

ภาคผนวก ข.

เอกสารสอบเทียบเครื่องมือที่ใช้ในการวิเคราะห์



CALIBRATION LABORATORY CO., LTD.

210-11, 14, 55 Soi Prasert Manukit 25 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10250
Tel. 02-578-0353-4 Fax 02-578-2672 www.cali-lab.com E-mail: cali@cali-lab.com



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : BALANCE
MANUFACTURER : METTLER-TOLEDO
MODEL / TYPE : MS204TS/00
SERIAL NO. : B935191252 [LA-002]
CLID. NO. : 362200356
JOB CONTROL NO. : 230321031262

CUSTOMER : ENVIRONMENTAL MEASUREMENTS CO., LTD.

5/45 BANG KLANG KRUNG BIZ TOWN, SOI SRINAGARINDRA 46TH (PRAMOTE),
NONG BON SUB-DISTRICT, PRAWET DISTRICT, BANGKOK 10250

DATE OF RECEIVED : 21 March 2023

DATE OF ISSUED : 10 April 2023

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

Calibrated By :

Somchai Rattanangam

Calibration Engineer



Approved By :

Mongkol Yotsoontorn

Authorized Signatory

10 April 2023

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

Certificate No. Q23031262

F3-011-04/01-12

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calibration



CALIBRATION LABORATORY CO., LTD.

210-11, 14, 55 Soi Prasert Manukit 25 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10250
Tel. 02-578-0353-4 Fax 02-578-2672 www.cali-lab.com E-mail: cali@cali-lab.com



REPORT OF CALIBRATION

FOR

NOMENCLATURE : BALANCE
MANUFACTURER : METTLER-TOLEDO
MODEL / TYPE : MS204TS/00
SERIAL NO. : B935191252 [LA-002]
LOCATION SITE : LABORATORY - BALANCE ROOM
DATE OF CALIBRATION : 04 April 2023

ENVIRONMENT CONDITIONS :

Temperature : 23 °C to 24 °C

Relative Humidity : 49 % to 50 %

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPMB-01 based on EURAMET/cg-187 version 4.0 (11/2015).
The calibration was performed by Comparison with Weight Set which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

Weight Set, Mettler Toledo Class E2 SN. 1588350.

TRACEABILITY :

The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand).
Certificate No. MM-0120-21, Due Date: 17 December 2023.

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 N4:2022)"

Certificate No. Q23031262

F3-011-04/01-12

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calibration



CALIBRATION LABORATORY CO., LTD.

210-11, 14, 15 & 16 Soi Prasart Manukul 23 Yotha 4, Praset Manukul Rd, Lumphini, Bangkok 10230
Tel. 02-578-0333-4 Fax 02-578-2572 www.cal-lab.com Email: info@cal-lab.com



ANAB
ACCREDITED
CALIBRATION LABORATORY
ACD-2314

CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

1. Error of Indications

Nominal Test Value (g)	Conventional mass (g)	Display Value (g)	Error of Balance (g)	Uncertainty $\pm$ (mg)	Coverage factor k
Unload	0.0000	0.0000	0.0000	0.03	2.28
0.1000	0.1000	0.1000	0.0000	0.06	2.00
0.5000	0.5000	0.5000	0.0000	0.07	2.00
1.0000	1.0000	1.0000	0.0000	0.07	2.00
2.0000	2.0000	2.0000	0.0000	0.07	2.00
5.0000	5.0000	5.0000	0.0000	0.07	2.00
10.0000	10.0000	10.0000	0.0000	0.07	2.00

2. Repeatability of Indications

Nominal Test Value (g)	Standard Deviation of Reading (g)
200.0000	0.00004

3. Effect of eccentric application of a load on the indication

Nominal Test Value (g)	Display Value (g)					Maximum Difference of Center Value (g)
	Position 1	Position 2	Position 3	Position 4	Position 5	
	100.0000	100.0001	100.0000	100.0000	100.0000	
100.0000	100.0000	100.0001	100.0000	100.0000	100.0000	0.0001

Note: The Scope of Accredited ANAB Certificate No. ACDM-2314 Version 008 Page 41 of 54

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

End of Certificate

Certificate No. Q23031261
F3-011-04/01-12



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CALIBRATION LABORATORY CO., LTD.

210-11, 14, 15 & 16 Soi Prasart Manukul 23 Yotha 4, Praset Manukul Rd, Lumphini, Bangkok 10230
Tel. 02-578-0333-4 Fax 02-578-2572 www.cal-lab.com Email: info@cal-lab.com



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ACD-2314

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : BALANCE
MANUFACTURER : SHIMADZU
MODEL / TYPE : AP225WD
SERIAL NO. : D316300692[L A-001]
CLID. NO. : 362100172
JOB CONTROL NO. : 230321031261

CUSTOMER : ENVIRONMENTAL MEASUREMENTS CO., LTD.

545 BAAN KLANG KRUNG BIZ TOWN, SOI SRINAGARINDRA 46/1 (PRAMOTE),
NONG BON SUB-DISTRICT, PRAWET DISTRICT, BANGKOK 10250

DATE OF RECEIVED : 21 March 2023

DATE OF ISSUED : 08 April 2023

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

Calibrated By : Somchai Ratanangam
Calibration Engineer



Approved By : Mongkol Yorsoonorn
Authorized Signatory
08 April 2023

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

Certificate No. Q23031261
F3-011-04/01-12

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CALIBRATION LABORATORY CO., LTD.

