เอกสารแนบ 6

เอกสารสอบเทียบเครื่องมือที่ใช้ในการตรวจวิเคราะห์

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

CLC Accredited ISO/IEC 17025

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NSC-TISI-TIS 17025 CALIBRATION 0059 CLC

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE	:	BALANCE
MANUFACTURER	:	METTLER TOLEDO
MODEL / TYPE	:	MS204TS/00
SERIAL NO.	:	B935191252[LA-002]
CLID. NO.	:	362200356
JOB CONTROL NO.	:	250215018254
CALIBRATION SERVICE	:	☐ IN-LABORATORY ☑ ON-SITE

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 : 15 February 2025 DATE OF ISSUED : 04 March 2025

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

[redacted]

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

[redacted]

[redacted]

CALIBRATION LABORATORY CO., LTD.
2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
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NSC-TISI-TIS 17025 CALIBRATION 0059 CLC

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	:	27 February 2025

ENVIRONMENT CONDITIONS :

Temperature : 23 °C to 24 °C Relative Humidity : 49 % to 51 %

PROCEDURE USED :

This instrument was calibrated under procedure No. **WI-305-46** 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 S/N. 158850.

TRACEABILITY :

The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand).

Certificate No. MM-0165-23, Due Date 21 December 2025.

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)"

[redacted]

[redacted]

CALIBRATION LABORATORY CO., LTD.
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CLC Accredited ISO/IEC 17025

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NSC-TISI-TIS 17025 CALIBRATION 0059 CLC

CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment ( ) adjustment

CALIBRATION DATA

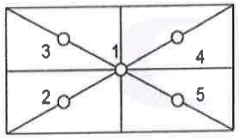
1. Error of indications

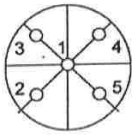
Nominal Test Value (g)	Conventional mass (g)	Display Value (g)	Error of Balance (g)	Uncertainty ± (mg)	Coverage factor *k*
Unload	0.0000	0.0000	0.0000	0.06	2,00
0.1000	0.1000	0.1000	0.0000	0.14	2,00
0.5000	0.5000	0.5000	0.0000	0.15	2,00
1.0000	1.0000	1.0001	+0.0001	0.15	2,00
2.0000	2.0000	2.0001	+0.0001	0.15	2,00
5.0000	5.0000	5.0000	0.0000	0.15	2,00
10.0000	10.0000	10.0001	+0.0001	0.15	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	99.9999	100.0001	99.9999	99.9998	99.9998	0.0002

Note. The Scope of Accredited TISI Certificate No. 23-LB0092 Issue 02 Page 116 of 138

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

End of Certificate

[redacted]

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NSC-TISI-TIS 17025 CALIBRATION 0059 CLC

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE	:	**BALANCE**
MANUFACTURER	:	**SHIMADZU**
MODEL / TYPE	:	**AP225WD**
SERIAL NO.	:	**D316300692[LA-001]**
CLID. NO.	:	**362100172**
JOB CONTROL NO.	:	**250215018253**
CALIBRATION SERVICE	:	☐ **IN-LABORATORY** ☑ **ON-SITE**

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 : 15 February 2025 **DATE OF ISSUED : 04 March 2025**

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

[redacted]

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

[redacted]

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CALIBRATION LABORATORY CO., LTD.
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NSC-TISI-TIS 17025 CALIBRATION 0059 CLC

REPORT OF CALIBRATION

FOR

NOMENCLATURE	:	BALANCE
MANUFACTURER	:	SHIMADZU
MODEL / TYPE	:	AP225WD
SERIAL NO.	:	D316300692[LA-001]
LOCATION SITE	:	LABORATORY-BALANCE ROOM
DATE OF CALIBRATION	:	27 February 2025

ENVIRONMENT CONDITIONS :

Temperature : 23 °C to 24 °C **Relative Humidity : 49 % to 51 %**

PROCEDURE USED :

This instrument was calibrated under procedure No. **WI-305-46** 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 S/N. 158850.

TRACEABILITY :

The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand).

Certificate No. MM-0165-23, Due Date 21 December 2025.

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)"

[redacted]

 [redacted]

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

CLC Accredited ISO/IEC 17025

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NSC-TISI-TIS 17025 CALIBRATION 0059 CLC

CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment ( ) adjustment

CALIBRATION DATA

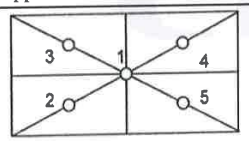
1. Error of indications

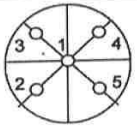
Nominal Test Value (g)	Conventional mass (g)	Display Value (g)	Error of Balance (g)	Uncertainty ± (mg)	Coverage factor *k*
Unload	0.0000	0.0000	0.0000	0.07	2,00
5.0000	5.0000	5.0001	+0.0001	0.11	2,00
10.0000	10.0000	10.0000	0.0000	0.11	2,00
20.0000	20.0000	20.0000	0.0000	0.12	2,00
40.0000	40.0000	39.9999	-0.0001	0.14	2,00
60.0000	59.9999	59.9999	0.0000	0.15	2,00
80.0000	79.9999	80.0000	+0.0001	0.19	2,00
100.0000	99.9999	100.0000	+0.0001	0.17	2,00
120.0000	119.9999	120.0000	+0.0001	0.21	2,00
140.0000	139.9999	139.9999	0.0000	0.25	2,00
160.0000	159.9998	159.9998	0.0000	0.26	2,00
180.0000	179.9998	179.9998	0.0000	0.30	2,00
200.0000	199.9997	199.9996	-0.0001	0.26	2,00

2. Repeatability of indications

Nominal Test Value (g)	Standard Deviation of Reading (g)
200.0000	0.00006

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	100.0000	99.9999	100.0000	100.0001	100.0000	0.0001

Note. The Scope of Accredited TISI Certificate No. 23-LB0092 Issue 02 Page 116,117 of 138

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

End of Certificate

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 [redacted]

CALIBRATION LABORATORY CO., LTD.
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ANAB ANSI National Accreditation Board ACCREDITED ISO/IEC 17025 CALIBRATION AND DIMENSIONAL MEASUREMENT ACDM-2814

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE	:	DO METER
MANUFACTURER	:	YSI
MODEL / TYPE	:	5000-230V/5010
SERIAL NO.	:	16D10162
CLID. NO.	:	272100329
JOB CONTROL NO.	:	250410042960

CALIBRATION SERVICE : ☑ IN-LABORATORY ☐ ON-SITE

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 : 10 April 2025 DATE OF ISSUED : 18 April 2025

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

[redacted]

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

[redacted]

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2/10-11,14, 55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
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ANAB ANSI National Accreditation Board ACCREDITED ISO/IEC 17025 CALIBRATION AND DIMENSIONAL MEASUREMENT ACDM-2814

REPORT OF CALIBRATION

FOR

NOMENCLATURE	:	DO METER
MANUFACTURER	:	YSI
MODEL / TYPE	:	5000-230V/5010
SERIAL NO.	:	16D101626/19D100367[DOM-01]
DATE OF CALIBRATION	:	11 April 2025

ENVIRONMENT CONDITIONS :

Temperature : (25 ± 2.5) °C Relative Humidity : (50 ± 15) %RH

PROCEDURE USED :

This instrument was calibrated under procedure No. **CLC-CPCH-06.** The calibration was performed by direct measurement with Certified Reference Material (CRM).

REFERENCE STANDARD USED :

Dissolved Oxygen, Sigma-Alorich Product ID QC3077-500ML.

TRACEABILITY :

The measurements are traceable to International System of Units (SI) , through Merck Co., Ltd.
Lot LRAD8571, Due Date April 2026.

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)"

[redacted]

 [redacted]

CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment ( ) adjustment

The table in the following gives the calibration results and associated measurement uncertainties of Do Meter.

CALIBRATION DATA

DO METER RESULT @ 20 °C

Nominal Value (mg/L)	DUC Reading (mg/L)	Correction (mg/L)	Uncertainty (mg/L)
8.18	8.2	-0.02	± 0.38

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 015 Page 5 of 68

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

End of Certificate

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14/6/5

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ANAB ANSI National Accreditation Board ACCREDITED ISO/IEC 17025 CALIBRATION AND DIMENSIONAL MEASUREMENT ACDM-2814

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.	:	250306027140
CALIBRATION SERVICE	:	☐ IN-LABORATORY ☑ ON-SITE

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 : 06 March 2025 DATE OF ISSUED : 25 March 2025

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

[redacted]

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

[redacted]

[redacted]

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

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ANAB ANSI National Accreditation Board ACCREDITED ISO/IEC 17025 CALIBRATION AND DIMENSIONAL MEASUREMENT ACDM-2814

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	:	19 March 2025

ENVIRONMENT CONDITIONS :

Temperature : 24 °C to 25 °C **Relative Humidity : 49% 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 S/N. 5592550.

TRACEABILITY :

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

Certificate No. Q24052150, Due Date 27 May 2025.

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)"

[redacted]

[redacted]

CALIBRATION LABORATORY CO., LTD.
2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
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ANAB ANSI National Accreditation Board ACCREDITED ISO/IEC 17025 CALIBRATION AND DIMENSIONAL MEASUREMENT ACDM-2814

CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

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	Measured Stability	Measured Overall
Setting (°C)	Indicating (°C)	(°C)	(°C)	Variation (°C)
104.0	104.0	0.29	0.11	0.68
180.0	180.0	0.83	0.22	1.40

[redacted]

[redacted]

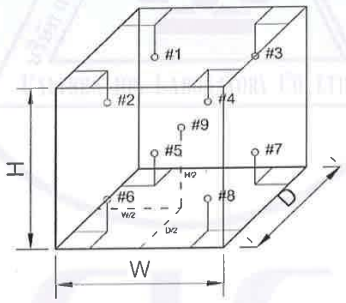
CALIBRATION DATA

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	103.64	103.91	103.49	103.54	103.67	103.61	103.47	103.96	103.72	0.43	2,00
180.0	180.0	179.19	179.91	178.87	179.17	179.38	179.38	178.90	179.22	179.63	0.51	2,00

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

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 015 Page 59 of 68



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

End of Certificate

[redacted]

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NSC-TISI-TIS 17025 CALIBRATION 0059 CLC

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.	:	250215018255
CALIBRATION SERVICE	:	☐ IN-LABORATORY ☑ ON-SITE

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 : 15 February 2025 DATE OF ISSUED : 04 March 2025

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

[redacted]

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

[redacted]

[redacted]

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2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
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CLC Accredited ISO/IEC 17025

NSC-TISI-TIS 17025 CALIBRATION 0059 CLC

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	:	27 February 2025

ENVIRONMENT CONDITIONS :

Temperature : 24 °C to 25 °C **Relative Humidity : 49 % to 51 %**

PROCEDURE USED :

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

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

REFERENCE STANDARD USED :

Hydra Series II, Fluke Model 2635A S/N. 8209003.

TRACEABILITY :

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

Certificate No. Q24052151, Due Date 27 May 2025.

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)"

[redacted]

 [redacted]

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

CLC Accredited ISO/IEC 17025

NSC-TISI-TIS 17025 CALIBRATION 0059 CLC

CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

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	Measured Stability	Measured Overall
Setting (°C)	Indicating (°C)	(°C)	(°C)	Variation (°C)
20.0	20.0	0.43	0.34	0.98

[redacted]

 [redacted]

CALIBRATION LABORATORY CO., LTD.
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CLC Accredited ISO/IEC 17025

NSC-TISI-TIS 17025 CALIBRATION 0059 CLC

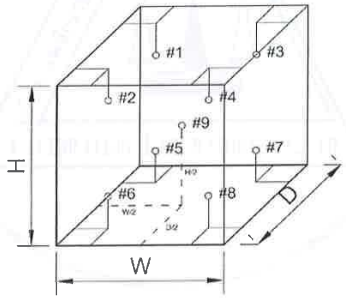
CALIBRATION DATA

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	20.55	20.53	20.57	20.51	20.59	20.52	20.40	20.47	20.27	0.58	2,00

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

The Scope of Accredited TISI Certificate No. 23-LB0092 Issue 02 Page 129 of 138



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

End of Certificate

[redacted]

[redacted]

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

CLC Accredited ISO/IEC 17025

NSC-TISI-TIS 17025 CALIBRATION 0059 CLC

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : pH METER
MANUFACTURER : APERA
MODEL / TYPE : PH700/201T-F
SERIAL NO. : PH700X1019061009/N/A [LA-008/PH-02]
CLID. NO. : 272401000
JOB CONTROL NO. : 250410042961
CALIBRATION SERVICE : ☑ IN-LABORATORY ☐ ON-SITE

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 : 10 April 2025 DATE OF ISSUED : 18 April 2025

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

[redacted]

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

[redacted]

[redacted]

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

CLC Accredited ISO/IEC 17025

NSC-TISI-TIS 17025 CALIBRATION 0059 CLC

REPORT OF CALIBRATION

FOR

NOMENCLATURE	:	pH METER
MANUFACTURER	:	APERA
MODEL / TYPE	:	PH700/201T-F
SERIAL NO.	:	PH700X1019061009/N/A [LA-008/PH-02]
DATE OF CALIBRATION	:	11 April 2025

ENVIRONMENT CONDITIONS :

Temperature : (25 ± 2.5) °C **Relative Humidity :** (50 ± 15) % RH

PROCEDURE USED :

This instrument was calibrated under procedure No. **WI-305-128, 238.** The calibration was performed by direct measurement with Certified Reference Material (CRM) and comparison with Calibration Bath, Precision Thermometer and IPRT which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. pH Standard Solution, NIMT TRM CODE TRM-S-2003, TRM CODE TRM-S-2007.
2. pH Standard Solution, Control Company Catalog Number 06664260,11754256, Lot Number CC787362.
3. Calibration Bath, Kambic Model OB-22/2 ULT S/N. 17115653.
4. Precision Thermometer, ASL Model F250 S/N. 1334023800.
5. IPRT, Wika Model CTP5000-250-D S/N. PO00043543-1-10-1.

[redacted]

[redacted]

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

CLC Accredited ISO/IEC 17025

NSC-TISI-TIS 17025 CALIBRATION 0059 CLC

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI) , through National Institute of Metrology (Thailand). Lot Number. 080124 , 120124. Due Date 23 January 2026.
2. The measurements are traceable to International System of Units (SI) , through Control Company. Certificate No. 4281-14495731 , Due Date 27 September 2025.
3. The measurements are traceable to International System of Units (SI) , through Calibration Laboratory Co., Ltd. Certificate No. Q24120999, Due Date 26 November 2025.
4. The measurements are traceable to International System of Units (SI) , through Thailand Institute of Scientific and Technological Research (TISTR). Certificate No. PSL-T 1042/67, Due Date 16 October 2025.
5. The measurements are traceable to International System of Units (SI) , through National Institute of Metrology (Thailand). Certificate No. TT-0146-24, Due Date 28 October 2025.

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)"

[redacted]

[redacted]

14.6/10

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

CLC Accredited ISO/IEC 17025

NSC-TISI-TIS 17025 CALIBRATION 0059 CLC

CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment ( ) adjustment

The table in the following gives the calibration results and associated measurement uncertainties of pH meter.

CALIBRATION DATA

1. pH METER RESULT @ 25 °C

Standard pH Buffer Solution (pH)	pH Meter Reading (pH)	pH Meter Reading (mV)	Correction (pH)	Uncertainty of Measurement (± pH)	*k* Factor
4.003	4.01	134	-0.007	0.014	2,00
7.005	7.00	-43	+0.005	0.014	2,00
10.015	10.01	-208	+0.005	0.100	2,05

Technical Note. Setting function CAL 3 point (4,7,10).

Note. The Scope of Accredited TISI Certificate No. 23-LB0092 Issue 02 Page 91 of 138

***2. TEMPERATURE RESULT**

Immersion depth (mm)	Actual Temperature (°C)	DUC Reading (°C)	Correction (°C)	Uncertainty ± (°C)
100	25.01	24.9	+0.11	0.07

Technical Note. Type of sensor : pH Probe

Probe ∅ 12 mm

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor of $k = 2{,}00$.

Note. * means Calibrations marked " Not TISI Accredited " in this Certificate have been included for completeness.

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

End of Certificate

[redacted]

[redacted]

ม.6/11

SP METROLOGY SYSTEM (THAILAND) CO.,LTD.

A Trescal company

ID LINE : IEC17025

ANAB ANSI National Accreditation Board ACCREDITED CALIBRATION AND DIMENSIONAL MEASUREMENT

Certificate of Calibration

Certificate Number : SPR25050011-3

Customer : ENVIRONMENTAL MEASUREMENTS CO., LTD.
5/45 Baan Klang Krung Biz Town, Soi Srinagarindra 46/1 (Pramote),
Nongbon Sub-district, Prawet District, Bangkok 10250

Equipment Name : Refrigerator

Manufacturer : Medicool

Model : BB-117

Serial Number : BB117-190725001

ID. Number : LA-003

Environmental Conditions

Ambient Temperature	: 25 °C ± 10 °C	Received Date	: 02 May 2025
Relative Humidity	: 60 % ± 20 %	Calibration Date	: 06 May 2025
Location of Calibration	: On-Site	Recommend Due Date	: N/A
Calibration Procedure	: SP-CPT-04-01	Date of Issue	: 07 May 2025

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received.Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full without written approval of SP Metrology System (Thailand).

[redacted]

[redacted]

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบเครื่องมือวัด.com

Calibration Report

Certificate Number : SPR25050011-3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Data Acquisition/Switch Unit	34970A	MY44074688	SPR24080102-24	07 Sep 2025

Traceability

This certification is traceable to the International System of Unit maintained at :

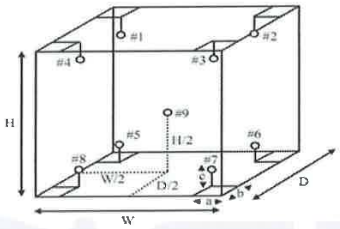
SP Metrology - SP Metrology system (Thailand) Co.Ltd.

