : 0.1 °C

Calibration point (°C)	Standard reading (°C)	UUC* reading (°C)	UUC* correction (°C)	Uncertainty of measurement (+/- °C)
20	20.00	20.0	0.00	0.12
25	25.00	25.0	0.00	0.12
30	30.00	30.0	0.00	0.12

UUC* = Unit under calibration



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Calibration Cert. # 3884.01
ISO/IEC 17025

Certificate of Calibration

Certificate No. : MT20-6303

Page : 1 of 2

Customer : Water Index & Consultal Co.,Ltd.

Address : 229/7-8 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. : B492.1010

Identification No. : ID146E94

Calibration Place : Customer Laboratory

Order No. : 2789/20

Received date : Sep 08, 2020

Calibration date : Sep 08, 2020

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.

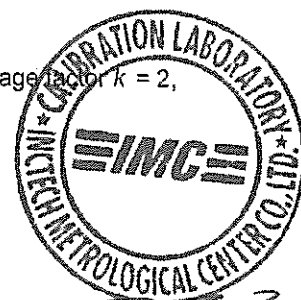
Reference Standard Instruments :

<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	MY49001901	MT19-7350	Dec 10, 2020

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.Yuttakorn Jamneansri
Issue date : Sep 17, 2020

Approved by : (Mr.Panuwat Phuklan)

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Calibration Cert. # 3884.01
ISO/IEC 17025

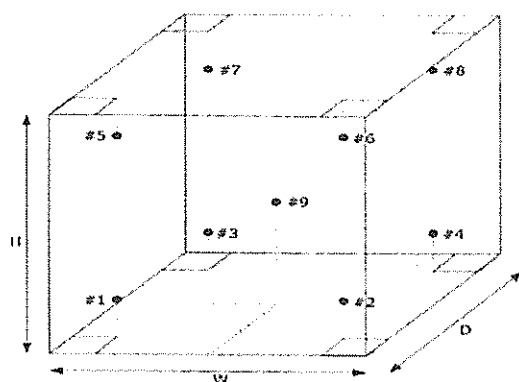
Certificate No. : MT20-6303

Page : 2 of 2

Function : Temperature measurement
Calibration point : 104, 110, 120, 150, 180 °CResult : Without adjustment
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	104.569	104.465	104.419	104.132	104.463	104.277	104.296	104.276	104.609	0.44
110	110.351	110.596	110.537	110.226	110.946	110.359	110.403	110.384	110.752	0.44
120	120.562	120.781	120.760	120.370	120.277	120.569	120.648	120.315	120.484	0.50
150	150.435	150.639	150.530	150.729	150.490	150.769	150.405	150.446	150.743	0.55
180	180.408	180.630	180.503	180.742	180.474	180.490	180.360	180.419	180.534	0.58

Setting temperature (°C)	Indicating Temperature (°C)	Measured stability (+/- °C)	Measured uniformity (°C)	Overall variation (°C)
104.0	104.0	0.05	0.51	0.60
110.0	110.0	0.06	0.56	0.86
118.0	120.0	0.38	0.85	0.93
148.0	148.0	0.43	0.89	0.95
178.5	178.5	0.45	0.99	1.1



- #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.



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Calibration Cert. # 3884.01
ISO/IEC 17025

Certificate of Calibration

Certificate No. : MT20-6640

Page : 1 of 2

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

Description : Water Bath

Manufacturer : Memmert

Model : N/A

Serial No. : N920481

Identification No. : 331502538

Calibration Place : Customer Laboratory

Order No. : 2904/20

Received date : Sep 08, 2020

Calibration date : Sep 08, 2020

Environment Condition :

Temperature : (25+/-10) °C

Humidity : (50+/-30) %RH

Calibration Method : Calibration were conducted using In-house calibration procedure CP-MT-005 According to comparison with LXI Data Acquisition Switch Unit. The calibration methods based on ASTM E715-80 (Reapproved 2016) Standard Specification for Water Bath.