2710-11-14, 55 Soi Praset Manukit 29 Yotha 4, Praset Manukit Rd., Laoprasa, Bangkok 10220
Tel: 02-578-0354-4 Fax: 02-578-2572 www.cal-lab.co.th E-mail: info@cal-lab.co.th



REPORT OF CALIBRATION

FOR

NOMENCLATURE : BALANCE
MANUFACTURER : SHIMADZU
MODEL / TYPE : AP225WD
SERIAL NO. : D316300692(LA-001)
LOCATION SITE : LABORATORY - BALANCE ROOM
DATE OF CALIBRATION : 04 April 2023

ENVIRONMENT CONDITIONS :

Temperature : 23 °C to 24 °C Relative Humidity : 49 % to 50 %

PROCEDURE USED :

This instrument was calibrated under procedure No. WT-505-46 according to EURAMET cg-18 Version 4.0 (11/2015).
The calibration was performed by Comparison with Weight Set which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

Weight Set, Metter Toledo Class E2 SN: 158850.

TRACEABILITY :

The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand).
Certificate No. NM-0120-21, Due Date 17 December 2023.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor which 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:2002)".

Certificate No. Q23031261

FS-011-04/01-12

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CALIBRATION LABORATORY CO., LTD.

2710-11-14, 55 Soi Praset Manukit 29 Yotha 4, Praset Manukit Rd., Laoprasa, Bangkok 10220
Tel: 02-578-0354-4 Fax: 02-578-2572 www.cal-lab.co.th E-mail: info@cal-lab.co.th



CONDITION OF CALIBRATION ITEM : GOOD
MEASUREMENT RESULTS : (X) without adjustment () adjustment
CALIBRATION DATA

1. Error of Indications

Nominal Test Value (g)	Conventional mass (g)	Display Value (g)	Error of Balance (g)	Uncertainty ± (mg)	Coverage factor k
Unloaded	0.0000	0.0000	0.0000	0.06	2.00
5.0000	5.0000	5.0000	0.0000	0.11	2.00
10.0000	10.0000	10.0000	0.0000	0.11	2.00
20.0000	20.0000	20.0000	0.0000	0.12	2.00
40.0000	40.0000	40.0000	0.0000	0.14	2.00
60.0000	60.0000	60.0000	0.0000	0.15	2.00
80.0000	80.0000	80.0000	0.0000	0.19	2.00
100.0000	100.0000	100.0000	0.0000	0.17	2.00
120.0000	120.0000	120.0000	0.0000	0.22	2.00
140.0000	140.0000	140.0000	0.0000	0.24	2.00
160.0000	159.9999	160.0000	+0.0001	0.26	2.00
180.0000	180.0000	180.0000	0.0000	0.30	2.00
200.0000	199.9997	199.9997	0.0000	0.26	2.00

2. Repeatability of Indications

Nominal Test Value (g)	Standard Deviation of Reading (g)
200.0000	0.00005

3. Effect of eccentric application of a load on the indication

			Display Value (g)					Maximum Difference of Center Value (g)	
			Position 1	Position 2	Position 3	Position 4	Position 5		
100.0000			100.0000	100.0000	99.9999	100.0000	100.0000	100.0001	0.0001

Note: The Scope of Accredited TISI Certificate No. 23-LB0092 Issue 01 Page 116 of 138

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

End of Certificate

Certificate No. Q23031261

FS-011-04/01-12

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CALIBRATION LABORATORY CO., LTD.

210-11-14, 55 Soi Praent Manukit 28 Yaek 4, Praent Manukit Rd., Ladprao, Bangkok 10230
Tel. 02-576-0353-4 Fax 02-576-2572 www.ccl-lab.com E-mail: info@ccl-lab.com



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ISO 9001:2015
ISO 17025:2017
ACCREDITED
ADN-1314

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : HOT AIR OVEN
MANUFACTURER : MEMMERT
MODEL / TYPE : UF110
SERIAL NO. : B422.0026[LA-0012]
CLID. NO. : 532202464
JOB CONTROL NO. : 230321031263

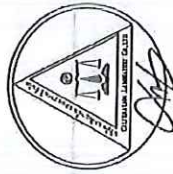
CUSTOMER : ENVIRONMENTAL MEASUREMENTS CO., LTD.
5145 BAAN KLANG KRUNG BIZ TOWN, SOI SRINAGARINDRA 46/1 (PRAMOTE),
NONG BON SUB-DISTRICT, PRAWET DISTRICT, BANGKOK 10250

DATE OF RECEIVED : 21 March 2023 DATE OF ISSUED : 08 April 2023

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

Calibrated By :

Wenick Inchausti
Calibration Engineer



Approved By :

Mongkol Yosoonontom
Authorized Signatory

08 April 2023

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

Certificate No. Q23031263

F3-011-04/01-12

page 1 of 2



local calibration



CALIBRATION LABORATORY CO., LTD.

210-11-14, 55 Soi Praent Manukit 28 Yaek 4, Praent Manukit Rd., Ladprao, Bangkok 10230
Tel. 02-576-0353-4 Fax 02-576-2572 www.ccl-lab.com E-mail: info@ccl-lab.com



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ISO 17025:2017
ACCREDITED
ADN-1314

REPORT OF CALIBRATION

FOR

NOMENCLATURE : HOT AIR OVEN
MANUFACTURER : MEMMERT
MODEL / TYPE : UF110
SERIAL NO. : B422.0026[LA-0012]
LOCATION SITE : LABORATORY-HOT ZONE
DATE OF CALIBRATION : 04 April 2023

ENVIRONMENT CONDITIONS :

Temperature : 24 °C ± 0.5 °C

Relative Humidity : 48% to 51 %

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CFTE-07 based on TLAS G-20 as calibration guidelines.
The calibration was performed by using Hydra Data Logger which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

Hydra Data Logger, Fluke Model 2020 SN: 5592550.