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบเครื่องมือวัด.com

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
ID LINE : IEC17025

Result of Calibration

Certificate Number : SPR25050011-3



Temperature Accuracy in the Measurement Zone.

Unit : °C

UUC Setting	Measured Temperature (°C) @ Probe No. (Probe No. 9 is REF.)									Uncertainty (±)
	# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	# 9	
4.0	3.37	4.12	4.25	4.13	3.93	3.98	3.95	4.23	4.16	0.60

Temperature Uniformity, Stability,Overall Variation

Unit : °C

UUC Setting	UUC Reading	Temperature Stability	Temperature Uniformity	Overall Variation
4.0	4.0	0.09	0.94	1.07

Note :

The result of calibration was found accurate as show on date and place of calibration only.

This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor k = 2, providing a level of confidence approximately 95 %

- End of Certificate -

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบเครื่องมือวัด.com

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

CLC Accredited ISO/IEC 17025

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ANAB ANSI National Accreditation Board ACCREDITED ISO/IEC 17025 CALIBRATION AND DIMENSIONAL MEASUREMENT ACDM-2814

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE	:	DIGITAL THERMOMETER WITH PROBE
MANUFACTURER	:	LUTRON
MODEL / TYPE	:	MTM-380SD
SERIAL NO.	:	I.570147/N/A[LA-0013/LA-0013/A]
CLID. NO.	:	232204019
JOB CONTROL NO.	:	250408041416
CALIBRATION SERVICE	:	☑ IN-LABORATORY ☐ ON-SITE

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 : 08 April 2025 DATE OF ISSUED : 11 April 2025

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

[redacted]

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

[redacted]

[redacted]

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

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ANAB ANSI National Accreditation Board ACCREDITED ISO/IEC 17025 CALIBRATION AND DIMENSIONAL MEASUREMENT ACDM-2814

REPORT OF CALIBRATION

FOR

NOMENCLATURE	:	DIGITAL THERMOMETER WITH PROBE
MANUFACTURER	:	LUTRON
MODEL / TYPE	:	MTM-380SD
SERIAL NO.	:	I.570147/N/A[LA-0013/LA-0013/A]
DATE OF CALIBRATION	:	10 April 2025

ENVIRONMENT CONDITIONS :

Temperature : (23 ± 2) °C Relative Humidity : (55 ± 10) % RH

PROCEDURE USED :

This instrument was calibrated under procedure No. **CLC-CPTH-06** based on **ASTM E 220-86** as calibration guidelines. The calibration was performed by using Calibration Bath, Precision Thermometer and IPRT which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Calibration Bath, Kambic Model OB-22/2 ULT, OB-22/2 S/N. 17115653, 17115654.
2. Precision Thermometer, ASL Model F250 S/N. 1334023800.
3. IPRT, Wika, ASL Model CTP5000-450-D, T100-250-1D S/N. PO00036374-1-10-12, PO106346-1-18.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI) , through Calibration Laboratory Co., Ltd. Certificate No. Q24120999, Q24112862. Due Date 26 November 2025, 12 November 2025.
2. The measurements are traceable to International System of Units (SI) , through Thailand Institute of Scientific and Technological Research (TISTR). Certificate No. PSL-T 1042/67, Due Date 16 October 2025.
3. The measurements are traceable to International System of Units (SI) , through National Institute of Metrology (Thailand). Certificate No. TT-0147-24, TT-0110-24. Due Date 28 October 2025, 06 August 2025.

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)"

[redacted]

[redacted]

14.6/13

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

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ANAB ANSI National Accreditation Board ACCREDITED ISO/IEC 17025 CALIBRATION AND DIMENSIONAL MEASUREMENT ACDM-2814

CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment ( ) adjustment

The DUC Reading were recorded and the means value were reported of five times measurement in the table below.

CALIBRATION DATA

CORRECTION OF TEMPERATURE : T1

Immersion depth (mm)	Actual Temperature (°C)	DUC Reading (°C)	Correction (°C)	Uncertainty ± (°C)
200	4.00	4.0	0.00	0.52
	20.02	20.1	-0.08	
	95.02	96.1	-1.08	
	104.02	105.1	-1.08	
	180.00	181.6	-1.60	

Technical Note. Type of sensor : Thermocouple Type K

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 015 Page 57 of 68

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

End of Certificate

[redacted]

[redacted]

14/6/14

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

CLC Accredited ISO/IEC 17025

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ANAB ANSI National Accreditation Board ACCREDITED ISO/IEC 17025 CALIBRATION AND DIMENSIONAL MEASUREMENT ACDM-2814

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.	:	250408041414
CALIBRATION SERVICE	:	☑ IN-LABORATORY ☐ ON-SITE

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 : 08 April 2025 DATE OF ISSUED : 11 April 2025

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

[redacted]

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

[redacted]

[redacted]

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

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ANAB ANSI National Accreditation Board ACCREDITED ISO/IEC 17025 CALIBRATION AND DIMENSIONAL MEASUREMENT ACDM-2814

REPORT OF CALIBRATION

FOR

NOMENCLATURE	:	DIGITAL THERMOHYGRO METER
MANUFACTURER	:	DIGICON
MODEL / TYPE	:	TH-02A
SERIAL NO.	:	1919E0284991[DTH-01]
DATE OF CALIBRATION	:	10 April 2025

ENVIRONMENT CONDITIONS :

Temperature : (23 ± 2) °C **Relative Humidity :** (55 ± 10) %RH

PROCEDURE USED :

This instrument was calibrated under procedure No. **CLC-CPTH-11.** The calibration was performed by using Chilled Mirror Hygrometer which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

Chilled Mirror Hygrometer, Edgetech Model Dew Master S/N. 44602.

Temperature & Humidity Chamber, PGC Model 9141-5116 S/N. 1304261.

TRACEABILITY :

The measurements are traceable to International System of Units (SI) , through Thunder Scientific Corporation. Certificate No. 22724, Due Date 03 October 2025.

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)"

[redacted]

[redacted]

14.6/15

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

CLC Accredited ISO/IEC 17025

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ANAB ANSI National Accreditation Board ACCREDITED ISO/IEC 17025 CALIBRATION AND DIMENSIONAL MEASUREMENT ACDM-2814

CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

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	0.27
25.0	25.00	24.5	+0.50	
30.0	30.00	29.5	+0.50	

2. CORRECTION OF HUMIDITY

STD Temperature (°C)	STD Reading (%RH)	DUC Reading (%RH)	Correction (%RH)	Uncertainty ± (%RH)
25	40.0	30	+10.0	0.8
25	60.0	50	+10.0	0.8

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 015 Page 60 of 68

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

End of Certificate

[redacted]

[redacted]

CALIBRATION LABORATORY CO., LTD.
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ANAB ANSI National Accreditation Board ACCREDITED ISO/IEC 17025 CALIBRATION AND DIMENSIONAL MEASUREMENT ACDM-2814

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.	:	250408041415
CALIBRATION SERVICE	:	☑ IN-LABORATORY ☐ ON-SITE

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 : 08 April 2025 DATE OF ISSUED : 11 April 2025

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

[redacted]

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

[redacted]

[redacted]

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

CLC Accredited ISO/IEC 17025

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ANAB ANSI National Accreditation Board ACCREDITED ISO/IEC 17025 CALIBRATION AND DIMENSIONAL MEASUREMENT ACDM-2814

REPORT OF CALIBRATION

FOR

NOMENCLATURE	:	DIGITAL THERMOHYGRO METER
MANUFACTURER	:	DIGICON
MODEL / TYPE	:	TH-02A
SERIAL NO.	:	1919E0284980[DTH-02]
DATE OF CALIBRATION	:	10 April 2025

ENVIRONMENT CONDITIONS :

Temperature : (23 ± 2) °C Relative Humidity : (55 ± 10) %RH

PROCEDURE USED :

This instrument was calibrated under procedure No. **CLC-CPTH-11.** The calibration was performed by using Chilled Mirror Hygrometer which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

Chilled Mirror Hygrometer, Edgetech Model Dew Master S/N. 44602.

Temperature & Humidity Chamber, PGC Model 9141-5116 S/N. 1304261.

TRACEABILITY :

The measurements are traceable to International System of Units (SI) , through Thunder Scientific Corporation.

Certificate No. 22724, Due Date 03 October 2025.

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)"

[redacted]

[redacted]

14/6/16

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

CLC Accredited ISO/IEC 17025

ilac-MRA

ANAB ANSI National Accreditation Board ACCREDITED TESTING CALIBRATION AND DIMENSIONAL MEASUREMENT ACDM-2814

CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

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	19.7	+0.30	0.27
25.0	25.00	24.6	+0.40	
30.0	30.00	29.5	+0.50	

2. CORRECTION OF HUMIDITY

STD Temperature (°C)	STD Reading (%RH)	DUC Reading (%RH)	Correction (%RH)	Uncertainty ± (%RH)
25	40.0	33	+7.0	0.8
25	60.0	53	+7.0	0.8

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 015 Page 60 of 68

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

End of Certificate

[redacted]

[redacted]

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

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NSC-TISI-TIS 17025 CALIBRATION 0059 CLC

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.	:	250215018258
CALIBRATION SERVICE	:	☐ IN-LABORATORY ☑ ON-SITE

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 : 15 February 2025 DATE OF ISSUED : 04 March 2025

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

[redacted]

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

[redacted]

[redacted]

CALIBRATION LABORATORY CO., LTD.
2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
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NSC-TISI-TIS 17025 CALIBRATION 0059 CLC

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	:	27 February 2025

ENVIRONMENT CONDITIONS :

Temperature : 24 °C to 25 °C **Relative Humidity : 49% 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. Q24120965, Due Date 13 May 2025.

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)"

[redacted]

[redacted]

CALIBRATION LABORATORY CO., LTD.
2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
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NSC-TISI-TIS 17025 CALIBRATION 0059 CLC

CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

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	0.40	0.28

[redacted]

[redacted]

14/6/18

CALIBRATION LABORATORY CO., LTD.
2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
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NSC-TISI-TIS 17025 CALIBRATION 0059 CLC

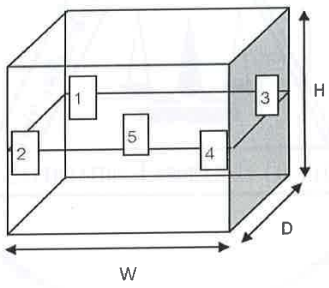
CALIBRATION DATA

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	
85.0	85.0	85.15	84.79	84.96	84.89	85.06	0.58

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

The Scope of Accredited TISI Certificate No. 23-LB0092 Issue 02 Page 128 of 138



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

End of Certificate

[redacted]

[redacted]

14/6/19

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2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
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CLC Accredited ISO/IEC 17025

NSC-TISI-TIS 17025 CALIBRATION 0059 CLC

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE	:	WATER BATH
MANUFACTURER	:	MEMMERT
MODEL / TYPE	:	WNB14
SERIAL NO.	:	L418.0758[LA-004]
CLID. NO.	:	332100157
JOB CONTROL NO.	:	250215018257
CALIBRATION SERVICE	:	☐ IN-LABORATORY ☑ ON-SITE

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 : 15 February 2025 DATE OF ISSUED : 04 March 2025

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

[redacted]

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

[redacted]

[redacted]

CALIBRATION LABORATORY CO., LTD.
2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
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CLC Accredited ISO/IEC 17025

NSC-TISI-TIS 17025 CALIBRATION 0059 CLC

REPORT OF CALIBRATION

FOR

NOMENCLATURE	:	WATER BATH
MANUFACTURER	:	MEMMERT
MODEL / TYPE	:	WNB14
SERIAL NO.	:	L418.0758[LA-004]
LOCATION SITE	:	LABORATORY - HOT ZONE
DATE OF CALIBRATION	:	27 February 2025

ENVIRONMENT CONDITIONS :

Temperature : 24 °C to 25 °C **Relative Humidity : 49% 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. Q24120965, Due Date 13 May 2025.

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)"

[redacted]

[redacted]

14/6/20

CALIBRATION LABORATORY CO., LTD.
2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
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NSC-TISI-TIS 17025 CALIBRATION 0059 CLC

CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

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	0.39	0.17

[redacted]

[redacted]

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CALIBRATION 0059
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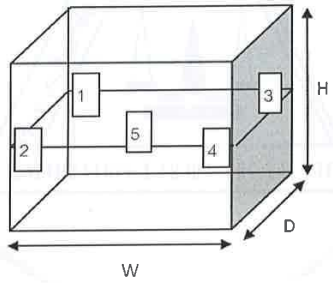
CALIBRATION DATA

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	96.45	96.30	96.22	96.04	96.26	0.51

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

The Scope of Accredited TISI Certificate No. 23-LB0092 Issue 02 Page 128 of 138



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

End of Certificate

[redacted]

[redacted]

14/6/21

List Certificate of Instrument for Environmental Quality Analysis.

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
เครื่องมือสำหรับวิเคราะห์คุณภาพน้ำและดิน									
1	UV-VIS Spectrophotometer	Color (ADMI), Fluoride Chemical Oxygen Demand	Agilent Technologies	Cary60 G6860A / MY15410009	DQE Services Co.,Ltd.	SP25 019	26 May 25	25 May 26	-
2	UV-VIS Spectrophotometer	Sulfate, Phosphorus Nitrogen–Ammonia Nitrogen–Nitrate	Hitachi	U-5100 / 23A4-008	DQE Services Co.,Ltd.	SP25-024	17 Jun 25	16 Jun 26	-
3	COD Reactor (Heating Block)	Chemical Oxygen Demand (COD)	Hanna	H839800-02 / H018500I	Hanna Instruments (Thailand) Ltd.	HIT-2510-0375	7 Mar 25	6 Mar 26	-
4	Cyanuric Acid Portable Photometer	Cyanuric acid	Hanna	H97722C / 95060058111	Hanna Instruments (Thailand) Ltd.	HIT-2513-0437	24 Mar 25	23 Mar 26	-
5	Atomic Absorption Spectrophotometer (AAS)	Arsenic, Cadmium ,Chromium Copper, Iron, Manganese Zinc, Potassium	Agilent Technologies	System ID:G8432A AA240FS / MY13160001	Thailand Institute of Scientific and Technological Research (TISTR)	MTC.ACL.No.372/68	3 Feb 25	2 Feb 26	-
6	Atomic Absorption Spectrophotometer (AAS)	Calcium, Lead, Mercury	Perkin Elmer	PinAAcle 900F / PFB520031902	Perkin Elmer Co.,Ltd.	PinAAcle 900F Preventive Maintenance Report	29 Apr 25	28 Apr 26	-
7	Inductively Coupled Plasma (ICP)		Agilent Technologies	System ID:G8015A G8015AA / MY18030001	Agilent Technologies (Thailand) Co.,Ltd.	Preventive Maintenance Checklist	3 Nov 25	2 Nov 26	-
8	Cold Vapor Atomic Absorption Spectrophotometer (CVAAS)	Mercury(Hg)	MILESTONE	DMA-80 / 24114043	Sithiporn Associates Co.,Ltd.	Service Protocol Report	31 Jan 25	30 Jan 26	-
9	Digestor Unit	Total Kjeldahl Nitrogen	FOSS TECATOR	DT2520 / 9190506	National Food Institute, Ministry of Industry, Thailand	2501440-001-01	27 Jan 25	26 Jan 26	-
10	Distillation Unit (Kjeldahl Method)		FOSS TECATOR	KT9 / 91905393	FOSS South East Asia	13851	25 Feb 25	24 Feb 26	-

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List Certificate of Instrument for Environmental Quality Analysis.

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
เครื่องมือสำหรับวิเคราะห์คุณภาพน้ำและดิน									
11	Incubator	Total Bacteria Total Coliform Bacteria	Memmert	IPP 260 / V615.0187	National Food Institute, Ministry of Industry, Thailand	2502229-001-01	19 Mar 25	18 Mar 26	-
12	Incubator	Fecal Coliform Bacteria Escherichia coli	Memmert	IPP 260 / V618.0033	National Food Institute, Ministry of Industry, Thailand	2502229-003-01	19 Mar 25	18 Mar 26	-
13	Water Bath	Pseudomonas Aeruginosa Staphylococcus Aureus	Memmert	WNE 14 / L416.0606	National Food Institute, Ministry of Industry, Thailand	2501624-001-01	10 Feb 25	9 Feb 26	-
14	Water Bath		Memmert	WNE 14 / L416.0612	National Food Institute, Ministry of Industry, Thailand	2501624-002-01	10 Feb 25	9 Feb 26	-
15	Auto Clave		ALP	CL-40L / 808763	National Food Institute, Ministry of Industry, Thailand	2502229-007-01	19 Mar 25	18 Mar 26	-
16	Auto Clave		ALP	CL-40L / 810010	National Food Institute, Ministry of Industry, Thailand	2503287-001-01	5 Jun 25	4 Jun 26	-
17	Analytical Balance		OHAUS	PX623 / C236754745	National Food Institute, Ministry of Industry, Thailand	2502227-001-01	19 Mar 25	18 Mar 26	-

Due Date of Calibration* : Based on the annual calibration plan. At least 1 time per year.

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DQE Services Co.,Ltd.
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Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com

NSC-TISI-TIS 17025 CALIBRATION 0404

CERTIFICATE OF CALIBRATION

Certificate No. : SP25-019 Page 1 of 5

Customer : United Analyst and Engineering Consultant Co.,Ltd. (Head Office)

Address : 3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260

Location of calibration : Instrument room (207)

Equipment : UV-Vis Spectrophotometer

Manufacturer : Agilent Technologies

Model : Cary 60

Serial No. : MY15410009

ID No. : UAE.WAT.020/2558

Received Date : 26 May 2025

Calibration Date : 26 May 2025

Issue Date : 29 May 2025

Condition Instrument : Good

[redacted]

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

The measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the DQE Services Co., Ltd.

