

ภาคผนวก จ

เอกสารสอบเทียบเครื่องมือที่ใช้ในการวิเคราะห์



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CALIBRATION LABORATORY CO., LTD.

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



ANAB
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NATIONAL VOLUNTARY
ACCOMMODATION
ACN-2014

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

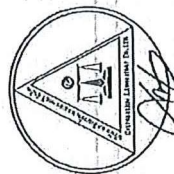
DATE OF RECEIVED : 21 March 2023

DATE OF ISSUED : 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 Yotsontorn
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



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ACN-2014

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-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, Mettler Toledo Class E2 SN: 158850.

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, 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:2022)"

Certificate No. Q23031262

F3-011-04/01-12

page 2 of 3



calibration



CALIBRATION LABORATORY CO., LTD.

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ACQ12314

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

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

Note: The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 005 Page 41 of 54

This report is valid for the above stated instruments only.

Certificate No. Q23031262
F3-011-04/01-12

End of Certificate

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ACQ12314

CERTIFICATE OF CALIBRATION

FOR

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

CUSTOMER : ENVIRONMENTAL MEASUREMENTS CO., LTD.

545 BAAN KIANG 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 : Somchai Ratanangam
Calibration Engineer



Approved By : Mongkol Yotsontom
Authorized Signatory
08 April 2023

This Calibration Certificate document: 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

page 1 of 3





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-305-46 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, Mettler Toledo Class E2 S/N. 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 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 M2022)".



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

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

Note. The Scope of Accredited TIS1 Certificate No. 23-130092 Issue 01 Page 116 of 138

This report is valid for the above stated instruments only.

End of Certificate





CALIBRATION LABORATORY CO., LTD.

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CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : HOT AIR OVEN
MANUFACTURER : MEMMERT
MODEL / TYPE : UF110
SERIAL NO. : B422.0026[LA-0012]
CLID. NO. : 332202464
JOB CONTROL NO. : 230521031263

CUSTOMER : ENVIRONMENTAL MEASUREMENTS CO., LTD.
5/45 BAAK 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 Inchaissi
Calibration Engineer



Approved By :

Mongkol Yotsontom
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

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calibration



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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 to 25 °C

Relative Humidity : 48% to 51 %

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPTH-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 2620 SN. 5592550.

TRACEABILITY :

The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd.
Certificate No. Q23031263, 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-402 M:2022)"

Certificate No. Q23031263

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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 hot air oven.

CALIBRATION DATA

1. HOT AIR OVEN PERFORMANCE

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

Certificate No. Q23031263

FS-011-04/01-12

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ACDM-2814

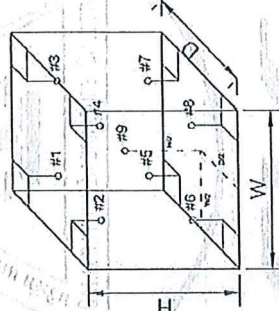
CALIBRATION DATA

2. TEMPERATURE DISTRIBUTION

DUC		Measured Temperature (°C) @Probe No.9 is Ref.									Uncertainty ± (°C)	Coverage factor &
Setting (°C)	Indicating (°C)	1	2	3	4	5	6	7	8	9		
104.0	104.0	103.22	103.79	103.49	103.60	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-2814 Version 008 Page 48 of 54



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

End of Certificate

Certificate No. Q23031263

FS-011-04/01-12

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accreditation



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CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : INCUBATOR
MANUFACTURER : ACCUPLUS
MODEL / TYPE : SMART IZ50
SERIAL NO. : 2059-0718-0010[LA-002]
CLID. NO. : 332100155
JOB CONTROL NO. : 230321031264

CUSTOMER : ENVIRONMENTAL MEASUREMENTS CO., LTD.

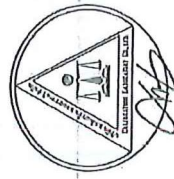
51/45 BAAN KIANG KRUNG BIZ TOWN, SOI SRINAGARDEA 46/1 (PRAMOTE),
NONG BON SUB-DISTRICT, PRAWET DISTRICT, BANGKOK 10250

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 :

Wanick Inchaistri
Calibration Engineer



Approved By :

Mongkol Yorsontorn
Authorized Signatory

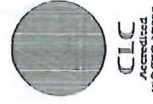
08 April 2023

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. Q23031264

FS-011-04/01-12

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REPORT OF CALIBRATION

FOR

NOMENCLATURE : INCUBATOR
MANUFACTURER : ACCUPLUS
MODEL / TYPE : SMART IZ50
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. WT-305-165 according to TILAS G-20-1/02-08 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, Fluke Model 2620 S/N. 5592550.