TRACEABILITY :

The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd.
Certificate No. Q22060550, Due Date 07 July 2023.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor complies with this title 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 M2022)"

Certificate No. Q23031263

F3-011-04/01-12

page 2 of 4



local calibration



CALIBRATION LABORATORY CO., LTD.

210-11-14-55 Soi Patet Manukit 29 Yook 4, Praset Manukit Rd, Ladphrao, Bangkok 10230
Tel. 02-578-0334-4 Fax 02-578-2572 www.cali-lab.com E-mail: cali@cali-lab.com



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LABORATORY
ACDM-2314

CONDITION OF CALIBRATION ITEM : GOOD

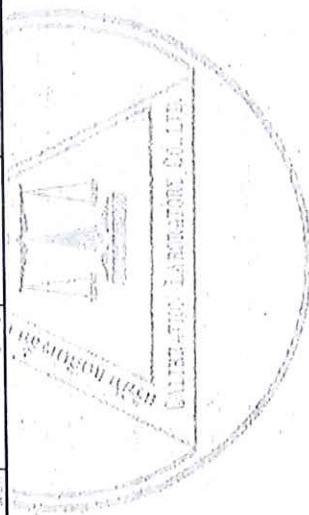
MEASUREMENT RESULTS : (X) without adjustment () adjustment

The table in the following gives the calibration results and associated measurement uncertainties of the measuring hot air oven.

CALIBRATION DATA

1. HOT AIR OVEN PERFORMANCE

DUC		Measured Uniformity (°C)	Measured Stability (°C)	Measured Overall Variation (°C)
Setting (°C)	Indicating (°C)			
104.0	104.0	0.80	0.41	2.05
180.0	180.0	1.67	0.20	3.29



CLC

Certificate No. Q23031263

F3-011-04/01-12

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CALIBRATION LABORATORY CO., LTD.

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ACDM-2314

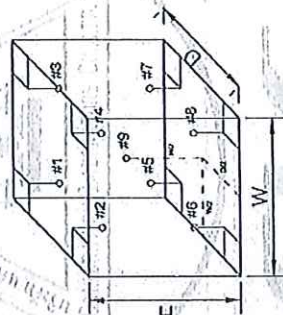
CALIBRATION DATA

2. TEMPERATURE DISTRIBUTION

DUC		Measured Temperature (°C) @ Probe No. 9 is Ref.									Uncertainty ± (°C)	Coverage factor k
Setting (°C)	Indicating (°C)	1	2	3	4	5	6	7	8	9		
104.0	104.0	103.22	103.79	103.49	103.30	103.76	103.70	103.32	104.54	103.90	0.65	2.00
180.0	180.0	178.23	179.61	178.93	179.18	179.39	179.37	178.51	181.15	179.79	0.61	2.00

Technical Note : W = 56 cm, D = 40 cm, H = 48 cm.

The Scope of Accredited ANAB Certificate No. ACDM-2314 Version 008 Page 48 of 54



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

End of Certificate

Certificate No. Q23031263

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CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : INCUBATOR
MANUFACTURER : ACCUPLUS
MODEL / TYPE : SMART I250
SERIAL NO. : 2059-0718-0010[LA-002]
CLID. NO. : 332100155
JOB CONTROL NO. : 230321031264

CUSTOMER : ENVIRONMENTAL MEASUREMENTS CO., LTD.

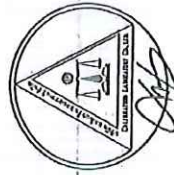
546 BAAN KLANG KRUNG BIZ TOWN, SOI SRINAGARINDRA 461 (PRAMOTE),
NONG BON SUB-DISTRICT, PRAWET DISTRICT, BANGKOK 10250

DATE OF RECEIVED : 21 March 2023 DATE OF ISSUED : 08 April 2023

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

Calibrated By :

Wenick Inchaosri
Calibration Engineer



Approved By :

Mongkol Yorsoonorn
Authorized Signatory

08 April 2023

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

Certificate No. Q23031264

F3-011-04/01-12

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REPORT OF CALIBRATION

FOR

NOMENCLATURE : INCUBATOR
MANUFACTURER : ACCUPLUS
MODEL / TYPE : SMART I250
SERIAL NO. : 2059-0718-0010[LA-002]
LOCATION SITE : LABORATORY
DATE OF CALIBRATION : 04 April 2023

ENVIRONMENT CONDITIONS :

Temperature : 24 °C to 25 °C

Relative Humidity : 48% to 51 %

PROCEDURE USED :

This instrument was calibrated under procedure No. WI-306-165 according to TLAS G-20-1/02-48 as calibration guidelines.

The calibration was performed by using Hydra Data Logger which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

Hydra Data Logger, Fluke Model 2620 S/N: 5592550.

TRACEABILITY :

The measurements are traceable to International System of Units (SI) , through Calibration Laboratory Co., Ltd.
Certificate No. Q23065550, Due Date 07 July 2023.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor, which 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 M2022)"

Certificate No. Q23031264

F3-011-04/01-12

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CALIBRATION LABORATORY CO., LTD.

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



CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : (X) without adjustment () adjustment

The table in the following gives the calibration results and associated measurement uncertainties of the measuring incubator.

CALIBRATION DATA

1. INCUBATOR PERFORMANCE

DUC		Measured Uniformity ($^{\circ}\text{C}$)	Measured Stability ($^{\circ}\text{C}$)	Measured Overall Variation ($^{\circ}\text{C}$)
Setting ($^{\circ}\text{C}$)	Indicating ($^{\circ}\text{C}$)			
20.0	20.0	0.47	0.53	1.13

Certificate No. Q23031264

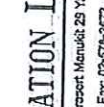
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CALIBRATION LABORATORY CO., LTD.