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NSC-TISI-TIS 17025 CALIBRATION 0404

REPORT OF CALIBRATION

Certificate No. : SP25-019 Page 2 of 5

Environment Condition : Ambient Temperature 25 ± 5 °C

Relative humidity 55 ± 20 %RH

Calibration method : In-house method CP-01 Based on ASTM E275-08

Certified Reference Materials :

Material	Serial No.	Certificate No.	Due date
Absobance Standard set	25760	115663	25 October 2025
Absobance Standard set	25757	115638	25 October 2025
Wavelength Standard set	25806	115657	25 October 2025
Wavelength Standard set	25758	115665	25 October 2025

Traceability : This certification is traceable to the International System of Unit maintained at National - Institute of Standards and Technology (NIST) through Starna Scientific Limited

Spectral Band Width of UUC : 1.5 nm.

Scan Speed of UUC : 60 nm/min

Scan Interval of UUC : 0.15 nm.

Resolution of UUC : Photometric 0.0001 Abs.

Wavelength 0.1 nm.

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Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com

REPORT OF CALIBRATION

Certificate No. : SP25-019

Calibration Results : Without adjustment

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor *k*
420	0.0000	0.0000	0.0000	0.0028	2.00
	0.5780	0.5739	0.0041	0.0031	2.00
	1.0484	1.0430	0.0054	0.0029	2.00
	2.1876	2.1876	0.0000	0.0084	2.00
440	0.0000	0.0000	0.0000	0.0028	2.00
	0.5595	0.5581	0.0014	0.0034	2.00
	1.0239	1.0219	0.0020	0.0035	2.00
	2.1230	2.1207	0.0023	0.0085	2.00
465	0.0000	0.0000	0.0000	0.0028	2.00
	0.5230	0.5190	0.0040	0.0029	2.00
	0.9633	0.9609	0.0024	0.0029	2.00
	1.9753	1.9719	0.0034	0.0079	2.00
546.1	0.0000	0.0000	0.0000	0.0028	2.00
	0.5181	0.5161	0.0020	0.0031	2.00
	1.0002	0.9979	0.0023	0.0033	2.00
	1.9973	2.0021	-0.0048	0.0102	2.00
590	0.0000	0.0000	0.0000	0.0028	2.00
	0.5517	0.5503	0.0014	0.0030	2.00
	1.0803	1.0808	-0.0005	0.0031	2.00
	2.0373	2.0324	0.0049	0.0105	2.00
635	0.0000	0.0000	0.0000	0.0028	2.00
	0.5591	0.5583	0.0008	0.0031	2.00
	1.0518	1.0513	0.0005	0.0030	2.00
	1.9274	1.9281	-0.0007	0.0102	2.00

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Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com

REPORT OF CALIBRATION

Certificate No. : SP25-019

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor *k*
235	0.0000	0.0000	0.0000	0.0050	2.00
	0.7469	0.7488	-0.0019	0.0063	2.00
257	0.0000	0.0000	0.0000	0.0050	2.00
	0.8674	0.8663	0.0011	0.0067	2.00
313	0.0000	0.0000	0.0000	0.0050	2.00
	0.2919	0.2902	0.0017	0.0052	2.00
350	0.0000	0.0000	0.0000	0.0050	2.00
	0.6430	0.6428	0.0002	0.0063	2.00

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Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com

REPORT OF CALIBRATION

Certificate No. : SP25-019

Wavelength Accuracy :

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor *k*
241.72	242.0	-0.28	0.18	2.00
279.45	279.5	-0.05	0.18	2.00
287.81	287.6	0.21	0.18	2.00
334.06	333.8	0.26	0.18	2.00
360.93	360.5	0.43	0.18	2.00
418.59	417.9	0.69	0.18	2.00
445.94	445.4	0.54	0.18	2.00
453.66	453.2	0.46	0.18	2.00
460.02	459.6	0.42	0.18	2.00
536.59	536.5	0.09	0.18	2.00
637.98	638.5	-0.52	0.18	2.00
431.38	430.7	0.68	0.18	2.00
472.50	472.3	0.20	0.18	2.00
513.47	513.5	-0.03	0.18	2.00
528.88	528.9	-0.02	0.18	2.00
573.17	573.8	-0.63	0.18	2.00
585.35	585.2	0.15	0.20	2.00
684.40	685.1	-0.70	0.18	2.00
740.72	741.1	-0.38	0.20	2.00
748.55	748.9	-0.35	0.18	2.00
807.03	807.1	-0.07	0.18	2.00
879.28	879.1	0.18	0.18	2.00

Remark : - UUC = Unit Under Calibration
- N/A = Not Avaiable
- The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor *k* , which for a normal distribution corresponds to a coverage probability of approximately 95%

- End of Certificate -

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Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com

CERTIFICATE OF CALIBRATION

Certificate No. : SP25-024

Customer : United Analyst and Engineering Consultant Co.,Ltd. (Head Office)

Address : 3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260

Location of calibration : Instrument room (207)

Equipment : UV-Vis Spectrophotometer

Manufacturer : HITACHI

Model : U-5100

Serial No. : 23A4-008

ID No. : UAE.WAS.010/2567

Received Date : 17 June 2025

Calibration Date : 17 June 2025

Issue Date : 20 June 2025

Condition Instrument : Good

[redacted]

Technical Manager Quality Manager

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

The measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the DQE Services Co., Ltd.

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DQE Services Co.,Ltd.
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Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com

REPORT OF CALIBRATION

Certificate No. : SP25-024

Environment Condition : Ambient Temperature 25 ± 5 °C

Relative humidity 55 ± 20 %RH

Calibration method : In-house method CP-01 Based on ASTM E275-08

Certified Reference Materials :

Material	Serial No.	Certificate No.	Due date
Absobance Standard set	25760	115663	25 October 2025
Absobance Standard set	25757	115638	25 October 2025
Wavelength Standard set	25806	115657	25 October 2025
Wavelength Standard set	25758	115665	25 October 2025

Traceability : This certification is traceable to the International System of Unit maintained at National - Institute of Standards and Technology (NIST) through Starna Scientific Limited

Spectral Band Width of UUC : 5.0 nm.

Scan Speed of UUC : 40

Scan Interval of UUC : 0.1 nm.

Resolution of UUC : Photometric 0.001 Abs.

Wavelength 0.1 nm.

เอกสารไม่ควบคุม

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32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Ladprao, Bangkok 10230
Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com

REPORT OF CALIBRATION

Certificate No. : SP25-024

Calibration Results : Without adjustment

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor *k*
420	0.0000	0.000	0.0000	0.0028	2.00
	0.5780	0.574	0.0040	0.0031	2.00
	1.0484	1.044	0.0044	0.0029	2.00
	2.1876	2.185	0.0026	0.0075	2.00
440	0.0000	0.000	0.0000	0.0028	2.00
	0.5595	0.558	0.0015	0.0035	2.00
	1.0239	1.021	0.0029	0.0035	2.00
	2.1230	2.122	0.0010	0.0079	2.00
465	0.0000	0.000	0.0000	0.0028	2.00
	0.5230	0.519	0.0040	0.0030	2.00
	0.9633	0.961	0.0023	0.0029	2.00
	1.9753	1.975	0.0003	0.0071	2.00
546.1	0.0000	0.000	0.0000	0.0028	2.00
	0.5181	0.515	0.0031	0.0031	2.00
	1.0002	0.996	0.0042	0.0033	2.00
	1.9973	1.994	0.0033	0.0084	2.00
590	0.0000	0.000	0.0000	0.0028	2.00
	0.5517	0.549	0.0027	0.0030	2.00
	1.0803	1.078	0.0023	0.0030	2.00
	2.0373	2.031	0.0063	0.0082	2.00
635	0.0000	0.000	0.0000	0.0028	2.00
	0.5591	0.557	0.0021	0.0031	2.00
	1.0518	1.049	0.0028	0.0030	2.00
	1.9274	1.924	0.0034	0.0081	2.00

เอกสารไม่ควบคุม

DQE Services Co.,Ltd.
32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Ladprao, Bangkok 10230
Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com

REPORT OF CALIBRATION

Certificate No. : SP25-024

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor *k*
235	0.0000	0.000	0.0000	0.0050	2.00
	0.7469	0.747	-0.0001	0.0057	2.00
257	0.0000	0.000	0.0000	0.0050	2.00
	0.8674	0.864	0.0034	0.0059	2.00
313	0.0000	0.000	0.0000	0.0050	2.00
	0.2919	0.293	-0.0011	0.0051	2.00
350	0.0000	0.000	0.0000	0.0050	2.00
	0.6430	0.639	0.0040	0.0055	2.00

เอกสารไม่ควบคุม

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Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com

REPORT OF CALIBRATION

Certificate No. : SP25-024

Wavelength Accuracy :

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor *k*
241.00	240.4	0.60	0.18	2.00
279.30	278.8	0.50	0.18	2.00
288.90	288.3	0.60	0.18	2.00
334.50	333.9	0.60	0.18	2.00
361.40	360.8	0.60	0.18	2.00
418.40	417.9	0.50	0.18	2.00
447.20	446.6	0.60	0.18	2.00
459.30	459.1	0.20	0.18	2.00
537.00	536.4	0.60	0.18	2.00
638.00	637.5	0.50	0.18	2.00
441.29	440.7	0.59	0.18	2.00
479.88	479.4	0.48	0.18	2.00
513.75	513.3	0.45	0.18	2.00
528.59	528.2	0.39	0.18	2.00
575.10	574.5	0.60	0.18	2.00
585.56	585.4	0.16	0.20	2.00
684.70	684.1	0.60	0.18	2.00
740.51	740.2	0.31	0.20	2.00
747.61	747.0	0.61	0.18	2.00
807.04	806.4	0.64	0.18	2.00
879.68	879.1	0.58	0.18	2.00

Remark : - UUC = Unit Under Calinration

- N/A = Not Avaiable
- The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor *k* , which for a normal distribution corresponds to a coverage probability of approximately 95%

- End of Certificate -

เอกสารไม่ควบคุม

Hanna Instruments (Thailand) Ltd.
410/67-68 Soi Ratchadapisek 24, Ratchadapisek Rd., Samsen-nok,
Huaykwang, Bangkok 10310 Tel: 0-2541-4199 Fax: 0-2541-4198

AC-3061

CERTIFICATE OF CALIBRATION

Equipment :	COD Test Tube Heater		
Meter Model :	HI839800-02	**Serial No. :**	H018500I
Tube Heater :	25 Vial Capacity	**Resolution :**	0.1°C
Temperature Range :	(-10 to 160)°C	**Temperature of Reaction :**	150°C
Manufacturer :	Hanna Instruments	**Made in :**	Romania
Condition As-Received :	Used Product	**Reference :**	RE250401
Ambient Temperature :	(25 ± 2)°C	**Relative Humidity :**	(50 ± 15)% RH
Customer name :	United Analyst and Engineering Consultant Co., Ltd. 3 Soi Udomsuk 41, Sukhumvit Rd., Bangchak, Phrakhanong, Bangkok 10260		
Received date :	5 March 2025		
Calibrate date :	7 March 2025		
Issue date :	7 March 2025		
Calibrated Location :	Hanna Instruments (Thailand) Ltd.		
Calibration Procedure :	This calibrator was conducted by using in-house: calibration procedure CP-04 by using certified reference standard instruments.		

[redacted]

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

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approval of the head of Hanna Instrument (Thailand)

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Condition of this calibration result:

Reference Standard Instruments : This certification is traceable to the international unit of unit maintained through:

Instruments	Model	Serial No.	Certificate No.	Traceable
Data Acquisition Switch Unit	34970A	MY44065265	WK2407-141-1	WK Electric Co., Ltd.
Digital Thermo-Hygrometer	HT-771SD	AL07155	25H171	Technology Promotion Association (Thailand-Japan).

Calibration Result:

Measurement Temperature Source Accuracy for COD Reactor.

Capacity (Vial)	Nominal Value (°C)	Average Value (°C)	Uncertainty of Measurement (±°C)
25 Vial	150.0	150.4	0.47

Unit : °C

(1A) 150.407	(2A) 150.377	(3A) 150.269	(4A) 150.402	(5A) 150.422
(1B) 150.426	(2B) 150.394	(3B) 150.644	(4B) 150.690	(5B) 150.542
(1C) 150.477	(2C) 150.303	(3C) 150.627	(4C) 150.257	(5C) 150.176
(1D) 150.462	(2D) 150.456	(3D) 150.199	(4D) 150.406	(5D) 150.102
(1E) 150.185	(2E) 150.513	(3E) 150.235	(4E) 150.460	(5E) 150.442

Figure: Shows the location of the temperature source.

The report 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 of certificate **

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Hanna Instruments (Thailand) Ltd.
410/67-68 Soi Ratchadapisek 24, Ratchadapisek Rd., Samsen-nok,
Huaykwang, Bangkok 10310 Tel: 0-2541-4199 Fax: 0-2541-4198

CERTIFICATE OF ANALYSIS

Equipment :	Cyanuric Acid Portable Photometer		
Meter Model :	HI97722C	**Serial No. :**	905060058111
Manufacturer :	Hanna Instruments		
Made in :	Romania		
Condition As-Received :	Used Product		
Reference :	RE250509		
Customer name :	United Analyst and Engineering Consultant Co., Ltd. 3 Soi Udomsuk 41, Sukhumvit Rd., Bangchak, Phrakhanong, Bangkok 10260		
Received date :	20 March 2025		
Calibrate date :	24 March 2025		
Issue date :	24 March 2025		
Ambient Temperature :	(25 ± 2)°C		
Relative Humidity :	(50 ± 15)% RH		
Calibrated Location :	Hanna Instruments (Thailand) Ltd.		

[redacted]

This certificate was certified only for the instrument we calibrated.

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

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Condition of this result of analysis

Cal Check Standard Cuvettes Specifications :

Product code: HI97722-11 **Lot number:** SC0391/24

Standard cuvette	Standard Value (mg/L)	Lot Standard Deviation (mg/L)	Lot number	Best used before
A, ZERO	0	0.001	8366	April 2026
B, HI97722	20	0.207	7872	April 2026

Specifications for validation procedure:

Standard cuvette	Standard Value (mg/L)	Lot Standard Deviation (mg/L)	Lot number	Best used before
B, HI97722	20 ± 1	19 to 21	7872	April 2026

Method of Standardization

This quality is standardized using which is calibrated by adaptation of Turbidimetric Method as the following details below :

Result of analysis :

Cyanuric Acid Standard (mg/L)	Reading (mg/L)	Error (mg/L)
0	0	0
20 ± 1	20	0

** End of certificate **

เอกสารไม่ควบคุม

Request No. 25-68 / 0320 MTC. ACL.No. 372 / 68

CALIBRATION CERTIFICATE

NOMENCLATURE : 1. Atomic Absorption Spectrophotometer "Agilent Technologies"
Model AA240FS, Serial No. MY13160001
2. Working standard solution "CPA chem"
Solution of 29 components, Lot No. 1012852

SUBMITTED BY : United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok 10260

CALIBRATION PROCEDURE : 1. Performance Verification of Atomic Absorption Spectrophotometer (WI-500-02-30)
2. Estimation Uncertainty of Measurement in Analytical Chemistry (QP-513)

CALIBRATION RANGE: 0.02, 0.10, 0.30, 0.50, 0.70 mg/l at 228.8 nm.Cd, 0.10, 0.20, 0.30, 0.50, 0.70 mg/l at 357.9 nm.Cr, 0.05, 0.10, 0.30, 0.50, 0.70 mg/l at 324.7 nm.Cu, 0.10, 0.30, 0.50, 0.70, 1.00 mg/l at 248.3 nm.Fe, 0.20, 0.50, 0.70, 1.00, 1.50 mg/l at 217.0 nm.Pb, 0.05, 0.10, 0.30, 0.50, 0.70 mg/l at 279.5 nm.Mn, 0.10, 0.30, 0.50, 0.70, 1.00 mg/l at 232.0 nm.Ni, 0.05, 0.10, 0.30, 0.50, 0.70 mg/l at 213.9 nm.Zn

CALIBRATION DATE : 3 February 2025

REFERENCE MATERIAL : Traceable to NIST "Agilent Technologies", "CARLO ERBA", "PanReac AppliChem"
Cadmium Lot No. 0001152457, Chromium Lot No. 0106315418, Copper Batch No. 0001268514, Iron Batch No. T126087A, Lead Lot No. 0123204734, Manganese Batch No. 0106301952, Nickel Batch No. 0104978044, Zinc Batch No. 0100792297

AMBIENT CONDITIONS : Temperature 25 ± 5 °C Relative humidity 50 ± 20 %

The Atomic Absorption Spectrophotometer has been calibrated against Reference Material

[redacted]

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Request No. 25-68 / 0320 1 / 5 MTC. ACL. No. 372 / 68

CALIBRATION DATA

1. Noise Level

Element	Cd	Cr	Cu	Fe	Pb	Mn	Ni	Zn
Absorbance	0.0006	0.0001	-0.0009	0.0003	0.0009	0.0010	0.0007	0.0008
	-0.0001	-0.0012	-0.0007	0.0005	0.0000	0.0002	0.0009	0.0002
	-0.0007	-0.0010	-0.0002	0.0008	0.0003	0.0014	0.0009	0.0002
	-0.0002	-0.0002	-0.0005	0.0009	0.0003	0.0002	0.0008	0.0011
	0.0000	-0.0005	-0.0008	0.0008	0.0007	0.0001	-0.0004	0.0013
	0.0001	-0.0002	-0.0007	0.0006	-0.0002	-0.0001	0.0002	0.0005
	-0.0002	0.0000	-0.0004	0.0009	-0.0002	-0.0008	0.0001	0.0008
	0.0006	-0.0007	-0.0001	0.0004	-0.0001	-0.0003	0.0009	0.0003
	0.0008	-0.0008	-0.0008	0.0014	0.0007	-0.0005	0.0009	0.0005
	-0.0005	-0.0008	-0.0009	0.0013	0.0006	-0.0002	0.0002	0.0014
	-0.0002	-0.0013	0.0010	0.0011	0.0004	-0.0005	0.0001	0.0006
	-0.0005	-0.0018	0.0012	0.0014	0.0004	-0.0006	0.0005	0.0014
	-0.0009	-0.0012	0.0006	0.0014	0.0003	-0.0003	0.0004	0.0010
	0.0003	-0.0017	0.0002	0.0016	0.0003	0.0000	-0.0005	0.0002
	0.0003	-0.0015	0.0003	0.0002	0.0006	0.0003	0.0007	0.0009
	0.0004	-0.0005	0.0001	0.0014	0.0007	0.0009	0.0007	0.0007
	-0.0001	0.0018	0.0010	0.0016	0.0001	-0.0002	0.0012	-0.0002
	0.0003	-0.0017	0.0012	0.0011	0.0003	0.0005	0.0011	-0.0002
	0.0010	-0.0018	-0.0007	0.0009	0.0010	0.0009	0.0001	0.0004
	0.0004	0.0007	-0.0008	0.0004	0.0011	0.0003	0.0002	0.0000
Average Absorbance	0.000	-0.001	0.000	0.001	0.000	0.000	0.000	0.001