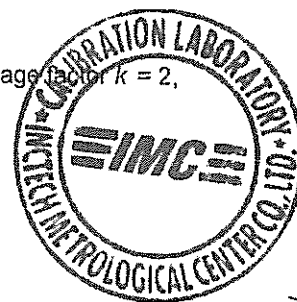
Reference Standard Instruments :

<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	MT19-7352	Dec 12, 2020

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 : Oct 05, 2020

Approved by : _____

(Mr.Panuwat Phuklan)

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Saimai, Bangkok 10220, Thailand

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



Calibration Cert. # 3884.01
ISO/IEC 17025

Certificate No. : MT20-6640

Page : 2 of 2

Function : Temperature measurement

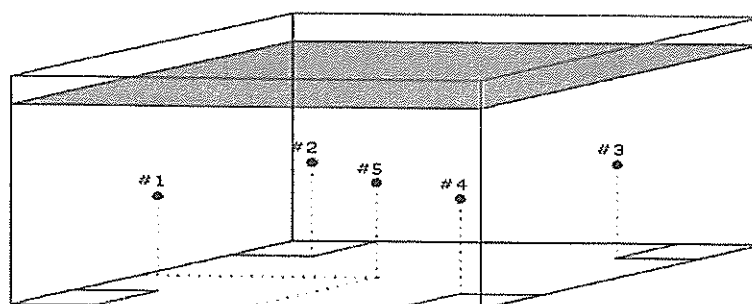
Result : Without adjustment

Calibration point : 85 °C

Resolution : 0.1 °C

Calibration point (°C)	Temperature of UUC* at each position (°C)					Average Temperature (°C)	Temperature (°C)		Uncertainty of measurement (+/- °C)
	Ch.1	Ch.2	Ch.3	Ch.4	Ch.5		Max	Min	
85	84.933	84.876	85.110	85.003	85.159	85.016	85.159	84.876	0.65

Setting temperature (°C)	Indicating Temperature (°C)	Measured stability (+/- °C)	Measured uniformity (°C)	Overall variation (°C)
85.0	85.0	0.55	0.89	1.2



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.

CALIBRATION REPORT



Cert. Number
BTC-T-24/63

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

Date of Issue 24 September 2020

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 : 20 September 2020

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%

Tractability Information

Reference Standards Description	Serial Number	Certificate Number	Cal. Date	Dule Date.
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 (RTD : 01-25)	MY44010097	BTC-T-01-63	25/June/2020	26/June/2021
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 : 20 September 2020

CALIBRATION REPORT

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

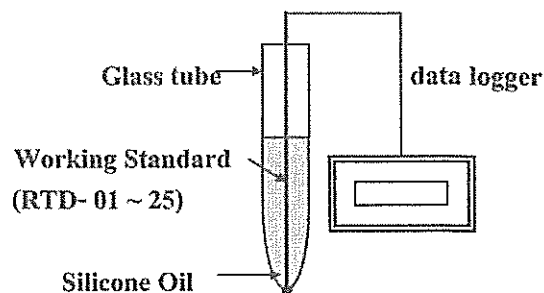
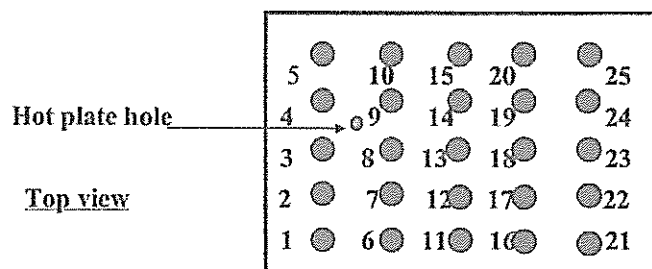
Date of Issue 24 September 2020



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Appendix A.



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	149.23	150.6	148.3	0.31	2.07	2.30

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.

Calibrated By:

(Mr. Boonlue Somprajob)

Date of Calibration : 20 September 2020

CALIBRATION REPORT



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Hole No. (Position)	Max (°C)	Min (°C)	Mid-Range (°C)	Difference (°C)	Uncertainty of measurement (\pm °C)
1	148.9	148.8	148.85	0.10	0.70
2	148.8	148.7	148.75	0.10	
3	148.7	148.6	148.65	0.10	
4	148.8	148.7	148.75	0.10	
5	148.8	148.7	148.75	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	148.5	148.3	148.40	0.20	
10	148.8	148.7	148.75	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	148.9	148.8	148.85	0.10	
16	148.8	148.7	148.75	0.10	
17	148.8	148.6	148.70	0.20	
18	150.1	149.9	150.00	0.20	
19	149	149.0	149.00	0.00	
20	149.7	149.4	149.55	0.30	
21	148.9	148.8	148.85	0.10	
22	148.8	148.7	148.75	0.10	
23	149.8	149.6	149.70	0.20	
24	148.8	148.7	148.75	0.10	
25	149.2	149.1	149.15	0.10	
Hot plate hole	148.9	148.8	148.85	0.10	

End of certificate ...

Calibrated By:

(Mr. Boonlue Somprajob)

Date of Calibration : 20 September 2020

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