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Tel. 02-578-0353-4 Fax 02-578-2672 www.cal-lab.com Email: cal@cal-lab.com



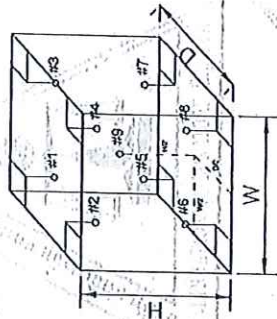
CALIBRATION DATA

2. TEMPERATURE DISTRIBUTION

DUC		Measured Temperature ($^{\circ}\text{C}$) @ Probe No.9 is Ref.									Uncertainty $\pm (^{\circ}\text{C})$	Coverage factor k
Setting ($^{\circ}\text{C}$)	Indicating ($^{\circ}\text{C}$)	1	2	3	4	5	6	7	8	9		
20.0	20.0	20.53	20.62	20.75	20.52	20.54	20.60	20.52	20.42	20.45	0.75	2.00

Technical Note : W = 50 cm, D = 48 cm, H = 110 cm.

The Scope of Accredited TISI Certificate No. 23-LB0092 Issue 01 Page 129 of 138



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

End of Certificate

Certificate No. Q23031264

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CALIBRATION LABORATORY CO., LTD.

210-11-14-55 Soi Prasert Manulit 29 Yaek 4, Prasert Manulit Rd., Luchphoo, Bangkok 10230
Tel. 02-578-0352-4 Fax 02-578-0372 www.cal-lab.co.th Email: info@cal-lab.co.th



NUCLEON 17025
CALIBRATION 1059
CLC

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : REFRIGERATOR
MANUFACTURER : MEDICOOL
MODEL / TYPE : BB-117
SERIAL NO. : BB117-190725001[LA-003]
CLD. NO. : 332100156
JOB CONTROL NO. : 230321031265

CUSTOMER : ENVIRONMENTAL MEASUREMENTS CO., LTD.

5/45 BAAN KLANG KRUNG BIZ TOWN, SOI SRINAGARINDRA 46/1 (PRAMOTE),
NONG BON SUB-DISTRICT, PRAWET DISTRICT, BANGKOK 10250

DATE OF RECEIVED : 21 March 2023 DATE OF ISSUED : 08 April 2023

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

Calibrated By :

Wenick Inchaisri

Calibration Engineer

Approved By :

Mongkol Yorsontom

Authorized Signatory

08 April 2023

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

Certificate No. Q23031265

F3-011-04/01-12

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CLC Calibration



CALIBRATION LABORATORY CO., LTD.

210-11-14-55 Soi Prasert Manulit 29 Yaek 4, Prasert Manulit Rd., Luchphoo, Bangkok 10230
Tel. 02-578-0352-4 Fax 02-578-0372 www.cal-lab.co.th Email: info@cal-lab.co.th



NUCLEON 17025
CALIBRATION 1059
CLC

REPORT OF CALIBRATION

FOR

NOMENCLATURE : REFRIGERATOR
MANUFACTURER : MEDICOOL
MODEL / TYPE : BB-117
SERIAL NO. : BB117-190725001[LA-003]
LOCATION SITE : LABORATORY
DATE OF CALIBRATION : 04 April 2023

ENVIRONMENT CONDITIONS :

Temperature : 24 °C to 25 °C

Relative Humidity : 48% to 51 %

PROCEDURE USED :

This instrument was calibrated under procedure No. WI-305-165 according to TLAS G-20-1/03-08 as calibration guidelines.

The calibration was performed by using Hydra Data Logger which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

Hydra Data Logger, Fuke Model 2620 S/N. 5592550.

TRACEABILITY :

The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd.

Certificate No. Q23065558, Due Date 07 July 2023.

UNCERTAINTY :

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

It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

Certificate No. Q23011265

F3-011-04/01-12

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CLC Calibration



CALIBRATION LABORATORY CO., LTD.

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Tel. 02-578-0353-4 Fax 02-578-2672 www.cali-lab.com Email: cali@cali-lab.com



ISO/IEC 17025
CALIBRATION 009
CLC

CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : (X) without adjustment () adjustment

The table in the following gives the calibration results and associated measurement uncertainties of the measuring refrigerator.

CALIBRATION DATA

DUC		Measured Uniformity	Measured Stability	Measured Overall
Setting (°C)	Indicating (°C)	(°C)	(°C)	Variation (°C)
4.0	4.0	0.67	0.91	2.23

Certificate No: Q23031265

F3-011-04/01-12

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certification



CALIBRATION LABORATORY CO., LTD.

210-11, 55 Soi Prasert Manukit 23 Yask 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
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ISO/IEC 17025
CALIBRATION 009
CLC

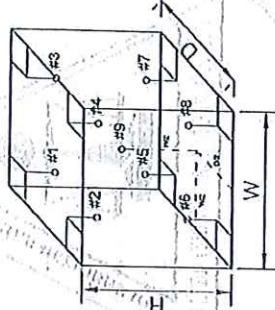
CALIBRATION DATA

2. TEMPERATURE DISTRIBUTION

DUC		Measured Temperature (°C) @ Probe No. 9 is Ref.									Uncertainty	Coverage
Setting (°C)	Indicating (°C)	1	2	3	4	5	6	7	8	9	± (°C)	factor k
4.0	4.0	3.37	3.91	3.35	3.51	3.51	3.26	3.17	3.19	3.32	1.14	2.00

Technical Note : W = 50 cm, D = 50 cm, H = 120 cm.