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Request No. 25-68 / 0320 2 / 5 MTC. ACL. No. 372 / 68

2. Precision

Element	Conc. (mg/l)	Absorbance										Ave. Abs.	SD	%RSD
Cd	0.02	0.0076	0.0066	0.0071	0.0065	0.0075	0.0066	0.0077	0.0065	0.0065	0.0065	0.007	0.0005	7.39
	0.30	0.0923	0.0921	0.0920	0.0917	0.0919	0.0904	0.0929	0.0910	0.0915	0.0927	0.092	0.0008	0.82
	0.70	0.2083	0.2082	0.2100	0.2114	0.2102	0.2091	0.2096	0.2093	0.2088	0.2082	0.209	0.0010	0.49
Cr	0.10	0.0095	0.0104	0.0097	0.0095	0.0093	0.0091	0.0096	0.0095	0.0082	0.0080	0.009	0.0007	7.63
	0.30	0.0234	0.0243	0.0237	0.0242	0.0214	0.0226	0.0232	0.0233	0.0237	0.0237	0.023	0.0008	3.61
	0.70	0.0474	0.0490	0.0497	0.0516	0.0487	0.0476	0.0474	0.0484	0.0473	0.0474	0.048	0.0014	2.85
Cu	0.05	0.0073	0.0072	0.0060	0.0068	0.0067	0.0065	0.0070	0.0066	0.0068	0.0070	0.007	0.0004	5.53
	0.30	0.0380	0.0385	0.0377	0.0382	0.0394	0.0375	0.0381	0.0392	0.0389	0.0385	0.038	0.0006	1.62
	0.70	0.0888	0.0895	0.0890	0.0902	0.0897	0.0893	0.0899	0.0890	0.0902	0.0898	0.090	0.0005	0.56
Fe	0.10	0.0102	0.0103	0.0100	0.0092	0.0109	0.0094	0.0101	0.0098	0.0092	0.0101	0.010	0.0005	5.39
	0.50	0.0421	0.0421	0.0424	0.0421	0.0425	0.0412	0.0419	0.0425	0.0419	0.0429	0.042	0.0005	1.09
	1.00	0.0791	0.0782	0.0780	0.0780	0.0776	0.0792	0.0780	0.0782	0.0786	0.0794	0.078	0.0006	0.78
Pb	0.20	0.0092	0.0087	0.0081	0.0092	0.0090	0.0087	0.0091	0.0082	0.0091	0.0088	0.009	0.0004	4.49
	0.70	0.0275	0.0290	0.0288	0.0283	0.0272	0.0286	0.0280	0.0285	0.0288	0.0286	0.028	0.0006	2.09
	1.50	0.0592	0.0580	0.0591	0.0596	0.0577	0.0589	0.0591	0.0584	0.0575	0.0595	0.059	0.0008	1.28
Mn	0.05	0.0126	0.0130	0.0123	0.0113	0.0115	0.0126	0.0122	0.0123	0.0114	0.0117	0.012	0.0006	4.81
	0.30	0.0588	0.0582	0.0584	0.0593	0.0582	0.0584	0.0596	0.0602	0.0581	0.0577	0.059	0.0008	1.33
	0.70	0.1320	0.1318	0.1313	0.1306	0.1324	0.1314	0.1320	0.1308	0.1303	0.1305	0.131	0.0007	0.56
Ni	0.10	0.0107	0.0110	0.0102	0.0098	0.0101	0.0106	0.0096	0.0108	0.0100	0.0102	0.010	0.0005	4.44
	0.50	0.0452	0.0454	0.0441	0.0449	0.0452	0.0450	0.0453	0.0452	0.0454	0.0455	0.045	0.0004	0.89
	1.00	0.0848	0.0875	0.0856	0.0853	0.0866	0.0866	0.0866	0.0865	0.0857	0.0859	0.086	0.0008	0.92
Zn	0.05	0.0367	0.0370	0.0372	0.0362	0.0369	0.0367	0.0363	0.0367	0.0365	0.0360	0.037	0.0004	1.02
	0.30	0.2022	0.2009	0.2022	0.2017	0.2022	0.2009	0.2001	0.2016	0.2022	0.2023	0.202	0.0008	0.38
	0.70	0.4118	0.4123	0.4107	0.4132	0.4142	0.4157	0.4086	0.4098	0.4101	0.4079	0.411	0.0025	0.60

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Request No. 25-68 / 0320 3 / 5 MTC. ACL. No. 372 / 68

3. Trueness

3.1 Reading on wavelength- Cadmium(Cd) at 228.8 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Cd	0.020	0.020	0.000	1.23	± 0.005
	0.300	0.300	0.000	0.11	± 0.005
	0.700	0.688	-0.012	1.67	± 0.008

3.2 Reading on wavelength- Chromium (Cr) at 357.9 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Cr	0.1000	0.109	0.009	9.39	± 0.009
	0.3000	0.306	0.006	1.98	± 0.012
	0.7000	0.657	-0.043	6.20	± 0.023

3.3 Reading on wavelength- Copper (Cu) at 324.7 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Cu	0.050	0.050	0.000	0.68	± 0.003
	0.300	0.292	-0.008	2.70	± 0.009
	0.700	0.684	-0.016	2.31	± 0.020

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3.4 Reading on wavelength- Iron (Fe) at 248.3 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Fe	0.100	0.107	0.007	7.06	± 0.014
	0.500	0.522	0.022	4.49	± 0.016
	1.000	0.990	-0.010	1.02	± 0.029

3.5 Reading on wavelength- Lead (Pb) at 217.0 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Pb	0.200	0.200	0.000	0.15	± 0.014
	0.700	0.701	0.001	0.10	± 0.030
	1.500	1.480	-0.020	1.32	± 0.061

3.6 Reading on wavelength- Manganese (Mn) at 279.5 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Mn	0.050	0.051	0.001	2.41	± 0.005
	0.300	0.291	-0.009	2.92	± 0.007
	0.700	0.665	-0.035	4.95	± 0.014

Continue 5 / 5

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Office/Laboratory
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Tel. (66) 0 2323 1672-80 ext. 115, 116
(66) 08 3219 9440
E-mail : mtc@tistr.or.th Website : www.tistr.or.th

Office
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Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217

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3.7 Reading on wavelength- Nickel (Ni) at 232.0 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Ni	0.100	0.098	-0.002	1.60	± 0.013
	0.500	0.490	-0.010	2.00	± 0.018
	1.000	0.951	-0.049	4.90	± 0.032

3.8 Reading on wavelength- Zinc (Zn) at 213.9 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Zn	0.050	0.048	-0.002	3.37	± 0.013
	0.300	0.325	0.025	8.32	± 0.013
	0.700	0.677	-0.023	3.33	± 0.019

[redacted]

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End of Certificate

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PinAAcle 900F Preventive Maintenance Report

Company Name: UAE Consultant Co., LTD.

Instrument Location: 41 Sukumvhit Rd.,

Phra Khanong, Bangkok 10260

Instrument Serial No.: PFBS20031902

Date: 29-Apr-2025

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PinAAcle 900F Preventive Maintenance (PM)

Company Name:	United Analyst and Engineering Consultant Co., LTD.		
Address (Instrument Location):	41 Sukumvhit Rd., Phra Khanong, Bangkok 10260		
Serial Number:	PFBS20031902	**PM Number:**	1 of 2
Customer Name (if applicable):	K. Yainda	**Telephone Number:**	095-5580049
Customer Support Engineer Name:	K. Chayanan	**Service Order Number:**	WO-03126047
Date PM Performed: (DD-MMM-YYYY)	29-Apr-2025	**Next PM Due Date:** (DD-MMM-YYYY)	29-Oct-2025
Standard Labor Hours to Complete PM :		**5 hours**	

Part Number	Release	Publication Date	PerkinElmer
09370145 Rev.9	A	January 2018	

Scope
The purpose of this PM is to ensure the continued functionality of the PinAAcle 900F by inspecting and replacing any worn or damaged parts. This service should only be performed by a trained representative of PerkinElmer.
The customer should save their method before the PM begins.

General Instructions:
The customer must provide the engineer operational data to demonstrate recent instrument performance prior to starting the PM.
Always check with the customer before making any changes that may affect the customer's analysis or calibration, including a current back-up of system software and/or data files.
The completed document should be signed by an authorized PerkinElmer and customer representative and left with the customer.
Update the PM sticker and instrument logbook as required.

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Component List

Component / Specific Model	Serial #	Configuration Notes
PinAACle900F	PFBS20031902	Syngistix V4.0.1.1935
FIAS100	100S24040501	

Parts Lists

Parts Included with the PM		
Part Number (if applicable)	Description	Quantity
B0501696	Fan Filters	2
N3160156	O-Ring Kits for Sampling Introduction (Stainless Steels Nebulizer)	N/A
N3160157	O-Ring Kits for Sampling Introduction (Plastic Nebulizer)	1
N9301714	Replacement Acetylene Filter Cartridge	1
TH001022	Replacement Air Filter Cartridge	1

Additional Reagents and Standards Required for PM				
Part Number (if applicable)	Description	Quality	Batch/Lot #	Expired Date (MM/YY)
N9300183	1000 mg/L Copper Standard	AR	27-39CUY1	Nov 2025

Additional Reagents and Standards Required for PM (Customer Support Solution)				
Part Number (if applicable)	Description	Quantity	Batch/Lot #	Expiration Date (MM/YY)
N/A	DI Water	250 mL	AR	AR
N/A	0.5% HNO_3	250 mL	AR	AR

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Additional Tools Required for PM			
Part Number (if applicable)	Description	Quantity	Serial #
N1013000	0.2A Neutral density filter	1	101N0089015
N1013002	1.0A Neutral density filter	1	101N0089015
03030997	System 2 EDL Driver	1	03030997
N3050605	As System 2 EDL	1	16148
N3050121	Cu Lumina HCL	1	060419-030180
N3050109	Ba Lumina HCL	1	061219-020041
N3050139	K Lumina HCL	1	030819-010130
N3050152	Ni Lumina HCL	1	052719-020020

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Procedure Checklist

Use (✓) to check off those steps in the checklist that have been completed.

1. **General:**
   - ☑ Review the instrument performance with the customer and document any recent problems.
   - ☑ Inspect the customer log book and make any appropriate PM entries.
   - ☑ Perform general inspection of system for cleanliness.
2. **PC Instrument Software:**
   - ☑ Instrument Software user files/databases archived, packed, and/or deleted as needed.
3. **Mechanical:**
   - ☑ Inspect and clean all fans and filters. Replace filters if necessary
   - ☑ Inspect all gas lines for leaks and/or wear. Replace if needed.
   - ☑ Clean exterior of the instrument.
   - ☑ Inspect the burner head, burner chamber, and nebulizer. Clean if needed as stated in the Hardware Guide.
   - ☑ Check burner head dimensions with the feeler gauge as stated in the Hardware Guide in the Maintenance chapter section on cleaning the burner head and checking sloth width. Replace if out of specification
   - ☑ Check the condition of the end cap, burner head, and nebulizer O-rings. Replace if necessary.
   - ☑ Check the drain system for signs of wear. Replace worn or damaged parts.
   - ☑ Visually check for proper flame conditions when igniting the Air-C2H2 and N20-C2H2 flames (if applicable).
4. **Electrical:**
   - ☑ Inspect PC boards. Clean if necessary.
   - ☑ Carefully check all internal and external cable connections.
   - ☑ Check instrument firmware revisions upgrade to current levels (if necessary)
   - ☑ Run Diagnostics Test within the Advanced function of the Spectrometer page. Check the results in the service log folder in the Spectrometer BM Log Viewer.
5. **Optics:**
   - ☑ Inspect and clean the sample compartment windows, if needed.
   - ☑ Inspect optics. Clean or replace if necessary,
6. **Gasses:**
   - ☑ Verify that the Gasses supplied to the instrument are within the pressure and purity specifications found in the PinAAcle 900 Series Pre-installation Checklist SDB.
   - ☑ Verify that the acetylene filter and air filter element is dry. Replace if necessary.

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7. **Flame Interlock Check:**

   Description: Check to ensure that all safety interlocks are closed.

Parameter	Specification	Test Results	Pass/Fail
Flame Sensor	Air/C_2H_2 Flame correctly shuts down	Active	Passed
Drain Sensor	Air/C_2H_2 Flame correctly shuts down	Active	Passed
Nebulizer Sensor	Air/C_2H_2 Flame correctly shuts down	Active	Passed
C_2H_2 Pressure Sensor	Air/C_2H_2 Flame correctly shuts down	Active	Passed
Air Pressure Sensor	Air/C_2H_2 Flame correctly shuts down	Active	Passed
Burner Head Sensor	Choosing Nitrous Oxide as the oxidant should trigger an interlock shuts down	Active	Passed

8. **After PM Performance tests:**

   8.1 Detector Linearity with Barium

   Description: Ensures that the detector is linear in the Visible Range.

Parameter	Specification	Certificate Value at 553.6 nm (Abs.)	Test Results	Pass/Fail
1.0 A ND Filter	± 5% from Cert.	0.9668	0.9878	Passed
0.2 A ND Filter	± 5% from Cert.	0.1953	0.1876	Passed

   8.2 Baseline Noise at 1.0 Absorbance with Barium

   Description: Ensures that a high absorbance will not produce excessive noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.010	0.0005	Passed

   8.3 AA Baseline Noise with Copper

   Description: Check baseline noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.001	0.0001	Passed

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8.4 D_2 Background Compensation with Copper

Description: Verifies the instruments ability to compensate for Background absorption.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.010	0.009	Passed

8.5 AA-BG Baseline Noise with Copper

Description: Ensures that background correction does not produce excessive noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.005	0.0001	Passed

8.6 AA-BG Baseline Noise with Arsenic

Description: Ensures that background correction does not produce excessive noise at a low wavelength.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.005	0.0004	Passed

8.7 Flame Sensitivity

Description: Instrument Sensitivity checked against Copper standard.

Standard Copper Sensitivity	Specification	Results (Abs.)	Pass/Fail
5 mg/L Sensitivity SS Neb (if applicable)	> 0.250 Abs.	N/A	Not Applicable
2 mg/L Sensitivity HS Neb (if applicable)	> 0.250 Abs.	N/A	Passed

10. **Review:**
    - ☑ Review with the customer PM work performed.
    - ☑ Review with the customer routine maintenance procedures.
    - ☑ Discuss recommended customer supplied materials to have on hand.
    - ☑ Attach PM sticker.

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Additional Comments

Additional Comments Regarding the PM

Review

The preventive maintenance checks and if applicable performance tests for PinAAcle 900F have been completed.

This PinAAcle 900F Passes ☑ Fails ☐ the preventive maintenance.

[redacted]

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http://www.perkinelmer.com

Service Report

Work Order Number	Activity Code	Billing Type	Requested Start Date	Model	Serial Number
WO-03126047	Planned Maintenance	Contract	10/01/2568 11:08 น.	AAN3200051	PFBS20031902

Service Representative Name	Contract Number	Expiry Date	Equipment ID	System ID
Kanan, Chayanan	SC-0035564109	31/10/2025	N/A	N/A

UDI Number
N/A

Equipment Location	Bill To Name
บริษัท ยูไนเต็ด แอนะลิติค แอนด์ เซราอบาราทอรี เซลพราไรเซน กรุงเทพมหานคร 51 10260 TH	บริษัท ยูไนเต็ด แอนะลิติค แอนด์ เซราอบาราทอรี เซลพราไรเซน กรุงเทพมหานคร 51 10260 TH

Customer Contact	Phone Number	Fax Number	Email	Purchase Order
K. กุ่านธิมดา แซ่เล็ก(ในหอง)	095-5580049	N/A	nichakom.praemai1996@gmail.com	HPO-250100002

Work Description

- PM 2/2 (AAนครั้งแก่)
- Cleaning Cell, Chamber, Filter
- Wavelength Calibrate ; Pass
- Wavelength Scan As,Cu,Bi,K,Ni ; Pass
- Align cell with Hg_0 : OK

Start Date	End Date	Work Description
29/04/2025	09/05/2025	

Tools Used

Quantity	Calibrated Tool	Description	Serial Number	Last Calibration Date	Next Calibration Date
*** No Calibrated Tools Used ***					

Material Used

Part Number	Part Description	Note	Lot/Serial Number	Quantity
*** No Parts Used ***				

Labour Details

Part Number	Part Description	Start Date	Quantity
SV000013	Preventative maintenance	29/04/2025	4

Work Complete	Customer Signature	Technician Signature
[redacted]		

Terms & Conditions

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Customer Acknowledgment of receipt of the above repair / replacement.

Special Terms and Conditions: This is not an invoice.

Taxes will be applied to your invoice if applicable.