TRACEABILITY :

The measurements are traceable to International System of Units (SI) through Calibration Laboratory Co., Ltd. -
Certificate No. Q22061550, 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. Q23031264

FS-011-04/01-12

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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 incubator.

CALIBRATION DATA

DUC		Measured Uniformity (°C)	Measured Stability (°C)	Measured Overall Variation (°C)
Setting (°C)	Indicating (°C)			
20.0	20.0	0.47	0.53	1.18

1. INCUBATOR PERFORMANCE

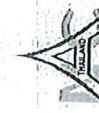


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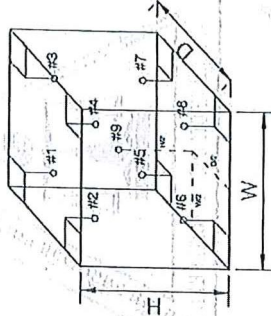
CALIBRATION DATA

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		
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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Certificate No. Q23031264

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No. 17/001-17/001



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Accredited
No. 17/001-17/001

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : REFRIGERATOR
MANUFACTURER : MEDICOOL
MODEL / TYPE : BB-117
SERIAL NO. : BB117-190725001[LA-003]
CLID. NO. : 332100156
JOB CONTROL NO. : 230321051265

CUSTOMER : ENVIRONMENTAL MEASUREMENTS CO., LTD.

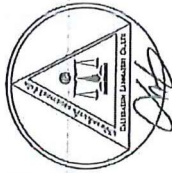
5/45 BANG KANG KRUNG EIZ TOWN, SOI SRINAGARDEA 46/1 (PRAMOTE),
NONG BON SUB-DISTRICT, PRAWET DISTRICT, BANGKOK 10250

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 Inchaistri
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. Q23031265

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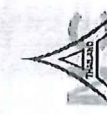


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No. 17/001-17/001

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. W4-305-165 according to TLAS G-20-1/02-08 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, Fake Model 2650 SN, 5592550.

TRACEABILITY :

The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd.
Certificate No. Q23063550, 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

FS-011-04/01-12

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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 refrigerator.

CALIBRATION DATA

1. REFRIGERATOR PERFORMANCE

DUC	Measured Uniformity		Measured Overall Variation (°C)
	Setting (°C)	Indicating (°C)	
4.0		4.0	0.91
			2.28

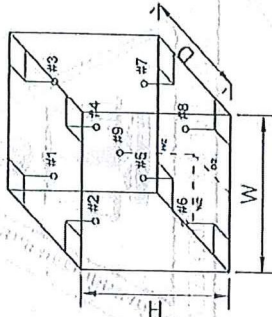
CALIBRATION DATA

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		
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 129 of 138



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

End of Certificate





CALIBRATION LABORATORY CO., LTD.

2710-11-14, 35 Soi Prasert Manukit 23 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-0353-4 Fax 02-578-2672 www.cal-lab.com E-mail: info@cal-lab.com



CERTIFICATE OF CALIBRATION

FOR

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

CUSTOMER : ENVIRONMENTAL MEASUREMENTS CO., LTD.

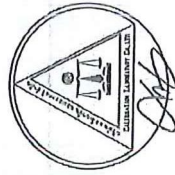
5/45 BAAN KIANG KRUNG BIZ TOWN, SOI SRINAGARINDRA 46/1 (PRAMOTE),
NONG BON SUB-DISTRICT, PRAWET DISTRICT, BANGKOK 10250

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 Inchaisti
Calibration Engineer



Approved By :

Mongkol Yotsontom
Authorized Signatory

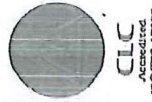
08 April 2023

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

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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 E-mail: info@cal-lab.com



REPORT OF CALIBRATION

FOR

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

ENVIRONMENT CONDITIONS :

Temperature : 30 °C to 31 °C

Relative Humidity : 50% to 53 %

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 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. Q22065550, 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 M2022)"

Certificate No. Q23031267

F3-011-04/01-12

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CALIBRATION LABORATORY CO., LTD.

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ISO/IEC 17025
CALIBRATION 6859
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			
4.0	4.0	4.0	1.31	3.16	6.65

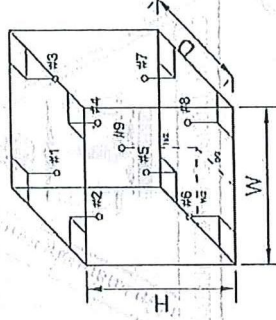
2. TEMPERATURE DISTRIBUTION

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	±.69	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. Q25031267

F3-011-04/01-12

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Certificate No. Q25031267

F3-011-04/01-12

page 4 of 4



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ISO 9001:2015

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.