The Scope of Accredited TISI Certificate No. 23-LB0092 Issue 01 Page 139 of 138



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

End of Certificate

Certificate No: Q23031265

F3-011-04/01-12

page 4 of 4





CALIBRATION LABORATORY CO., LTD.

210-11-14, 55 Soi Prasat Manukit 23 Yaek 4, Praset Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-0334 Fax 02-578-2572 www.ccl-lab.com E-mail: ccl@cal-lab.com



ISO 9001:2015
CERTIFICATION



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : REFRIGERATOR
MANUFACTURER : S-COOL
MODEL / TYPE : SS-HA-112
SERIAL NO. : 21091450 [LA-0013]
CLD. NO. : 332300656
JOB CONTROL NO. : 230321031267

CUSTOMER : ENVIRONMENTAL MEASUREMENTS CO., LTD.

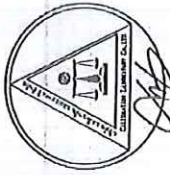
545 BAAN KLANG KRUNG BIZ TOWN, SOI SRINAGARINDRA 46/1 (PRAMOTE),
NONG BON SUB-DISTRICT, PRAWEI DISTRICT, BANGKOK 10250

DATE OF RECEIVED : 21 March 2023 DATE OF ISSUED : 08 April 2023

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

Calibrated By :

Wenick Inchaesri
Calibration Engineer



Approved By :

Mongkol Yosoonorn
Authorized Signatory

08 April 2023

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

Certificate No. Q23031267

F3-011-04/01-12

page 1 of 4



CALIBRATION LABORATORY CO., LTD.

210-11-14, 55 Soi Prasat Manukit 23 Yaek 4, Praset Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-0334 Fax 02-578-2572 www.ccl-lab.com E-mail: ccl@cal-lab.com



ISO 9001:2015
CALIBRATION

REPORT OF CALIBRATION

FOR

NOMENCLATURE : REFRIGERATOR
MANUFACTURER : S-COOL
MODEL / TYPE : SS-HA-112
SERIAL NO. : 21091450 [LA-0013]
LOCATION SITE : 1st FLOOR
DATE OF CALIBRATION : 04 April 2023

ENVIRONMENT CONDITIONS :

Temperature : 30 °C to 31 °C

Relative Humidity : 50% to 55 %

PROCEDURE USED :

This instrument was used under procedure No. WI-305-165 according to TLAS C-20-1/02-08 as calibration guidelines.

The calibration was performed by using Hydra Dam Logger which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

Hydra Dam Logger, Fluke Model 2820 S/N. 5592550.

TRACEABILITY :

The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd.

Certificate No. Q22065551, Due Date 07 July 2023.

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-4/02:2002)"

Certificate No. Q23031267

F3-011-04/01-12

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CALIBRATION LABORATORY CO., LTD.

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Tel: 02-578-0335-4 Fax: 02-578-2572 www.cclablab.com Email: cclab@cal-lab.com



ISO 17025:2005
CALIBRATION 0699
CLC

CONDITION OF CALIBRATION ITEM: GOOD

MEASUREMENT RESULTS: (X) without adjustment () adjustment

The table in the following gives the calibration results and associated measurement uncertainties of the measuring refrigerator.

CALIBRATION DATA

1. REFRIGERATOR PERFORMANCE

Setting (°C)	DUC		Measured Uniformity (°C)	Measured Stability (°C)	Measured Overall Variation (°C)
	Indicating (°C)	4.0	1.31	3.16	6.65

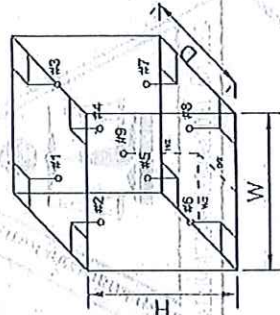
2. TEMPERATURE DISTRIBUTION

CALIBRATION DATA

DUC		Measured Temperature (°C) @ Probe No.9 is Ref.								Uncertainty ± (°C)	Coverage factor k
Setting (°C)	Indicating (°C)	1	2	3	4	5	6	7	8	9	
4.0	4.0	8.60	8.55	7.86	8.07	9.05	9.01	8.96	8.65	8.75	2.00

Technical Note: W = 100 cm, D = 40 cm, H = 123 cm.

The Scope of Accredited TISI Certificate No. 23-LB0092 Issue 01 Page 129 of 138



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

End of Certificate

Certificate No. Q23031267

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Certificate No. Q23031267

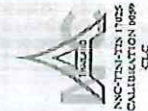
F3-011-04/01-12

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Tel. 02-579-0353-4 Fax 02-579-2672 www.cali-lab.com E-mail: cali@cali-lab.com



NOTES: 1765
CALIBRATION 0699
CLC

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : REFRIGERATOR
MANUFACTURER : S-COOL
MODEL / TYPE : SS-HA-112 V2
SERIAL NO. : 22111408[LA-0014]
CLID. NO. : 332300655
JOB CONTROL NO. : 230321031266

CUSTOMER : ENVIRONMENTAL MEASUREMENTS CO., LTD.