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Atomic Absorption/FIAS 100/400 Preventive Maintenance (PM)			
Company Name:	United Analyst and Engineering Consultant Co., LTD.		
Address (Instrument Location):	41 Sukumvhit Rd., Phra Khanong, Bangkok 10260		
Room Number:	Lab		
Asset Number (if applicable):	2 of 2W	**Customer System ID:**	K. Yanida
Service Engineer Name:	K. Chayanan	**Service Order Number:**	WO-03051971
Date PM Performed: (DD-MMM-YYYY)	29-Apr-2025	**Next PM Due Date:** (DD-MMM-YYYY)	29-Oct-2025

Part Number	Release	Publication Date	PerkinElmer
09370005	C	January 2013	

Scope
The purpose of this PM is to ensure the continued functionality of the Atomic Absorption/FIAS 100/400 by inspecting and replacing any worn or damaged parts. This service should only be performed by a trained representative of PerkinElmer.
The customer should save their method before the PM begins.

General Instructions:
Always check with the customer before making any changes that may affect the customer's analysis or calibration.
The completed document should be signed by an authorized PerkinElmer and customer representative and left with the customer.
Update the PM sticker and instrument logbook as required.

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Component List

Component / Specific Model	Serial #	Firmware Version	Configuration Notes
FIAS100	100S24040501	2.20	Syngistix V4.0.1.1935

Parts Lists

Parts Included with the PM				
Part Number (if applicable)	**Description**	**Quantity**	**Batch/Lot #**	**Expiration Date** (MM/YY)
B050 2706	Fan Filter	1	N/A	N/A

Additional Tools Required for PM				
Part Number (if applicable)	**Description**	**Quantity**	**Serial #**	**Calibration Due Date** (MM/YY)
N/A	Digital Volt Meter	1	N/A	N/A
Additional Reagents and Standards Required for PM				
Part Number (if applicable)	**Description**	**Quantity**	**Batch/Lot #**	**Expiration Date** (MM/YY)
N/A	N/A	N/A	N/A	N/A

เอกสารไม่ควบคุม

Procedure Checklist

Use (✓) to check off those steps in the checklist that have been completed.

1. **General:**
   - ☑ Review the instrument performance with the customer and document any recent problems.

     _____

   - ☑ Is the Working Environment Acceptable? If not, document.

     _____

   - ☐ Visual Damage (if yes, describe)

     _____

   - ☑ Check incoming AC line voltage for proper levels and grounding.
   - ☑ Verify Voltage switch on back of instrument is correct
   - ☑ Perform general inspection of system for cleanliness. Clean if needed.
   - ☑ Gas supply cylinders secured, lines leak checked and argon or nitrogen supply pressure verified (45 – 58 psi).
   - ☑ Inspect the customer log book and make any appropriate PM entries.
   - ☑ Fan checked and filter cleaned
   - ☑ Heating mantle or Universal Cell Holder checked

2. **Instrument components**
   - ☑ Non-return valve checked/repaired/replaced if needed (B019 8111). Clean the valve if there is any liquid in it. Replace the rubber sleeve (B013 5123) if it is worn. Check the flow meter for any signs of fluid in it. Clean the flow meter if needed.
   - ☑ Verify condition of pump pressure adjustment levers (B050 7794 - look for cracks or problems with the springs), pump rollers (B300 0251 check for wear), and thumb screws (B050 7796).
   - ☑ Check the Multiport valve for proper switching, flow, and insure there are no leaks. Clean valve parts and replace o-rings if needed (large o-ring: B050 1250, small o-ring: B004 5095). Use a squirt bottle & fishing line to try to dislodge clogs.
   - ☑ Firmware Version checked. Latest is 2.20.

3. **Mixing/Separation Assembly & Pump Tubing:**
   - ☑ Mixing separator assembly checked
   - ☑ Filter/membrane checked (B050 8306)
   - ☑ Condition of the pump tubing (replace if necessary), correct pump tubing for the solutions being run. Make sure the correct magazines are being used. B050 7791 for 0.13 – 1.80 mm tubing; B050 7792 for 1.60 – 3.18 mm tubing.

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4. **Cell, Cell Windows, Transfer Line:**
   - ☑ Cell checked
   - ☑ Cell windows checked
   - ☑ Transfer line checked for moisture (if moisture is a problem, the Nafion dryer might be needed)

5. **Operational Tests:**
   - ☑ Run DI water through the carrier/reductant/sample system. Verify smooth flow of liquid throughout without leaks. Replace tubing & fittings if needed.

6. **Review:**
   - ☑ Review with the customer PM work performed.
   - ☑ Review with the customer routine maintenance procedures.
   - ☑ Discuss recommended customer-supplied materials to have on hand.
   - ☑ Attach PM sticker.
   - ☑ Update Logbook.

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Additional Comments

Additional Comments Regarding the PM

Review

The preventive maintenance checks and if applicable performance tests for FIAS 100/400 have been completed.

This FIAS 100/400 Passes ☑ *Fails* ☐ *the preventive maintenance.*

[redacted]

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Document History

Revision	Description of Change	Page(s)	Date
A	First release		May 2008
B	Addition of Batch/Lot Number, Expiration Date, and Report Fields.	2,7	February 2009
C	Update to new format	All	January 2013

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Service Report

Work Order Number	Activity Code	Billing Type	Requested Start Date	Model	Serial Number
WO-03051971	Planned Maintenance	Contract	10/03/2568 23:08 น.	B0508570	100524040501
Service Representative Name	**Contract Number**		**Expiry Date**	**Equipment ID**	**System ID**
Kanan, Chayanan	SC-003565090		24/05/2025	N/A	N/A
UDI Number					
N/A					

Equipment Location	Bill To Name
บริษัท ยูไนเต็ด แอนะลิสิส แอนด์ เซอวเวเจอร์ เรดพรอโดนส กรุงเทพมหานคร 51 10260 TH	บริษัท ยูไนเต็ด แอนะลิสิส แอนด์ เซอวเวเจอร์ เรดพรอโดนส กรุงเทพมหานคร 51 10260 TH

Customer Contact	Phone Number	Fax Number	Email	Purchase Order
K. Nichakorn เมพวิทน	095-5580049	N/A	pengnicha.nh2@gmail.com	HPO-340400211

Work Description

- PM 2/2 Warranty
- Cleaning Port Vale, Manifold, Tuning
- Run Hg test ; Pass

Start Date	End Date	Work Description
29/04/2025	29/04/2025	
29/04/2025	29/04/2025	

Tools Used

Quantity	Calibrated Tool	Description	Serial Number	Last Calibration Date	Next Calibration Date
*** No Calibrated Tools Used ***					

Material Used

Part Number	Part Description	Note	Lot/Serial Number	Quantity
*** No Parts Used ***				

Labour Details

Part Number	Part Description	Start Date	Quantity
SV000013	Preventative maintenance	29/04/2025	3
SV000002	Service Travel	29/04/2025	1

[redacted]

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Agilent CrossLab
From Insight to Outcome

Agilent CrossLab Start Up Services

Agilent 5100 5110 ICP-OES Preventive Maintenance

Agilent Preventive Maintenance provides factory recommended service for your analytical instruments to assure reliable operation and the accuracy of your results

Delivered by highly trained and certified service engineers using genuine Agilent parts and supplies, Agilent Preventive Maintenance provides what you need to reduce unplanned downtime and keep your systems operating at their peak performance.

This checklist is used as a guide for completing the preventive maintenance tasks. A signed copy of this checklist is provided for your records.

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Agilent CrossLab
From Insight to Outcome

Introduction

Customer Information

- Customers should provide all necessary operating supplies upon request of the engineer.
- A customer representative should be available to the engineer while performing the preventive maintenance procedures. Customers are responsible for regular maintenance and are encouraged to observe the service representative.
- Any parts not included in the Parts Lists section of this document are not part of the recommended Preventive Maintenance service nor are they included in the price of this service.
- If a system requires the use of extra or special procedures and/or parts for the maintenance service, then these must be ordered separately and charged as a repair, which may incur additional costs.
- For customers using HF applications, the instrument should be returned to its standard sample introduction system.

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Agilent CrossLab
From Insight to Outcome

Important Customer Web Links

- To access **Agilent University**, visit http://www.agilent.com/crosslab/university/ to learn about training options, which include online, classroom and onsite delivery. A training specialist can work directly with you to help determine your best options.
- To access the **Agilent Resource Center** web page, visit https://www.agilent.com/en-us/agilentresources. The following information topics are available:
  - Sample Prep and Containment
  - Chemical Standards
  - Analysis
  - Service and Support
  - Application Workflows
- The **Agilent Community** is an excellent place to get answers, collaborate with others about applications and Agilent products, and find in-depth documents and videos relevant to Agilent technologies. Visit https://community.agilent.com/welcome
- Videos about specific preparation requirements for your instrument can be found by searching the **Agilent YouTube** channel at https://www.youtube.com/user/agilent
- **Need to place a service call?** Flexible Repair Options | Agilent

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Service Engineer's Responsibilities

- Contact the customer and ensure that all necessary supplies are available before the preventive maintenance visit.
- Only select those pages that relate to the system or module being serviced.
- Complete empty fields with the relevant information.
- Complete the relevant checkboxes in the checklist using either a "**X**" or tick mark "✓".
- Check **"Service not applicable"** check boxes to indicate services/tasks not delivered, as appropriate.
- Complete the Preventive Maintenance services in the most logical order relevant to the individual system service in the order of the tasks listed.
- Complete the **Service Review** section together with the customer.
- Complete the fields for page numbers at the foot of each selected page
- Add relevant page numbers to selected pages and complete the total number of pages field in the Service Completion section
- **Ask the customer to sign the Service Verification section including the customer's and your signature.**

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Instrument Maintenance

System Information

☐ Check this box if an instrument configuration report is attached instead of completing the table.

Instrument System Name and ID	5110 VDV ICP-OES
Instrument System Site and Location	UAE Consultant

List System Component Product Numbers	**List the Serial Numbers of each Component**
1. G 8019 A	MY 18030001
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	

ICP-OES Configuration Table	**Circle the type or write in the type if other**
Nebulizer Type	SeaSpray | OneNeb | Conikal | Other
Spray Chamber	Cyclonic Single Pass | Cyclonic Double Pass | Other
Torch	Radial | Dual View | Other
Torch Type	One Piece | Semi Demountable | Fully Demountable | Other
Injector Diameter	2.4mm | 1.8mm | 1.4mm | 0.8mm | Other
Injector Material	Quartz | Ceramic | Other

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Preparation

- ☑ Discuss any specific issues with the customer before starting.
- ☑ Review the instrument logbook for recorded problems and comments.
- ☑ Save instrument control settings before starting the procedure.
- ☑ Perform a general inspection of the system for cleanliness.
- ☑ Check for proper installation of parts, assemblies, sensors etc.
- ☑ Check system for required installation of components and implementation of Service Notes
- ☑ Check for required firmware/software updates and verify with customers if they would like them installed.
- ☐ For HF application systems, if standard sample introduction system was not installed, ask the customer to install it. N/A
- ☑ Ask the customer to remove any samples from the ICP-OES sample introduction area, auto sampler or around the ICP-OES.

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Preventive Maintenance Procedures

Record Pre-PM instrument performance

- ☑ Run Instrument Performance test.
- ☑ Record results in Instrument Performance Test Results Table – Pre-PM.

Clean and inspect ICP-OES system

- ☑ Look for any obvious external damage or problems.
- ☑ Inspect water cooling hoses, gas lines and power cord for excessive wear or damage.
- ☑ Perform a general internal inspection of the system for excessive dust accumulation, clean if necessary.
- ☑ Inspect sample introduction components and record any required maintenance in the Service Engineer Comments and notify the customer as the required actions required.
- ☑ Record the instrument operating conditions in the ICP-OES Status Results Table.
- ☑ Replace the polychromator purge filter.
- ☑ Replace the radial pre-optics window
- ☑ Replace the axial pre-optics window for SVDV and VDV instruments.
- ☑ Check exhaust flow for the correct positive extraction at the exhaust duct to insure they meet minimum specifications.
- ☑ Replace air inlet dust filter.
- ☐ Replace high capacity air inlet dust filter element if installed. N/A
- ☑ Remove and clean instrument water inlet filter.

Agilent Water Recirculator

- ☐ **Service not applicable**
- ☑ Drain cooling fluid and remove any particles from the chiller reservoir
- ☑ Remove, clean and reinstall water inlet metal mesh filter if present.
- ☑ Re fill with Agilent Cool Clear cooling fluid.
- ☑ Clean the cooling system Air filter and the condenser.

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SPS 3 Auto Sampler

- ☑ **Service not applicable**
- ☐ Power cycle the autosampler and verify successful initialization.
- ☐ Inspect X and Z axis belts for wear. Replace is necessary.
- ☐ Clean X and Z axis slide shafts.
- ☐ Using customer's racks and the Agilent software move the sample probe to the 4 outermost corners and rinse port, ensure that the probe is approximately centered in the vial.

SPS 4 Auto sampler

- ☑ **Service not applicable**
- ☐ Clean the spill tray, rack location mat, end frames and chassis with a damp soft cloth and diluted mild detergent.
- ☐ Clean the auto sampler cover panels, if cover kit is installed, with domestic window cleaner.
- ☐ Check the X-axis and Z-axis drive belts for cracks, splits, damaged teeth, excessive fraying, color changes or degradation from fumes.
- ☐ Check the X-axis, Theta-axis and Z-axis FFC cables for cracks, incorrect positioning, damaged edges or damaged connectors.
- ☐ Pump Tubing Replacement. Replace peristaltic pump tubing. Replace all tubing that goes from the rinse station to the pump and from the pump to the waste/rinse bottles
- ☐ Test using customer's tray and move the sample probe to the sample vial 1, wash vial and rinse port and ensure that the probe is centered in the vial. If not use calibration wizard and calibrate the position.

AVS 4, 6, 7 Advanced Valve System

- ☑ **Service not applicable**
- ☐ Replace valve rotor seal
- ☐ Check fittings for signs of leaks
- ☐ Check tubing including autosampler tubing for kinks or excessive wear
- ☐ Check high flow pump for signs of leaks

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ICP-OES adjustment

- ☑ Check position of Zn peak, adjust if required.
- ☑ Check Argon Ratio, adjust to specified value if required.
- ☑ Perform Detector Calibration.
- ☑ Perform Instrument Calibration.

Record Post-PM instrument performance

- ☑ Run Instrument Performance test.
- ☑ Record results in Instrument Performance Test Results Table - Post PM.
- ☑ For systems using ICP Expert version 7.3 and above, run the following Instrument tests
  - ☑ Subsystem Communications Test
  - ☑ Air Flow
  - ☑ Water Flow
  - ☑ Gas Flows
  - ☑ RF Generator
  - ☑ Camera Test
  - ☑ Optics Test
  - ☑ Nebulizer Test
- ☑ Record the result in the Instrument Test Results Table

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Restore Instrument

- ☐ For HF applications, ask the customer to reinstall their sample introduction system. N/A
- ☑ Leave system in an idle state: on and purging.
- ☑ Guidance: If the PM service is performed prior to a qualification service, then use the qualification procedure as a guide for final instrument set up and checkout.

Service Review

- ☑ Attach available reports/printouts of all tests to this documentation.
- ☑ Record the Preventive Maintenance service activity in the customer's records/logbook.
- ☑ Record the PM event in the Smart Alerts logbook, if applicable.
- ☑ Update/reset instrument maintenance counters as appropriate.
- ☑ Affix the PM sticker to the system or instrument logbook based on the customer's request.
- ☑ Complete the Service Engineer Comments section if there are additional comments.
- ☑ Review this service, parts replaced, and test results obtained with the customer.
- ☑ If the instrument firmware was updated, record the details of the change in the Service Engineer's Comments box. Systems in a compliant environment may need additional documentation.
- ☑ **Complete the Signature Page with both Service Engineer and Customer signatures.**

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Test Results

Instrument Performance Test Results Table

Note: These measurements do not form part of any specification and are for reference only.

	Pre PM Sensitivity Check		Post PM Sensitivity Check	
	Radial	Axial *	Radial	Axial*
Zn 213.857 nm SRBR	17863.8	2579.2	2230.8	3962.9
Mn 257.610 nm SRBR	94870.5	196149	105863.0	178844
Al 396.152 nm SBR	5.2	8.0	7.0	7.4
K 766.491 nm SBR	3.0	14.6	3.4	8.7

* Axial result is not applicable for G8016AA, G8012AA Radial View instruments.

Instrument Test Results Table

Note: The Instrument Test results are for systems using ICP Expert version 7.3 and above only.

Instrument Test	Result
Subsystem Communications Test	Pass
Air Flow	Pass
Water Flow	Pass
Gas Flows	Pass
RF Generator	Pass
Camera Test	Pass
Optics Test	Pass
Nebulizer test	Pass

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ICP-OES Status Results Table

Note: These measurements do not form part of any specification and are for reference only.

Measurement	Standby Mode		Plasma On	
Mains Voltage	231 288	VAC	226. 380	VAC
Mains Current	0.083	A	0.100	A
Instrument Temperature	21.1	°C	21.6	°C
RF Air Flow (sensor speed)	44.0	Hz	41.1	Hz
Plasma Exhaust Temperature	No measurement		47.1	°C
Water Flow Oscillator	No measurement		1.14	L/min
Water Flow Detector	0.92	L/min	0.90	L/min
Water Inlet Temperature	19.5	°C	18.5	°C
Polychromator Temperature	35.4	°C	35.4	°C
CCD Temperature	-40.1	°C	-39.9	°C
Thermal Stabilizer	35.0	°C	35.0	°C
Argon Supply Pressure	634.43	kPa	583.77	kPa
Purge Gas Supply Pressure*1	631.28	kPa	604.02	kPa
Option Gas Supply Pressure*1	-	kPa	-	kPa
Nebulizer Flow	No measurement		0.70	L/min
Nebulizer Back Pressure	No measurement		273.61	kPa
Plasma Gas Flow	No measurement		1196	L/min
Auxiliary Gas Flow	No measurement		1.00	L/min
RF Power	No measurement		1200.4	W
RF Supply Current	No measurement		8.228	A
RF Supply Voltage	No measurement		194.529	V

*1 If option installed

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Consumed PM Parts

Part Description	Part Number	Product or Model# where used	Quantity consumed
Axial Pre-Optic Window	G8010-68014	G8010A, G8011A, G8014A/G8015A	1
Radial Pre-Optic Window	G8010-68015	All	1
Agilent Cool Clear Coolant Fluid	5799-0037	Agilent Water Recirculator	-
Purge Gas Filter	G8010-60136	All	1
Air inlet filter	G8000-68002	All	1
High Capacity Air Filter	G8010-60189	Optional	-
Rotor seal for 6-7 port valve for AVS6/7	G8494-60002	G8494A/G8495	-
Rotor seal for 4 port valve for AVS4	G8493-60002	G8493A	-
Rinse solution to rinse station 2.5mm id x 1m	G8410-80123	SPS 4	-
Barb connector 2.5mm-1.5mm ID	G8410-80124	SPS 4	-
PVC waste tubing,8mm od x 5mm id, 2m	G8410-80122	SPS 4	-
Additional Parts may be required from engineer's stock:			
X axis drive belt	5410047500	SPS 3	-
Z axis drive belt	5410047400	SPS 3	-
Peristaltic pump tubing, PVC SolvaFlex, 3 bridged,	3710049000	SPS 4	-

Consumed Parts Reference
(Purchased by customer, not included as part of PM)

☑ Section Not Applicable

Part Description	Part Number	Product or Model# where used	Quantity consumed

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Signature Page

Service Engineer Comments (optional)

If there are any specific points you wish to note as part of performing the installation or other items of interest for the customer, please write in this box.