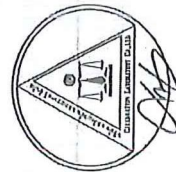
5/45 BAAN KIANG KRUNG BIZ TOWN, SOI SRINAGARINDRA 46/1 (PRAMOTE),
NONG BON SUB-DISTRICT, PRAWET DISTRICT, BANGKOK 10250

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 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. Q23031266

FS-011-04/01-12

page 1 of 4



calibration



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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-505-165 according to TILAS G-20-1/02-08 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. Q22061530, Due Date 07 July 2023.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty multiplied by the coverage factor $k=2$ 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:2012)"

Certificate No. Q23031266

FS-011-04/01-12

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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 ($^{\circ}\text{C}$)	Measured Stability ($^{\circ}\text{C}$)	Measured Overall Variation ($^{\circ}\text{C}$)
Setting ($^{\circ}\text{C}$)	Indicating ($^{\circ}\text{C}$)			
4.0	4.0	1.56	2.70	5.65



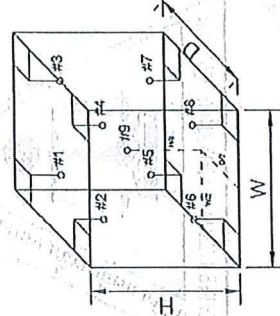
CALIBRATION DATA

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		
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.

2/10-11/4, 55 Soi Prasert Manukit 23 Yeak 4, Prasert Manukit Rd., Ladphrao, Bangkok, 10230
Tel. 02-578-0353-4 Fax. 02-578-2672 www.cali-lab.com Email: cali@cali-lab.com



NSC-TN-17025
CALIBRATION 1809
CLC

CERTIFICATE OF CALIBRATION

FOR

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

CUSTOMER : ENVIRONMENTAL MEASUREMENTS CO., LTD.

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

DATE OF RECEIVED : 09 March 2023

DATE OF ISSUED : 13 March 2023

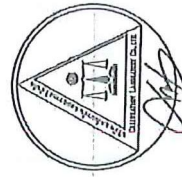
Report of calibration screening must not be taken in part. Except complete. Without the approval of the Calibration Laboratory Co., Ltd.

Calibrated By :

Oranur Kanchapchai
Calibration Engineer

Approved By :

Mongkol Yoisoonorn
Authorized Signatory
13 March 2023

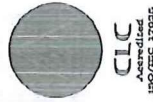


This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q23026565

F3-011-04/01-12

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CALIBRATION LABORATORY CO., LTD.

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NSC-TN-17025
CALIBRATION 1809
CLC

REPORT OF CALIBRATION

FOR

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

ENVIRONMENT CONDITIONS :

Temperature : $(23 \pm 2) ^\circ\text{C}$ Relative Humidity : $(65 \pm 10) \% \text{RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. WI-3105-74. 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 Thunders 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 M2022)"

Certificate No. Q23026565

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CALIBRATION LABORATORY CO., LTD.

2/10-11, 14, 55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrae, Bangkok 10230
Tel. 02-578-0353-4 Fax 02-578-2572 www.ccl-laboratory.com E-mail: ccl@cl-laboratory.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 (°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.

Certificate No. Q23026566

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., Ladphrae, Bangkok 10230
Tel. 02-578-0353-4 Fax 02-578-2572 www.ccl-laboratory.com E-mail: ccl@cl-laboratory.com



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

Calibrated By :

Oranut Kamcharphai

Calibration Engineer



Approved By :

Mongkol Yotsontorn

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. Q23026566

F3-011-04/01-12

page 1 of 3





CALIBRATION LABORATORY CO., LTD.

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Tel. 02-578-0353-4 Fax 02-578-2572 www.cal-lab.com E-mail: cal@cal-lab.com



REPORT OF CALIBRATION

FOR

NOMENCLATURE : DIGITAL THERMOHYGROMETER
MANUFACTURER : DIGICON
MODEL / TYPE : TH-02A
SERIAL NO. : 1919E0284980 [DTEH-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. 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 S/N. 36151.
Temperature & Humidity Chamber, PGC Model 9141-5114 S/N.0802282.

TRACEABILITY :

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

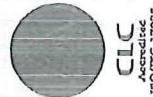
UNCERTAINTY :

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 M:2022)"

Certificate No. Q23026566

F3-011-04/01-12

page 2 of 3



CALIBRATION LABORATORY CO., LTD.