545 BAAN KLANG KRUNG BIZ TOWN, SOI SRINAGARINDRA 46/1 (PRAMOTE),
NONG BON SUB-DISTRICT, PRAWET DISTRICT, BANGKOK 10250

DATE OF RECEIVED : 21 March 2023 DATE OF ISSUED : 08 April 2023

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

Calibrated By :

Wenick Inchaizi
Calibration Engineer

Approved By :

Mongkol Yossoontorn
Authorized Signatory

08 April 2023

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

Certificate No. Q23031266

F3-011-04/01-12

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calibration



CALIBRATION LABORATORY CO., LTD.
21/0-11, 14, 15 Soi Prasert Manukul 28 Yeak 4, Prasert Manukul Rd., Ladphrao, Bangkok 10230
Tel. 02-579-0353-4 Fax 02-579-2672 www.cali-lab.com E-mail: cali@cali-lab.com



NOTES: 1765
CALIBRATION 0699
CLC

REPORT OF CALIBRATION

FOR

NOMENCLATURE : REFRIGERATOR
MANUFACTURER : S-COOL
MODEL / TYPE : SS-HA-112 V2
SERIAL NO. : 22111408[LA-0014]
LOCATION SITE : LABORATORY
DATE OF CALIBRATION : 04 April 2023

ENVIRONMENT CONDITIONS :

Temperature : 24 °C to 25 °C

Relative Humidity : 48% to 51 %

PROCEDURE USED :

This instrument was calibrated under procedure No. WI-305-165 according to TLAS G-20-1/02-08 as calibration guidelines.

The calibration was performed by using Hydm Dms Logger which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

Hydm Dms Logger, Fiske Model 2620 S/N. S592550.

TRACEABILITY :

The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd.
Certificate No. Q22061551, Due Date 07 July 2023.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor complies with it is table which for a normal distribution corresponds to a coverage probability of approximately 95 %.
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

Certificate No. Q23031266

F3-011-04/01-12

page 2 of 4



calibration



CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : (X) without adjustment () adjustment

The table in the following gives the calibration results and associated measurement uncertainties of the measuring refrigerator.

CALIBRATION DATA

1. REFRIGERATOR PERFORMANCE

DUC		Measured Uniformity	Measured Stability	Measured Overall
Setting (°C)	Indicating (°C)	(°C)	(°C)	Variation (°C)
4.0	4.0	1.56	2.70	5.65



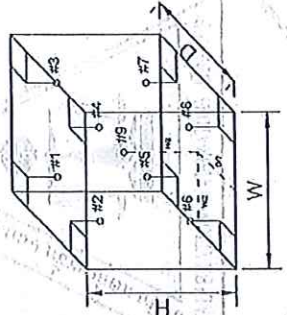
CALIBRATION DATA

2. TEMPERATURE DISTRIBUTION

DUC		Measured Temperature (°C) @ Probe No.9 is Ref									Uncertainty	Coverage
Setting (°C)	Indicating (°C)	1	2	3	4	5	6	7	8	9	± (°C)	factor k
4.0	4.0	7.98	8.13	7.53	7.39	7.46	7.66	7.01	7.05	7.63	3.17	2.00

Technical Note : W = 100 cm, D = 40 cm, H = 123 cm.

The Scope of Accredited TISI Certificate No. 23-LB0092 Issue 01 Page 129 of 138



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

End of Certificate





CALIBRATION LABORATORY CO., LTD.
210-11, 14, 55 Soi Prasert Manukul 23 Yaek 4, Prasert Manukul Rd., Ladphrao, Bangkok 10220
Tel. 02-578-4353-4 Fax 02-578-2672 www.cali-lab.com E-mail: cali@cal-lab.com



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : DIGITAL THERMOHYGRO METER
MANUFACTURER : DIGICON
MODEL / TYPE : TH-02A
SERIAL NO. : 1919E0284991[DTE-01]
CLID. NO. : 232100200
JOB CONTROL NO. : 230309026565

CUSTOMER : ENVIRONMENTAL MEASUREMENTS CO., LTD.
5/45 BAAN KLANG KRUNG BIZ TOWN, SOI SEINAGARINDRA 46/1 (PRAMOTE),
NONG BON SUB-DISTRICT, PRAVET DISTRICT, BANGKOK 10250

DATE OF RECEIVED : 09 March 2023 DATE OF ISSUED : 13 March 2023

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

Calibrated By :

Oranut Kanchaphai
Calibration Engineer

Approved By :

Mongkol Yorsontorn
Authorized Signatory
13 March 2023

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

Certificate No. Q23026565
FS-011-04/01-12

page 1 of 3



CALIBRATION LABORATORY CO., LTD.
210-11, 14, 55 Soi Prasert Manukul 23 Yaek 4, Prasert Manukul Rd., Ladphrao, Bangkok 10220
Tel. 02-578-4353-4 Fax 02-578-2672 www.cali-lab.com E-mail: cali@cal-lab.com



REPORT OF CALIBRATION

FOR

NOMENCLATURE : DIGITAL THERMOHYGRO METER
MANUFACTURER : DIGICON
MODEL / TYPE : TH-02A
SERIAL NO. : 1919E0284991[DTE-01]
DATE OF CALIBRATION : 11 March 2023

ENVIRONMENT CONDITIONS :

Temperature : $(21 \pm 2) ^\circ\text{C}$

Relative Humidity : $(55 \pm 10) \% \text{RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. WI-305-74. The calibration was performed by using Chilled Mirror Hygrometer and Temperature & Humidity Chamber which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

Chilled Mirror Hygrometer, Edgetech Model Dew Master SN. 36151.
Temperature & Humidity Chamber, PQC Model 9141-S114 S/N.0802232.

TRACEABILITY :

The measurements are traceable to International System of Units (SI), through Thunder Scientific Corporation. Certificate No. 21023. Due Date 09 December 2023.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2.00$ which for a normal distribution corresponds to a coverage probability of approximately 95%. It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

Certificate No. Q23026565
FS-011-04/01-12

page 2 of 3



CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : (X) without adjustment () adjustment

The table in the following gives the calibration results and associated measurement uncertainties of the measuring digital thermohygro meter.