Service Verification

Service Request Number: 6008 006610
Service Engineer Name: Worawit T.
Service Engineer Signature: Worawit T.
Total number of pages in this document: 14

Date Service Completed: 3 Nov 2025
Customer Name: Aphorn O.
Customer Signature: Aphorn O.

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Report Summary	
Instrument Model	Agilent 5100/5110 VDV ICP-OES
Instrument ID	G8011A/G8015A
Instrument Serial Number	MY18030001
Software Version	7.3.1.9507
Firmware Version	3442
Tested By	Burin 5nd test final
Test Completed On	11/19/2025 2:14:28 PM

Result Summary	
Subsystem Communications Test	Pass
Air Flow Test	Skipped
Water Flow Test	Skipped
Gas Flows Test	Skipped
RF Generator Test	Skipped
Camera Test	Skipped
Optics Test	Skipped
Advanced Valve System Test	Skipped
Resolution Test	Pass
Sensitivity Test	Pass
Precision Test	Pass
Subsystem Communications Test	**Pass**

Resolution Test — **Pass**

Element Wavelength	Specification	Width
N (174.213 nm)	≤ 9.40	6.66
As (188.980 nm)	≤ 8.20	6.00
C (193.027 nm)	≤ 11.50	7.94
Mo (202.032 nm)	≤ 8.20	6.15
Cr (206.158 nm)	≤ 13.40	8.80
Zn (213.857 nm)	≤ 8.70	6.60
Pb (220.353 nm)	≤ 9.50	7.07
Co (228.615 nm)	≤ 17.20	10.73
Ba (230.424 nm)	≤ 9.40	6.85
Mn (257.610 nm)	≤ 13.30	9.20
Mn (260.568 nm)	≤ 20.30	13.82
Cr (267.716 nm)	≤ 11.00	7.99
Cu (324.754 nm)	≤ 25.00	17.85
Cu (327.395 nm)	≤ 14.20	11.44
Sr (338.071 nm)	≤ 33.50	24.20
Ba (455.403 nm)	≤ 44.00	33.83
Sr (460.733 nm)	≤ 36.00	18.28
Ba (493.408 nm)	≤ 36.00	24.97
Ba (614.171 nm)	≤ 42.00	29.36
Ar (675.283 nm)	≤ 74.00	57.75
K (766.491 nm)	≤ 80.00	73.92

Sensitivity Test — **Pass**

Radial

Element Wavelength	Specification	Method	Ratio	Standard	Blank
As (188.980 nm)	≥ 46.0	SRBR	96.4	735.7	50.5
Se (196.026 nm)	≥ 41.0	SRBR	79.6	779.2	77.7
Zn (213.857 nm)	≥ 1421.0	SRBR	2270.3	24005.6	110.8
Pb (220.353 nm)	≥ 46.0	SRBR	129.5	1701.5	144.5
Mn (257.610 nm)	≥ 3518.0	SRBR	9810.6	233072.5	561.7
Al (396.152 nm)	≥ 3.4	SBR	6.5	36392.0	4836.0
Ba (493.408 nm)	≥ 34.0	SBR	93.1	1586633.9	16860.6
K (766.491 nm)	≥ 1.8	SBR	1.9	54511.9	19124.8

Axial

Element Wavelength	Specification	Method	Ratio	Standard	Blank
As (188.980 nm)	≥ 208.0	SRBR	245.0	3080.3	143.7
Se (196.026 nm)	≥ 159.0	SRBR	211.9	3471.4	233.5
Zn (206.200 nm)	≥ 234.0	SRBR	771.1	8797.9	126.5
Zn (213.857 nm)	≥ 1743.0	SRBR	6307.2	120003.6	359.8
Cd (214.439 nm)	≥ 4227.0	SRBR	6012.4	96451.0	256.0
Pb (220.353 nm)	≥ 320.0	SRBR	571.2	12760.9	463.5
Mn (257.610 nm)	≥ 10625.0	SRBR	39386.8	1701779.7	1862.7
Cr (267.716 nm)	≥ 1048.0	SRBR	5192.7	206938.5	1564.3
Cu (324.754 nm)	≥ 19.0	SBR	49.4	261983.3	5202.7
Al (396.152 nm)	≥ 6.0	SBR	20.3	318135.9	14932.2
Ba (493.408 nm)	≥ 60.0	SBR	255.9	13403057.9	52173.2
K (766.491 nm)	≥ 24.0	SBR	38.7	1918325.2	48283.1

Precision Test — **Pass**

Radial

Element Wavelength	Specification	Measured Value % RSD
As (188.980 nm)	≤ 2.60	1.32
Se (196.026 nm)	≤ 2.60	0.81
Zn (213.857 nm)	≤ 1.50	0.25
Pb (220.353 nm)	≤ 2.60	0.78
Mn (257.610 nm)	≤ 1.50	0.28
Al (396.152 nm)	≤ 1.50	0.31
Ba (493.408 nm)	≤ 1.50	0.28
K (766.491 nm)	≤ 1.50	0.19

Axial

Element Wavelength	Specification	Measured Value % RSD
As (188.980 nm)	≤ 1.50	0.61
Se (196.026 nm)	≤ 1.50	0.72
Zn (206.200 nm)	≤ 1.50	0.37
Zn (213.857 nm)	≤ 1.50	0.32
Cd (214.439 nm)	≤ 1.50	0.31
Pb (220.353 nm)	≤ 1.50	0.37
Mn (257.610 nm)	≤ 1.50	0.69
Cr (267.716 nm)	≤ 1.50	0.35
Cu (324.754 nm)	≤ 1.50	0.49
Al (396.152 nm)	≤ 1.50	0.49
Ba (493.408 nm)	≤ 1.50	0.73
K (766.491 nm)	≤ 1.50	0.31

SITHIPORN associates

DMA-80 DIRECT MERCURY ANALYZER System

SITHIPORN ASSOCIATES CO.,LTD.
451-451/1 Sirinthorn Road, Bangbumru,Bangplud, Bangkok 10700 Thailand
Tel. (662) 433-8331, 434-9191 fax: (662) 433-1679,434-9510

เอกสารควบคุม

DMA-80 Direct Mercury Analyzer

SERVICE PROTOCOL REPORT

To be filled in before service visit (1st page)

Customer information:

Company:	บ.ยูไนเต็ด แอนนาลิสต์ฯ จก. (สนง.ใหญ่)
Department:	LAB
Person in charge:	คุณ ภูชงค์ พานิชย์เลิศอำไพ
Address:	ซอยอุดมสุข 41 ถนนสุขุมวิท กรุงเทพมหานคร 10260
Tel.:	+66 (86) 3191292
E-mail:	bhuchonk@uaeconsultant.co.th

Technical data:

Unit Serial Number:	**24114043**		
Terminal type or USB-640 Gateway:	Termianl-660	SN	24107843
Software, type and revision:	Easy Control	Rev.	03-F-SP1(2023-09-20)
Air Compressor (if present)	95100	SN	12236761
Gas system pump (if present)	-	SN	-
Installation and last maintenance dates:	Inst. on: 31/01/2025	Maint. on:	

NOTE: after achievement of the following protocol a filled and signed copy of this report has to be sent to Milestone srl at: service@milestonesrl.com

For the best result of the test below we recommended to use the Milestone DMA-80 Service Kit (PN DMA-SKIT).

เอกสารควบคุม

1. VISUAL INSPECTION

	Good	Damaged	Corroded/Dirty
External chassis	√		
Inside	√		
Electric parts	√		
Screws	√		

2. ELECTRICAL SAFETY TEST

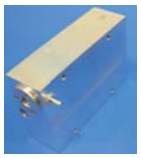
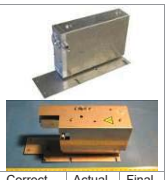
Using a suitable testing device check the below reported parameters and take note of the results.

Parameter	Result	OK	Not OK
Voltage : 230 VAC (±10%)	Actual value : 223 VAC	√	
Ground : ≤ 2	Actual value: 0.8 VAC	√	

3. PRESSURE CHECK

	Oxygen (purity O_2>99,95%)		Milestone air compressor
Gas carrier		Purity: -	√

The pressure at the supply source manometer should be approx. 4.0bar
The flow rate depends by type of cuvette installed on the DMA-80 unit.

	Correct value	Actual value	Final value	Correct value	Actual value	Final value	Correct value	Actual value	Final value
Inlet pressure	3.1 bar	-	-	3.1 bar	-	-	3.1 bar	3.1 bar	Pass
Flow rate	10-12 l/h	-	-	8-10 l/h	-	-	6-8 l/h	8 l/h	Pass

Check all possible leakage points and their conditions:

	Good	Damaged	Corroded
Tubing	√		
Silicon joints	√		
O-rings	√		
Cuvette sealing O-rings	√		
Gas connections	√		
Valves	√		
Sample boat carrier	√		
Catalyst flange	√		

เอกสารควบคุม

4. AUTOSAMPLER SYSTEM

	OK	Not OK	Re-Adjusted
Calibration of autosampler motor	√		
Cylinders alignment	√		

	Fast	Slow	Normal
Speed of pneumatic cylinders			√

Using the maintenance grease, periodically lightly lubricate all exposed steel rods of the horizontal and vertical cylinders.

5. COMPONENTS CHECK

Conditions of the different parts used/installed on DMA unit:

	OK	Not OK	Replaced	Cleaned
Catalyst tube			√	
Amalgamator	√			
Quartz boats	√			
Nickel boats	-			
Autosampler plate	√			
Gas kit accessories	-			

6. TEMPERATURES

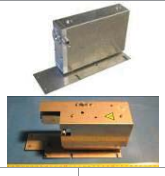
	Correct value		Actual value	Final value (Pass)
Drying/ Decomposition furnace	If controlled by Infrared sensor	850°C ± 10°C	-	-
	If controlled by thermocouple	650°C ± 10°C	650	Pass
Catalyst furnace	Type 1	515°C ± 5°C	-	-
	Type 2,3	565°C ±10°C	565°C	Pass

เอกสารควบคุม

Amalgamator stand by temperature	If controlled by Infrared sensor	170°C ± 10°C	170°C	Pass
	If IR sensor is not present	145°C ± 25°C	-	-
Amalgamator heating temperature	850°C ± 10°C		850°C	Pass
Cuvette	125°C ± 5°C		125°C	Pass

7. SPECTROMETER

The spectrometer can be equipped with a single beam system (ducon lamp) or with a dual beam system (tricon lamp)

	Old cuvette type						Actual cuvette type					
												
	Gain			Offset			Gain			Offset		
	Correct value	Actual value	Final value	Correct value	Actual value	Final value	Correct value	Actual value	Final value	Correct value	Actual value	Final value
Dualcell system	3,6VDC	-	-	0,015VDC ± 0,005VDC	-	-	3,93VDC	3.9V	Pass	0,015VDC ± 0,005VDC	0.015V	Pass
Tricell system*	-	-	-	-	-	-	3,96VDC	-	-	0,015VDC ± 0,005VDC	-	-

(*)The recommended Hg lamp operating signal should be around 3,96VDC (for detector 2) and 3,93VDC (for detector 1).

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	OK	Not OK
Conditions of the spectrometer system	√	
Alignment between lamp, cuvette and detector	√	
Cuvette cleaning (glass windows, sealing O-rings…)	√	
Lamp intensity	√	
Operation of the mechanical shutter (if present)	√	

8. MILESTONE AIR COMPRESSOR

Maintenance	OK	Date last service
Drain (compressor)	√	
Replacing air filters (air purification module)	√	
Check sealing connections	√	

9. PARTS TO BE REPLACED

PN	DESCRIPTION	Replaced	Not Replaced
DMA8133	Catalyst tube: 6 months if the unit runs daily, 1 year if the unit is used rarely. *In case of analyse of sample with high organic concentration the lifetime of the catalyst can be less than 6 months.*		√
DMA8134	Amalgamator: 6 months if the unit runs daily 1 year if the unit is used rarely		√
DMA8195A	Hg lamp tri-cell (model 2011): 5 years		√
DMA8137	Hg lamp dual-cell: 5 years	-	-
70200	Hg trap 1 year		√
DMA8058/B	Amalgamator coil 6 months/1 year or as soon as the heating is not more homogeneous		√
DMA8142	Nickel sample boats (set of 40pcs) 2 years if strongly used, replace after 1 year	-	-
DMA8347	Quartz sample boats (set of 10pcs) 2/3 years		√
DMA8335	Metal sample boat carrier 2 years		√
SL0108	PU-tube diam. 6/4 mm for internal O_2/air supply 2 years		√
SO0376D	Heating coil for drying/decomposition 2 years		√

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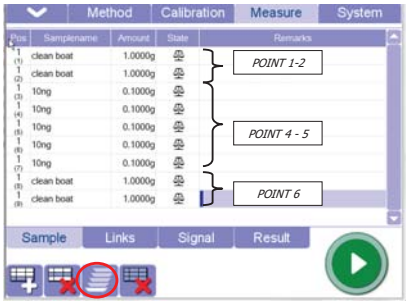
10. TESTING PROCEDURE

It consists to run some measurements for the evaluation of the analytical performance of the unit, like: absorbance, peaks shape, temperatures, lamp signal and verify the proper working of whole system.

1) Run minimum 2 blanks on the same sample boat (quartz if possible) in manner to clean it
2) Run blanks until absorbance value (Height) decrease under 0.0030 in cell 1
3) Set a fresh and stabilized 100µg/L Hg standard according to the prescriptions reported on the DMA80 User Manual. The quality of the used standard is fundamental for the success of the entire procedure
4) Weight approximately 100µg of the fresh 100µg/L – Standard (10ng) and start the analysis as a single measurement mode
5) Repeat five times the test
6) Run again two blanks measurements



Now, it is possible to evaluate:

- Peaks

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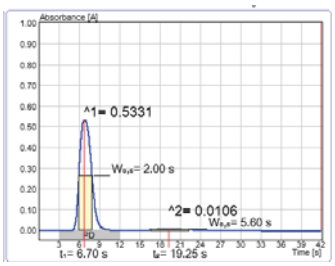


- The shape of the peak must be regular.
- The distance between Peak Cell 1 and Peak Cell 2 must be between 11 to 15 seconds.

- Results

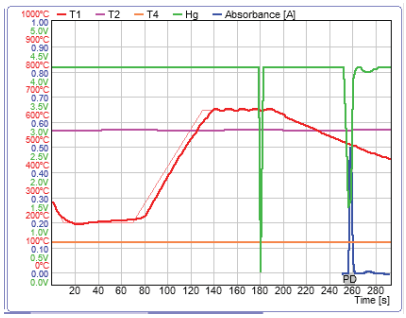
Pos	Samplename	Amount	State	Height	Hg [ng]	[µg/kg]	Cal. Factor	Σ
- (7)	Stability10ng		M			100.290 0.92%	1.0000	
1 (8)	Stability10ng	0.1000g	✔	0.4931	9.9095	99.0951	1.0000	Σ
2 (9)	Stability10ng	0.1000g	✔	0.4965	9.9934	99.9335	1.0000	Σ
3 (10)	Stability10ng	0.1000g	✔	0.4991	10.059	100.597	1.0000	Σ
4 (11)	Stability10ng	0.1000g	✔	0.4976	10.022	100.221	1.0000	Σ
5 (12)	Stability10ng	0.1000g	✔	0.5031	10.160	101.602	1.0000	Σ

- The obtained absorbance (height) must be > 0.42 in cell 1 for each 100ppb analysis (0.22 with cuvette installed until December 2005, DMA s/n 05120292.)
- The relative standard deviation (rsd) is < 3 %.
- After two blanks (after 10ng measurements), the absorbance is < 0.0030 in cell 1(*).

(*) This condition is valid only in case the unit has: catalyst and amalgamator new, conditioned and never use before, sample boat carrier new and/or perfectly cleaned, catalyst flange new and/or perfectly cleaned, cuvette new and/or perfectly cleaned, tubes, silicon joints and o-rings replaced. Otherwise other blanks (more than 2) might be necessary.

- Temperatures & signal profiles

เอกสารคุมไว้



- The Hg lamp signal must be between 3.8 and 4.5V and stable. A few minutes after the start of the analysis the lamp does switch off because of the zero detection but then it instantly returns to the original condition. In case of Tricell configuration two green colour graphics are reported. After the zero shuttering the time necessary to return to full signal is longer on Tricell compare to Ducon lamp.
- During the run the catalyst oven temperature must be stable around to 565°C or 515°C.
- The drying and ashing furnace must be follow the set temperature method.
- During the run the Amalgamator furnace temperature must be stable at the stand by temperature (170°C or 145°C). Then at the release step it must raise up to 850/900°C.
- The Cuvette temperature must be stable at approximately 125°C.
- The Hg absorbance peaks must be correctly detected and reported.