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Tel. 02-578-0353-4 Fax 02-578-2572 www.cal-lab.com E-mail: 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 digital thermohygro meter.

CALIBRATION DATA

1. CORRECTION OF TEMPERATURE

Test point ($^{\circ}\text{C}$)	Actual 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	+5.0	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. Q23026566

F3-011-04/01-12

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CERTIFIED



CALIBRATION LABORATORY CO., LTD.

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Tel. 02-578-0333-4 Fax 02-578-2672 www.cal-laboratory.com Email: cal@cal-laboratory.com

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : WATER BATH
MANUFACTURER : M-LAB
MODEL / TYPE : WBN 15
SERIAL NO. : 0335(LA-007)
CLID. NO. : 332300657
JOB CONTROL NO. : Z30321031269

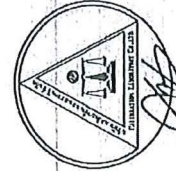
CUSTOMER : ENVIRONMENTAL MEASUREMENTS CO., LTD.
5/45 BAAN KLANG KRUNG BIZ TOWN, SOI SRINAGARINDRA 46/1 (PRAMOTE),
NONG BON SUB-DISTRICT, PRAWET DISTRICT, BANGKOK 10250

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

Report of calibrations 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 Yotsoontorn
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

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CERTIFIED



CALIBRATION LABORATORY CO., LTD.

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Tel. 02-578-0333-4 Fax 02-578-2672 www.cal-laboratory.com Email: cal@cal-laboratory.com

REPORT OF CALIBRATION

FOR

NOMENCLATURE : WATER BATH
MANUFACTURER : M-LAB
MODEL / TYPE : WBN 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 Hydram Data Logger which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

Hydram 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 $k=2$, 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. 02-578-0353-4 Fax 02-578-2672 www.cal-lab.com E-mail: sale@cal-lab.com



CLC
Accredited
TISI 1762
CALIBRATION 999

CONDITION OF CALIBRATION ITEM : GOOD

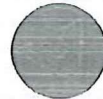
MEASUREMENT RESULTS : (X) without adjustment () adjustment

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)
85.0	85.0	0.35	0.18



CALIBRATION LABORATORY CO., LTD.

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CLC
Accredited
TISI 1762
CALIBRATION 999

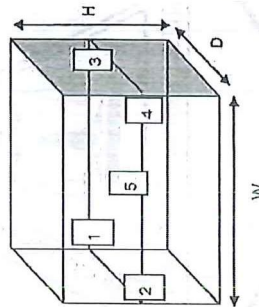
CALIBRATION DATA

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	
85.0	85.0	84.69	84.88	84.68	84.81	84.75	0.48

Technical Note : W = 35 cm, D = 50 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. Q3031269

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CALIBRATION LABORATORY CO., LTD.

210-11, 55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrae, Bangkok 10230
Tel. 02-578-0534 Fax 02-578-2672 www.cal-lab.co.th Email: sale@cal-lab.co.th



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : WATER BATH
MANUFACTURER : MEMMERT
MODEL / TYPE : WNB14
SERIAL NO. : L418.0758[L4-004]
CLID. NO. : 332100157
JOB CONTROL NO. : 230321031268

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

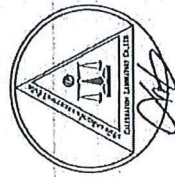
DATE OF RECEIVED : 21 March 2023 DATE OF ISSUED : 08 April 2023

Report of calibration 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 Yossoontorn

Authorized Signatory

08 April 2023

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

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REPORT OF CALIBRATION

FOR

NOMENCLATURE : WATER BATH
MANUFACTURER : MEMMERT
MODEL / TYPE : WNB14
SERIAL NO. : L418.0758[L4-004]
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-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. 5592550.

TRACEABILITY :

The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd.
Certificate No. Q3032733, 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 $k=2$, 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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ISO/IEC 17025
CALIBRATION 17625
CLC

CONDITION OF CALIBRATION ITEM : GOOD

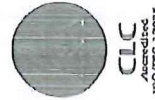
MEASUREMENT RESULTS : (X) without adjustment () adjustment

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



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ISO/IEC 17025
CALIBRATION 17625
CLC

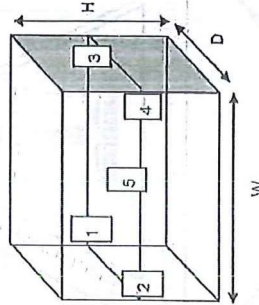
CALIBRATION DATA

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 instrument/s only.

End of Certificate

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