CALIBRATION DATA

1. CORRECTION OF TEMPERATURE

Test point (°C)	Actual Temperature (°C)	DUC Reading (°C)	Correction (°C)	Uncertainty ± (°C)
20.0	20.00	19.6	+0.40	0.40
25.0	25.01	24.5	+0.51	
30.0	29.98	29.5	+0.48	

2. CORRECTION OF HUMIDITY

STD Temperature (°C)	STD Reading (%RH)	DUC Reading (%RH)	Correction (%RH)	Uncertainty ± (%RH)
25	40.0	34	+6.0	1.3
25	60.0	52	+8.0	1.5

Note: The Scope of Accredited TISI Certificate No. 23-LB0092 Issue 01 Page 48 of 138

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

End of Certificate

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : DIGITAL THERMOHYGRO METER

MANUFACTURER : DIGICON

MODEL / TYPE : TH-02A

SERIAL NO. : 1919E0284980[DTH-02]

CLID. NO. : 232100201

JOB CONTROL NO. : 230309026566

CUSTOMER : ENVIRONMENTAL MEASUREMENTS CO., LTD.

5/45 BAAN KLANG-KRUNG BIZ TOWN, SOI SRINAGARDRA 46/1 (PRAMOTE),
NONG BON SUB-DISTRICT, PRAWET DISTRICT, BANGKOK 10250

DATE OF RECEIVED : 09 March 2023 DATE OF ISSUED : 13 March 2023

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

Calibrated By : Oranut Kamchaphai
Calibration Engineer



Approved By : Mongkol Yotsoontom
Authorized Signatory
13 March 2023

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





CALIBRATION LABORATORY CO., LTD.
2710-11/14, 35 Soi Prasert Manulak 29 Yaek 4, Prasert Manulak Rd., Ladphrao, Bangkok 10230
Tel. 02-578-0334 Fax 02-578-2572 www.cali-lab.com E-mail: cali@cali-lab.com



REPORT OF CALIBRATION

FOR

NOMENCLATURE : DIGITAL THERMOHYGRO METER
MANUFACTURER : DIGICON
MODEL / TYPE : TH-02A
SERIAL NO. : 1919E0284980 [DTH-02]
DATE OF CALIBRATION : 11 March 2023

ENVIRONMENT CONDITIONS :

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

PROCEDURE USED :

This instrument was calibrated under procedure No. WL-305-74. The calibration was performed by using Chilled Mirror Hygrometer and Temperature & Humidity Chamber which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

Chilled Mirror Hygrometer, EdgeTech Model Dew Master SN: 36151.
Temperature & Humidity Chamber, PGC Model 9141-5114 SN: 0802282.

TRACEABILITY :

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

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2.00$ which for a normal distribution corresponds to a coverage probability of approximately 95 %. It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02: M2022)".

Certificate No. Q23026566

F3-011-04/01-12

page 2 of 3



CALIBRATION LABORATORY CO., LTD.
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Tel. 02-578-0334 Fax 02-578-2572 www.cali-lab.com E-mail: cali@cali-lab.com



CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : (X) without adjustment () adjustment

The table in the following gives the calibration results and associated measurement uncertainties of the measuring digital thermohygro meter.

CALIBRATION DATA

1. CORRECTION OF TEMPERATURE

Test point ($^{\circ}\text{C}$)	Ambial Temperature ($^{\circ}\text{C}$)	DUC Reading ($^{\circ}\text{C}$)	Correction ($^{\circ}\text{C}$)	Uncertainty $\pm$ ($^{\circ}\text{C}$)
20.0	20.00	19.6	+0.40	0.40
25.0	25.01	24.6	+0.41	
30.0	29.98	29.6	+0.38	

2. CORRECTION OF HUMIDITY

STD Temperature ($^{\circ}\text{C}$)	STD Reading (%RH)	DUC Reading (%RH)	Correction (%RH)	Uncertainty $\pm$ (%RH)
25	-0.0	35	-45.0	1.3
25	60.0	54	+6.0	1.5

Note: The Scope of Accredited TISI Certificate No. 23-LB0092 Issue 01 Page 48 of 138

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

End of Certificate

Certificate No. Q23021566

F3-011-04/01-12

page 3 of 3





CALIBRATION LABORATORY CO., LTD.

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Tel. 02-578-0353-4 Fax 02-578-2672 www.ccl-lab.com Email: cal@cal-lab.com



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : WATER BATH
MANUFACTURER : M-LAB
MODEL / TYPE : WEN 15
SERIAL NO. : 0335[LA-007]
CLID. NO. : 332300657
JOB CONTROL NO. : 230321031269

CUSTOMER : ENVIRONMENTAL MEASUREMENTS CO., LTD.

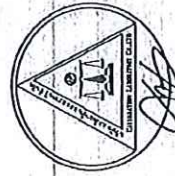
5/45 BAAKLANG KRUNG BIZ TOWN, SOI SRINAGARINDRA 46/1 (PRAMOTE),
NONG BON SUB-DISTRICT, PRAWET DISTRICT, BANGKOK 10250

DATE OF RECEIVED : 21 March 2023 DATE OF ISSUED : 08 April 2023

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

Calibrated By :

Wenick Inchaisri
Calibration Engineer



Approved By :

Mongkol Yorsontom
Authorized Signatory

08 April 2023

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

Certificate No. Q23031269

F3-011-04/01-12

page 1 of 4



CALIBRATION LABORATORY CO., LTD.