11. FINAL REPORT

All screws inserted and tightened	√
All tubing sealing connections checked, cleaned or replaced and tightened	√
All heating elements are working	√
Sensors installed, checked and tightened	√
Safety devices (thermo switch) fully checked	√
All cooling fans are functioning	√
Testing procedure successfully passed	√
Necessary tools available at customer's site	√
Last revision of User Manual available at customer's site	√
Advised customer about care and maintenance instructions	√

เอกสารคุมไว้

Remarks:

Working hours of Service Engineer	

Service Engineer Name	Signature	Date
ชนม์เฉลิม วิลัยศรี	ชนม์เฉลิม วิลัยศรี	31-01-2025

Laboratory Manager / Operator acceptance signature:	

เอกสารคุมไม่ ่ว

สุดสาหกรรมเพื่อนวัฒนาอุตสาหกรรมอาหาร
ศูนย์บริการห้องปฏิบัติการอุตสาหกรรมอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center

Verification Certificate

Certificate No.: 2501440-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road, Bangchack, Prakhanong, Bangkok 10260

Equipment: Digestion Unit (Heating Block)
Manufacturer: FOSS
Model: Tecator Digestor 2520
Serial No.: 91905060
ID No.: UAE.WAS.030/2566
Order No.: 2501440
Operation No.: 2501440-001
Date of Receipt: 27 January 2025
Date of Calibration: 27 January 2025

[redacted]

The uncertainties are for a confidence probability of approximately 95 %.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the National Food Institute.

F-CS-009 Revision: 01 Date: 20-04-65

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2008 Soi 36, Arun Amarin Road, Bang Yi Khan Subdistrict, Bang Phlat District, Bangkok
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เอกสารคุมไม่

[redacted]

สุดสาหกรรมเพื่อนวัฒนาอุตสาหกรรมอาหาร
ศูนย์บริการห้องปฏิบัติการอุตสาหกรรมอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center

Verification Report

Certificate No.: 2501440-001-01
Equipment: Digestion Unit (Heating Block)
Model: Tecator Digestor 2520 Serial No.: 91905060
Resolution: 1 °C ID No : UAE.WAS.030/2566
Manufacturer: FOSS
Date of Calibration: 27 January 2025

Location: Dry Laboratory (312), UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Environment Condition:
Ambient Temperature (29 ± 1) °C
Relative Humidity (58 ± 2) %
Line Voltage (224 ± 1) Volt

Condition of this results of Calibration:

1. This instrument was calibrated by insert standard thermocouples type R into its Digestion blocks and Calibration according to NFI Method W-TE-026 based on BS 4309 : 1968
   - The temperature scale used was based on ITS - 90 .
   - All data show below were final values and the initial data may be obtained upon request.
2. Reference Standard Instrument :

Instrument	Model	Serial No.	Certificate No.	Due Date	Through
Digital Thermometer with Thermocouple	34970A Type R	MY44045576/MY41194453 S/CH1, R/CH2, R/CH3	TC24/0063	5-Jun-2025	N.M. Technical Center Laboratory

3. This certificate is traceable to International System of Units (SI Units).
4. This certificate was certified only for the instrument we calibrated.
5. This result of calibration was found accurate as shown on date and place of calibration only.
6. Condition of Calibrated item : Good
   UUC* Description
   Time of Record 1 Hour 6 Minute At 380 °C
7. Result of Calibration : [X] Without adjustment [ ] After adjustment

[redacted]

F-CS-012 Revision: 01 Date: 20-04-65

2008 ถนนสุขุมวิท 41 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร
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เอกสารคุมไม่

[redacted]

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ศูนย์บริการห้องปฏิบัติการอุตสาหกรรมอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center

Verification Report

Certificate No.: 2501440-001-01
Equipment: Digestion Unit (Heating Block)
Model: Tecator Digestor 2520 Serial No.: 91905060
Resolution: 1 °C ID No : UAE.WAS.030/2566
Manufacturer: FOSS
Date of Calibration: 27 January 2025

Calibration point: 380 °C
Calibration result:
Table1 : Reporting of Temperature

Block No.	UUC* Setting (°C)	UUC* Reading (°C)	Stability (±°C)	Standard Thermometer (°C)	Uncertainty (±°C)
1	380	380	0.22	377.84	2.0
2	380	380	0.19	378.68	2.0
3	380	380	0.13	378.70	2.0
4	380	380	0.12	379.82	2.0
5	380	380	0.20	381.01	2.0
6	380	380	0.16	380.48	2.0
7	380	380	0.16	378.22	2.0
8	380	380	0.19	377.99	2.0
9	380	380	0.09	378.48	2.0
10	380	380	0.15	378.17	2.0
11	380	380	0.18	377.64	2.0
12	380	380	0.11	379.27	2.0
13	380	380	0.13	378.14	2.0
14	380	380	0.25	379.11	2.0
15	380	380	0.15	379.83	2.0
16	380	380	0.18	378.05	2.0
17	380	380	0.31	378.44	2.0
18	380	380	0.18	378.29	2.0
19	380	380	0.17	378.41	2.0
20	380	380	0.13	379.24	2.0

Note:
- UUC* = Unit Under Calibration
- Immersion depth of standard thermometer in tube level high of sand is equal heater plate of UUC.
- Stability = One-half of the greatest maximum difference of measured temperatures at one sensors, for at least half an hour after reaching steady state.

The report uncertainty of measurement was based on standard uncertainty multiplied by coverage [redacted] providing a level of confidence of approximately 95 %.

F-CS-012 Revision: 01 Date: 20-04-65

2008 ถนนสุขุมวิท 41 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร
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เอกสารคุมไม่

[redacted]

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Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center

Verification Report

Certificate No.: 2501440-001-01

Equipment: Digestion Unit (Heating Block)
Model: Tecator Digestor ; Serial No.: 91905060
Resolution: 1 °C ID No.: UAE.WAS.030/2566
Manufacturer: FOSS

Date of Calibration: 27 January 2025

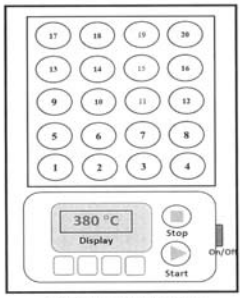
Page 4 of 4

Calibration point: 380 °C

Calibration result: Continued

Figure 1. Location of Reference Standard and Block Diagram of Digestion Unit

TOP VIEW



Sensor Installation Location

[redacted]

--------- End ---------

F-CS-012 Revision: 01 Date: 20-04-65

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เอกสารควบคุม [redacted]

FOSS

Customer Service Report

FOSS South East Asia
3388 Sirinrat Building, 25th – 26th Floor, Unit No. 3388/90,
Rama IV Road, Klongton , Klongtoey, Bangkok, Thailand 10110

Report No.: 13851

Date: 25 February 2025

Customer: UAE

Job No.: 11732

Address: BANOKOK

Instrument: KT9 Distillator

Serial: 91905393

	Travel To Customer (Hrs)		Labour (Hrs)	Travel From Customer (Hrs)
Start	07:00	2hrs	09:00-12:00	17:00
Finish	09:00		13:00-16:00	18:00

Job Type

Application		Special		Standard			
Distributor	x	Courtesy Visit	x	Installation	x	Training	x
Digital Service	x	PMA Onboarding	x	Quote	x	In House	x
Internal	x	Warranty	x	Repair	x	PM	X
Investigate	x	Sales Support	x	Remote	x	Health Check Visit	x

PMA Type						
	Smartcare	x	Smartcare Pro	x	Fosscare	X
	Smartcare Advance	x	Fosscare Pro	x	N/A	x

Details of Work / Test

PM KT9 12MO
- Test before PM
- Cleaning KT9 , Steamoth
- Fushing Akali pump
- Replace PM kit 12 MO
- test operation
  - Dilution 80 + 85 mL can to 80 mL
  - distillation 5 min 150-170 mL
  - Akali 50 + 50 mL
  - * Recivur not vsc ff
- all pass

Instrument Ready for Use	OK	X	Not OK*	x

Part No:	Batch	Description	Qty
60100196	09.12.2024	PM kit kjeltec 9 Distillator	1

I confirm this report is accurate and complete.

Signed FOSS [redacted]

Name

Email: **Customer Contact.:**

*Remark:

Please scan QR code [redacted]

เอกสารควบคุม [redacted]

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Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center

ilac-MRA
NSC-TISI-TIS 17025 CALIBRATION 0061

Calibration Certificate

Certificate No.: 2502229-001-01

Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.

Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakhanong, Bangkok 10260

Page 1 of 3

Equipment: CHAMBER (Incubator)

Manufacturer: MEMMERT

Model: IPP 260

Serial No.: V615.0187

ID No.: UAE.MIC.003/2559

Order No.: 2502229

Operation No.: 2502229-001

Date of Receipt: 19 March 2025

Date of Calibration: 19 March 2025

[redacted]

The uncertainties are for a confidence probability of approximately 95 %.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the National Food Institute.

F-CS-009 Revision: 01 Date: 20-04-65

2008 ซอยอรุณอมรินทร์ 36 ถนนอรุณอมรินทร์ แขวงบางยี่ขัน เขตบางพลัด กรุงเทพมหานคร
2008 Soi 36, Arun Amarin Road, Bang Yi Khan Subdistrict, Bang Phlat District, Bangkok 10700, Thailand
Tel. +66(0) 2422 8688 Fax. +66(0) 2422 8545

nfi.or.th

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ศูนย์บริการห้องปฏิบัติการสถาบันอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center

ilac-MRA
NSC-TISI-TIS 17025 CALIBRATION 0061

Calibration Report

Certificate No.: 2502229-001-01

Equipment: CHAMBER (Incubator)
Model: IPP 260 Serial No.: V615.0187
Resolution: 0.1 °C ID No.: UAE.MIC.003/2559
Manufacturer: MEMMERT

Date of Calibration: 19 March 2025

Page 2 of 3

Location: LABORATORY, UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.

Environment Condition:
Ambient Temperature (16.2 ± 1) °C
Relative Humidity (32 ± 4) %
Line Voltage (223 ± 3) Volt

Condition of this results of Calibration:

1. This instrument was calibrated by insert 9 standard thermometer into its chamber and calibration according to W-TE-014 Based on TLAS G-20-1/02-08 (E): Guidelines for Calibration and Checks of Temperature Controlled Enclosures.
   - The temperature scale used was based on ITS - 90.
   - All data show below were final values and the initial data may be obtained upon request.
2. Reference Standard Instrument :

Instrument	Model	Serial No./ID No.	Certificate No.	Due Date	Through
Digital Thermometer with sensor	34972A	MY49016851	TE 670477-01	4 May 2025	NATIONAL FOOD INSTITUTE
	RTD	CH#101-109/ RTD#101-109			

3. This certificate is traceable to International System of Units (SI Units).
4. This certificate was certified only for the instrument we calibrated.
5. This result of calibration was found accurate as shown on date and place of calibration only.
6. Condition of Calibrated item : Good

   UUC Description :

   Time of Record 1 Hour 9 Minute At 35.0 °C

   Fresh air Damper [-] Open Position [-]
   [X] Close Fan [-]
   [-] Not Available
7. Result of Calibration : [X] Without adjustment [ ] After adjustment

[redacted]

F-CS-012 Revision: 01 Date: 20-04-65

2008 ซอยอรุณอมรินทร์ 36 ถนนอรุณอมรินทร์ แขวงบางยี่ขัน เขตบางพลัด กรุงเทพมหานคร
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เอกสารควบคุม [redacted]

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Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center

NSC-TISI-TIS 17025 CALIBRATION 0061

Calibration Report

Certificate No.: 2502229-001-01

Equipment: CHAMBER (Incubator)

Model: IPP 260 Serial No.: V615.0187

Resolution: 0.1 °C ID No.: UAE.MIC.003/2559

Manufacturer: MEMMERT

Date of Calibration: 19 March 2025

Calibration point: 35.0 °C

Calibration result:

Calibration Condition	Temperature (°C)	Relative Humidity (%)	Line Voltage (Volt)
MIN	15.5	28	220.0
MAX	17.1	35	225.0

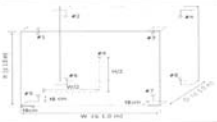

Table1 : Reporting of Temperature

Calibration point (°C)	Measured Temperature (°C) @ Sensor No. (Sensor No.9 is REF)									Uncertainty ± (°C)
	# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	# 9	
35.0	34.94	34.95	34.91	34.93	35.15	35.01	34.98	35.05	35.12	0.29

Table 2 : Reporting of Characterization Result

UUC* Setting (°C)	UUC* Reading (°C)			Stability ± (°C)	Uniformity (°C)	Overall Variation (°C)
	MIN	MAX	Average			
35.0	35.0	35.0	35.0	0.10	0.21	0.35

Note The quoted uncertainty include " Stability " and " Loading effect (20% of Temp Uniformity) "

UUC* = Unit Under Calibration

Stability = One-half of the greatest maximum difference of measured temperatures at any one sensors, for at least half an hour after reaching steady state.

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.

Overall Variation = The difference of the maximum and minimum measured temperatures througout observation time.

The report uncertainty of measurement was based on standard uncertainty multiplied by coverage [redacted] level of confidence of approximately 95 %.

--------- End ---------

F-CS-012 Revision: 01 Date: 20-04-65

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Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center

NSC-TISI-TIS 17025 CALIBRATION 0061

Calibration Certificate

Certificate No.: 2502229-003-01

Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.

Address: 3 Soi Udomsuk 41, Sukhumvit Road, Bangchack, Prakhanong, Bangkok 10260

Equipment: CHAMBER (Incubator)

Manufacturer: MEMMERT

Model: IPP260

Serial No.: V618.0033

ID No.: UAE.MIC.021/2561

Order No.: 2502229

Operation No.: 2502229-003

Date of Receipt: 19 March 2025

Date of Calibration: 19 March 2025

[redacted]

The uncertainties are for a confidence probability of approximately 95 %.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the National Food Institute.

F-CS-009 Revision: 01 Date: 20-04-65

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Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center

NSC-TISI-TIS 17025 CALIBRATION 0061

Calibration Report

Certificate No.: 2502229-003-01

Equipment: CHAMBER (Incubator)

Model: IPP260 Serial No.: V618.0033

Resolution: 0.1 °C ID No.: UAE.MIC.021/2561

Manufacturer: MEMMERT

Date of Calibration: 19 March 2025

Location: 302, UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.

Environment Condition:
Ambient Temperature (23.0 ± 1) °C
Relative Humidity (59 ± 1) %
Line Voltage (223 ± 3) Volt

Condition of this results of Calibration:

1. This instrument was calibrated by insert 9 standard thermometer into its chamber and calibration according to W-TE-014 Based on TLAS G-20-1/02-08 (E): Guidelines for Calibration and Checks of Temperature Controlled Enclosures.
   - The temperature scale used was based on ITS - 90.
   - All data show below were final values and the initial data may be obtained upon request.
2. Reference Standard Instrument :

Instrument	Model	Serial No./ID No.	Certificate No.	Due Date	Through
Digital Thermometer with sensor	34972A	MY57003188	TE 670486-01	8 June 2025	NATIONAL FOOD INSTITUTE
	RTD	CH#301-309/ RTD#301-309			

3. This certificate is traceable to International System of Units (SI Units).
4. This certificate was certified only for the instrument we calibrated.
5. This result of calibration was found accurate as shown on date and place of calibration only.
6. Condition of Calibrated item : Good

UUC Description :

Time of Record 1 Hour 9 Minute At 22.0 and 25.0 °C

Fresh air Damper [ ] Open Position [ ]
[X] Close Fan [ ]
[ ] Not Available

7. Result of Calibration : [X] Without adjustment [ ] After adjustme[redacted]

F-CS-012 Revision: 01 Date: 20-04-65

เอกสารควบคุม

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Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center

NSC-TISI-TIS 17025 CALIBRATION 0061

Calibration Report

Certificate No.: 2502229-003-01

Equipment: CHAMBER (Incubator)

Model: IPP260 Serial No.: V618.0033

Resolution: 0.1 °C ID No.: UAE.MIC.021/2561

Manufacturer: MEMMERT

Date of Calibration: 19 March 2025

Calibration point: 22.0 and 25.0 °C

Calibration result:

Calibration Condition	Temperature (°C)	Relative Humidity (%)	Line Voltage (Volt)
MIN	22.7	58	220.0
MAX	23.3	60	225.0

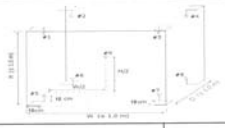


Table1 : Reporting of Temperature

Calibration point (°C)	Measured Temperature (°C) @ Sensor No. (Sensor No.9 is REF)									Uncertainty ± (°C)
	# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	# 9	
22.0	22.18	22.18	22.16	22.19	21.94	21.95	21.96	21.98	22.08	0.27
25.0	25.51	25.32	25.29	25.34	25.05	25.02	25.04	25.09	25.15	0.27

Table 2 : Reporting of Characterization Result

UUC* Setting (°C)	UUC* Reading (°C)			Stability ± (°C)	Uniformity (°C)	Overall Variation (°C)
	MIN	MAX	Average			
22.0	22.0	22.0	22.0	0.026	0.14	0.29
25.0	25.0	25.0	25.0	0.035	0.36	0.55

Note The quoted uncertainty include " Stability " and " Loading effect (20% of Temp Uniformity) "

UUC* = Unit Under Calibration

Stability = One-half of the greatest maximum difference of measured temperatures at any one sensors, for at least half an hour after reaching steady state.

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.

Overall Variation = The difference of the maximum and minimum measured temperatures througout observation time.

The report uncertainty of measurement was based on standard uncertainty multiplied by cove[redacted] level of confidence of approximately 95 %.