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REPORT OF CALIBRATION

FOR

NOMENCLATURE : WATER BATH
MANUFACTURER : M-LAB
MODEL / TYPE : WEN 15
SERIAL NO. : 0335[LA-007]
LOCATION SITE : LABORATORY-HOT ZONE
DATE OF CALIBRATION : 04 April 2023

ENVIRONMENT CONDITIONS :

Temperature : 24 °C to 25 °C

Relative Humidity : 48% to 51%

PROCEDURE USED :

This instrument was calibrated under procedure No. WI-305-135 based on ASTM E 715-80:2016 as calibration guidelines.

The calibration was performed by using Hydra Data Logger which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

Hydra Data Logger, Fluke Model 2620 S/N: S592550.

TRACEABILITY :

The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd.

Certificate No. Q23022733, Due Date 01 September 2023.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2.00$ which for a normal distribution corresponds to a coverage probability of approximately 95%. It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)".

Certificate No. Q23031269

F3-011-04/01-12

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CALIBRATION LABORATORY CO., LTD.
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Tel. 02-578-0333-4 Fax 02-578-2672 www.cali-lab.com Email: cali@cali-lab.com

CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : (X) without adjustment () adjustment

The table in the following gives the calibration results and associated measurement uncertainty of the measuring water bath.

CALIBRATION DATA

1. WATER BATH PERFORMANCE

Test Point (°C)	DUC Reading (°C)	Uniformity (°C)	Stability (°C)
85.0	85.0	0.35	0.18



CALIBRATION LABORATORY CO., LTD.
2710-11-14, 55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-0333-4 Fax 02-578-2672 www.cali-lab.com Email: cali@cali-lab.com



CALIBRATION LABORATORY CO., LTD.
2710-11-14, 55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-0333-4 Fax 02-578-2672 www.cali-lab.com Email: cali@cali-lab.com

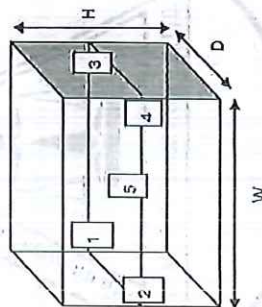
CALIBRATION DATA

2. TEMPERATURE DISTRIBUTION

Test Point (°C)	DUC Reading (°C)	STD Reading (°C)					Uncertainty ± (°C)
85.0	85.0	Probe No. 1	Probe No. 2	Probe No. 3	Probe No. 4	Probe No. 5	
		84.69	84.88	84.68	84.81	84.75	0.48

Technical Note : W = 35 cm, D = 30 cm, H = 15 cm.

The Scope of Accredited TISI Certificate No. 23-LB0092 Issue 01 Page 128 of 138



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

End of Certificate

Certificate No. Q23031269

F3-011-04/01-12

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Certificate No. Q23031269

F3-011-04/01-12

page 4 of 4





CALIBRATION LABORATORY CO., LTD.

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ISO 9001:2015
CLC

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : WATER BATH
MANUFACTURER : MEMMERT
MODEL / TYPE : WNB14
SERIAL NO. : L413.0758[LA-004]
CLID. NO. : 332100157
JOB CONTROL NO. : 230321031268

CUSTOMER : ENVIRONMENTAL MEASUREMENTS CO., LTD.

5/45 BANGKANG KRUNG BIZTOWN, SOI SRINAGARINDRA 46/1 (PRAMOTE),
NONG BON SUB-DISTRICT, PRAWET DISTRICT, BANGKOK 10250

DATE OF RECEIVED : 21 March 2023 DATE OF ISSUED : 08 April 2023

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

Calibrated By :

Wenick Inchaian
Calibration Engineer



Approved By :

Mongkol Yorsontorn
Authorized Signatory

08 April 2023

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

Certificate No. Q23031268

FS-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-lab.com Email: info@cal-lab.com



ISO 9001:2015
CLC

REPORT OF CALIBRATION

FOR

NOMENCLATURE : WATER BATH
MANUFACTURER : MEMMERT
MODEL / TYPE : WNB14
SERIAL NO. : L413.0758[LA-004]
LOCATION SITE : LABORATORY-HOT ZONE
DATE OF CALIBRATION : 04 April 2023

ENVIRONMENT CONDITIONS :

Temperature : 24 °C to 25 °C

Relative Humidity : 48% to 51%

PROCEDURE USED :

This instrument was calibrated under procedure No. WI-505-135 based on ASTM E 715-80:2016 as calibration guidelines.

The calibration was performed by using Hydram Data Logger which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

Hydram Data Logger, Fluke Model 2620 SN. 5592550.

TRACEABILITY :

The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd.

Certificate No. Q23022733, Due Date 01 September 2023.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2.00$ which for a normal distribution corresponds to a coverage probability of approximately 95 %.

It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

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CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : (X) without adjustment () adjustment

The table in the following gives the calibration results and associated measurement uncertainties of the measuring water bath.

CALIBRATION DATA

1. WATER BATH PERFORMANCE

Test Point (°C)	DUC Reading (°C)	Uniformity (°C)	Stability (°C)
95.0	95.0	0.33	0.16



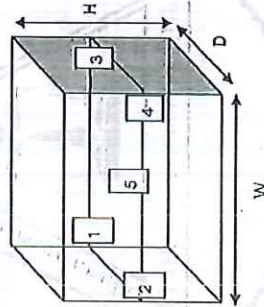
CALIBRATION DATA

2. TEMPERATURE DISTRIBUTION

Test Point (°C)	DUC Reading (°C)	STD Reading (°C)					Uncertainty ± (°C)
		Probe No. 1	Probe No. 2	Probe No. 3	Probe No. 4	Probe No. 5	
95.0	95.0	96.43	96.14	96.24	96.21	96.33	0.44

Technical Note : W = 35 cm, D = 29 cm, H = 14 cm.

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This report is valid for the above stated instruments only.

End of Certificate