--------- End ---------

F-CS-012 Revision: 01 Date: 20-04-65

เอกสารควบคุม

2008 ซอยอรุณอมรินทร์ 36 ถนนอรุณอมรินทร์ แขวงบางยี่ขัน เขตบางพลัด กรุงเทพมหานคร 10700
2008 Soi 36, Arun Amarin Road, Bang Yi Khan Subdistrict, Bang Phlat District, Bangkok 10700, Thailand
Tel. +66(0) 2422 8688 Fax. +66(0) 2422 8545

สถาบันอาหาร
ศูนย์บริการห้องปฏิบัติการอุตสาหกรรมอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center

NSC-TISI-TIS 17025
CALIBRATION 0061

Calibration Certificate

Certificate No.: 2501624-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakhanong, Bangkok 10260

Equipment: Water Bath
Manufacturer: MEMMERT
Model: WNE14
Serial No.: L416.0606
ID No.: UAE.MIC.002/2560
Order No.: 2501624
Operation No.: 2501624-001
Date of Receipt: 10 February 2025
Date of Calibration: 10 February 2025

[redacted]

The uncertainties are for a confidence probability of approximately 95 %.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the National Food Institute.

F-CS-009 Revision: 01 Date: 20-04-65

เอกสารไม่ควบคุม

สถาบันอาหาร
ศูนย์บริการห้องปฏิบัติการอุตสาหกรรมอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center

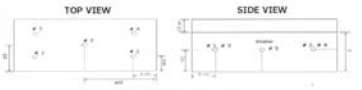
NSC-TISI-TIS 17025
CALIBRATION 0061

Calibration Report

Certificate No.: 2501624-001-01
Equipment: Water Bath
Model: WNE14 Serial No.: L416.0606
Resolution: 0.1 °C ID No.: UAE.MIC.002/2560
Manufacturer: MEMMERT
Date of Calibration: 10 February 2025

Calibration point: 44.5 °C
Calibration result:

Calibration Condition	Temperature (°C)	Relative Humidity (%)	Line Voltage (Volt)
Min	25.7	52	223.0
Max	26.3	65	225.0



Sensor Installation Location

Table1 : Reporting of Temperature

Calibration Point	Measured Temperature (°C) @ Sensor No. (Sensor No.5 is REF)					Uncertainty
(°C)	# 1	# 2	# 3	# 4	# 5	± (°C)
44.5	44.55	44.46	44.48	44.47	44.48	0.18

Table 2 : Reporting of Characterization Result

UUC* Setting	UUC* Reading (°C)			Stability	Uniformity	Overall Variation
(°C)	MIN	MAX	Average	± (°C)	(°C)	(°C)
44.5	44.5	44.5	44.5	0.082	0.070	0.29

Note The quoted uncertainty include " Stability " and " Loading effect (20% of Temp Uniformity)"
UUC* = Unit Under Calibration
Stability = One-half of the greatest maximum difference of measured temperatures at any one sensors, for at least half an hour after reaching steady state.
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.
Overall Variation = The difference of the maximum and minimum measured temperatures througout observation time.

The report uncertainty of measurement was based on standard uncertainty multiplied b[redacted] providing a level of confidence of approximately 95 %.

--------- End ---------

F-CS-012 Revision: 01 Date: 20-04-65

เอกสารไม่ควบ[redacted]

สถาบันอาหาร
ศูนย์บริการห้องปฏิบัติการอุตสาหกรรมอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center

NSC-TISI-TIS 17025
CALIBRATION 0061

Calibration Report

Certificate No.: 2501624-001-01
Equipment: Water Bath
Model: WNE14 Serial No.: L416.0606
Resolution: 0.1 °C ID No.: UAE.MIC.002/2560
Manufacturer: MEMMERT
Date of Calibration: 10 February 2025

Location: 302 Microbiology Laboratory, UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Environment Condition:
Ambient Temperature (26 ± 1) °C
Relative Humidity (59 ± 7) %
Line Voltage (224 ± 1) Volt

Condition of this results of Calibration:

1. This instrument was calibrated by insert 5 standard thermometer into its liquid bath and calibration according to W-TE-011 based on ASTM E715-80 (2022): Standard Specification for Gravity-Convection and Forced-Circulation Water Baths.
   - The temperature scale used is ITS - 90.
   - All data show below were final values and the initial data may be obtained upon request.
2. Reference Standard Instrument :

Instrument	Model	Serial No./ID No.	Certificate No.	Due Date	Through
Digital Thermometer with sensor	34972A	MY59002902	TE 670478-01	4-May-25	NATIONAL FOOD INSTITUTE
	RTD	RTD#301-305 / CH#301-305			

3. This certificate is traceable to International System of Units (SI Units).
4. This certificate was certified only for the instrument we calibrated.
5. This result of calibration was found accurate as shown on date and place of calibration only.
6. Condition of Calibrated item : Good
   UUC Description:
   Time of Record 1 Hour 9 Minute At 44.5 °C
7. Result of Calibration : [X] Without adjustment
   [ ] After adjustment

[redacted]

F-CS-012 Revision: 01 Date: 20-04-65

เอกสารไม่คว[redacted]

สถาบันอาหาร
ศูนย์บริการห้องปฏิบัติการอุตสาหกรรมอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center

NSC-TISI-TIS 17025
CALIBRATION 0061

Calibration Certificate

Certificate No.: 2501624-002-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakhanong, Bangkok 10260

Equipment: Water Bath
Manufacturer: MEMMERT
Model: WNE14
Serial No.: L416.0612
ID No.: UAE.MIC.003/2560
Order No.: 2501624
Operation No.: 2501624-002
Date of Receipt: 10 February 2025
Date of Calibration: 10 February 2025

[redacted]

The uncertainties are for a confidence probability of approximately 95 %.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the National Food Institute.

F-CS-009 Revision: 01 Date: 20-04-65

เอกสารคุมม่[redacted]

สถาบันการส่งเสริมอุตสาหกรรมเพื่อสังคม
ศูนย์บริการห้องปฏิบัติการสถาบันอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center

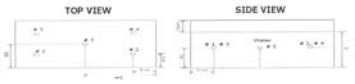
NSC-TISI-TIS 17025 CALIBRATION 0061

Calibration Report

Certificate No.: 2501624-002-01
Equipment: Water Bath
Model: WNE14 Serial No.: L416.0612
Resolution: 0.1 °C ID No.: UAE.MIC.003/2560
Manufacturer: MEMMERT
Date of Calibration: 10 February 2025

Calibration point: 44.5 °C
Calibration result:

Calibration Condition	Temperature (°C)	Relative Humidity (%)	Line Voltage (Volt)
Min	23.0	52	223.0
Max	25.0	65	225.0



Sensor Installation Location

Table1 : Reporting of Temperature

Calibration Point (°C)	Measured Temperature (°C) @ Sensor No. (Sensor No.5 is REF) # 1	# 2	# 3	# 4	# 5	Uncertainty ± (°C)
44.5	44.45	44.52	44.47	44.48	44.45	0.20

Table 2 : Reporting of Characterization Result

UUC* Setting (°C)	UUC* Reading (°C) MIN	MAX	Average	Stability ± (°C)	Uniformity (°C)	Overall Variation (°C)
44.5	44.4	44.5	44.5	0.081	0.077	0.23

Note The quoted uncertainty include " Stability " and " Loading effect (20% of Temp Uniformity)"
UUC* = Unit Under Calibration
Stability = One-half of the greatest maximum difference of measured temperatures at any one sensors, for at least half an hour after reaching steady state.
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.
Overall Variation = The difference of the maximum and minimum measured temperatures throughout observation time.

The report uncertainty of measurement was based on standard uncertainty multiplied by [redacted] providing a level of confidence of approximately 95 %.

--------- End ---------

F-CS-012 Revision: 01 Date: 20-04-65

2008 ซอยอรุณอมรินทร์ 36 ถนนอรุณอมรินทร์ แขวงบางยี่ขัน เขตบางพลัด กรุงเทพมหานคร 10700
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เอกสารควบคุม [redacted]

สถาบันการส่งเสริมอุตสาหกรรมเพื่อสังคม
ศูนย์บริการห้องปฏิบัติการสถาบันอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center
NSC-TISI-TIS 17025 CALIBRATION 0061

Calibration Report

Certificate No.: 2501624-002-01
Equipment: Water Bath
Model: WNE14 Serial No.: L416.0612
Resolution: 0.1 °C ID No.: UAE.MIC.003/2560
Manufacturer: MEMMERT
Date of Calibration: 10 February 2025

Location: 302 Microbiology Laboratory, UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Environment Condition:
Ambient Temperature (24 ± 1) °C
Relative Humidity (59 ± 7) %
Line Voltage (224 ± 1) Volt

Condition of this results of Calibration:

1. This instrument was calibrated by insert 5 standard thermometer into its liquid bath and calibration according to W-TE-011 based on ASTM E715-80 (2022): Standard Specification for Gravity-Convection and Forced-Circulation Water Baths.
   - The temperature scale used is ITS - 90.
   - All data show below were final values and the initial data may be obtained upon request.
2. Reference Standard Instrument :

Instrument	Model	Serial No./ID No.	Certificate No.	Due Date	Through
Digital Thermometer with sensor	34972A	MY59002902	TE 670478-01	4-May-25	NATIONAL FOOD INSTITUTE
	RTD	RTD#306-310 / CH#306-310			

3. This certificate is traceable to International System of Units (SI Units).
4. This certificate was certified only for the instrument we calibrated.
5. This result of calibration was found accurate as shown on date and place of calibration only.
6. Condition of Calibrated item : Good
   UUC Description:
   Time of Record 1 Hour 9 Minute At 44.5 °C
7. Result of Calibration : [X] Without adjustment [ ] After adjustment

[redacted]

F-CS-012 Revision: 01 Date: 20-04-65
2008 ซอยอรุณอมรินทร์ 36 ถนนอรุณอมรินทร์ แขวงบางยี่ขัน เขตบางพลัด กรุงเทพมหานคร 10700
2008 Soi 36, Arun Amarin Road, Bang Yi Khan Subdistrict, Bang Phlat District, Bangkok 10700, Thailand
Tel: +66(0) 2422 8688 Fax: +66(0) 2422 8545
เอกสารควบคุม [redacted]

สถาบันการส่งเสริมอุตสาหกรรมเพื่อสังคม
ศูนย์บริการห้องปฏิบัติการสถาบันอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center
NSC-TISI-TIS 17025 CALIBRATION 0061

Calibration Certificate

Certificate No.: 2502229-007-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road, Bangchack, Prakhanong, Bangkok 10260

Equipment: Autoclave
Manufacturer: ALP
Model: CL-40L
Serial No.: 808763
ID No.: UAE.MIC.026/2563
Order No.: 2502229
Operation No.: 2502229-007
Date of Receipt: 19 March 2025
Date of Calibration: 19 March 2025

Calibrated by Mr.Jerawut Prapawuttipong Scientist **Approved by** [redacted]

Date of Issue: 25 March 2025

The uncertainties are for a confidence probability of approximately 95 %.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the National Food Institute.

F-CS-009 Revision: 01 Date: 20-04-65

2008 ซอยอรุณอมรินทร์ 36 ถนนอรุณอมรินทร์ แขวงบางยี่ขัน เขตบางพลัด กรุงเทพมหานคร 10700
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เอกสารไม่ควบคุม [redacted]

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สถาบันการส่งเสริมอุตสาหกรรมเพื่อสังคม
ศูนย์บริการห้องปฏิบัติการสถาบันอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center
NSC-TISI-TIS 17025 CALIBRATION 0061

Calibration Report

Certificate No.: 2502229-007-01
Equipment: Autoclave
Model: CL-40L Serial No.: 808763
Resolution: 0.1 °C ID No.: UAE.MIC.026/2563
Manufacturer: ALP
Date of Calibration: 19 March 2025

Location: LABORATORY, UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Environment Condition:
Ambient Temperature (23 ± 1) °C
Relative Humidity (60 ± 5) %
Line Voltage (225 ± 1) Volt

Condition of this results of Calibration:

1. This instrument was calibrated by insert 3 standard Data loggers with RTD into its autoclave and calibration according to W-TE-018 based on BS 2646-1:2021, Autoclaves for sterilization in laboratories Part 1: Design, construction, safety and performance - Specification.
   - The temperature scale used was based on ITS - 90.
   - All data show below were final values and the initial data may be obtained upon request.
2. Reference Standard Instrument :

Instrument	Model	Serial No.	Certificate No.	Due Date	Through
Digital Thermometer with RTD (Data Logger)	HiTemp140-PT	S35646	TE 670370-01	23-Mar-25	NATIONAL FOOD INSTITUTE
	HiTemp140-PT	S33753	TE 670371-01	23-Mar-25	NATIONAL FOOD INSTITUTE
	HiTemp140-PT	S29973	TE 670372-01	23-Mar-25	NATIONAL FOOD INSTITUTE

3. This certificate is traceable to International System of Units (SI Units).
4. This certificate was certified only for the instrument we calibrated.
5. This result of calibration was found accurate as shown on date and place of calibration only.
6. This standard does not apply to sterilizers or disinfectors used for medical, dental, pharmaceutical.
7. Condition of Calibrated item : Good
   UUC Description : Setting program function sterilization : STERILIZE/NORMAL
   Time of sterilization 15 Minute At 115.0 aand 121.0 °C
8. Result of Calibration : [X] Without adjustment [ ] After adjustment

[redacted]

F-CS-012 Revision: 01 Date: 20-04-65
2008 ซอยอรุณอมรินทร์ 36 ถนนอรุณอมรินทร์ แขวงบางยี่ขัน เขตบางพลัด กรุงเทพมหานคร 10700
2008 Soi 36, Arun Amarin Road, Bang Yi Khan Subdistrict, Bang Phlat District, Bangkok 10700, Thailand
Tel: +66(0) 2422 8688 Fax: +66(0) 2422 8545

เอกสารไม่ค [redacted]

สถาบันอาหาร
ศูนย์บริการห้องปฏิบัติการสถาบันอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center

NSC-TISI-TIS 17025 CALIBRATION 0061

Calibration Report

Certificate No.: 2502229-007-01
Equipment: Autoclave
Model: CL-40L Serial No.: 808763
Resolution: 0.1 °C ID No.: UAE.MIC.026/2563
Manufacturer: ALP
Date of Calibration: 19 March 2025

Calibration point: 115.0 aand 121.0 °C

Calibration result:

Calibration Condition	Temperature (°C)	Relative Humidity (%)	Line Voltage (Volt)
Min	22.0	55	224
Max	24.0	65	226

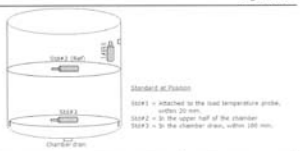

Table1 : Reporting of Temperature

Calibration Point (°C)	Measured Temperature (°C) @ Sensor No. (Sensor No.2 is REF)			Uncertainty ± (°C)
	Std.# 1	Std.# 2 (Ref)	Std.# 3	
115.0	115.32	115.46	115.22	0.64
121.0	121.31	121.53	121.31	0.64

Table 2 : Reporting of Characterization Result

UUC* Setting (°C)	UUC* Reading				Stability ± (°C)	Uniformity (°C)	Overall Variation (°C)
	Min (°C)	Max (°C)	Average (°C)	MPa			
115.0	115.0	115.1	115.0	0.08	0.11	0.12	0.26
121.0	121.0	121.1	121.0	0.12	0.13	0.15	0.29

Note

The quoted uncertainty include " Stability " and " Loading effect (20% of Uniformity)"

UUC* = Unit Under Calibration

Stability = One-half of the greatest maximum difference of measured temperatures at any one sensors, for at least half an hour after reaching steady state.

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.

Overall Variation = The difference of the maximum and minimum measured temperatures througout observation time.

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

[redacted]

--------- End ---------

F-CS-012 Revision: 01 Date: 20-04-65

2008 ซอยอรุณอมรินทร์ 36 ถนนอรุณอมรินทร์ แขวงบางยี่ขัน เขตบางพลัด กรุงเทพมหานคร 10700
2008 Soi 36, Arun Amarin Road, Bang Yi Khan Subdistrict, Bang Phlat District, Bangkok 10700, Thailand
Tel: +66(0) 2422 8688 Fax: +66(0) 2422 8545

เอกสารไม่ควบ
[redacted]

สถาบันอาหาร
ศูนย์บริการห้องปฏิบัติการสถาบันอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center

NSC-TISI-TIS 17025 CALIBRATION 0061

Calibration Certificate

Certificate No.: 2503287-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road, Bangchack, Prakhanong, Bangkok 10260

Equipment: Autoclave
Manufacturer: ALP
Model: CL-40L
Serial No.: 810010
ID No.: UAE.MIC.032/2565
Order No.: 2503287
Operation No.: 2503287-001
Date of Receipt: 5 June 2025
Date of Calibration: 5 June 2025

Calibrated by Mr.Pheraphat Tuanjit, Scientist **Approved** [redacted]

Date of Issue: 11 June 2025

The uncertainties are for a confidence probability of approximately 95 %.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the National Food Institute.

F-CS-009 Revision: 01 Date: 20-04-65

2008 ซอยอรุณอมรินทร์ 36 ถนนอรุณอมรินทร์ แขวงบางยี่ขัน เขตบางพลัด กรุงเทพมหานคร 10700
2008 Soi 36, Arun Amarin Road, Bang Yi Khan Subdistrict, Bang Phlat District, Bangkok 10700, Thailand
Tel: +66(0) 2422 8688 Fax: +66(0) 2422 8545

เอกสารไม่ควบค
[redacted]

สถาบันอาหาร
ศูนย์บริการห้องปฏิบัติการสถาบันอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center

NSC-TISI-TIS 17025 CALIBRATION 0061

Calibration Report

Certificate No.: 2503287-001-01
Equipment: Autoclave
Model: CL-40L Serial No.: 810010
Resolution: 1 °C ID No.: UAE.MIC.032/2565
Manufacturer: ALP
Date of Calibration: 5 June 2025

Location: Room 301 Media Preparation, UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.

Environment Condition:
Ambient Temperature (26 ± 1) °C
Relative Humidity (55 ± 5) %
Line Voltage (230 ± 5) Volt

Condition of this results of Calibration:

1. This instrument was calibrated by insert 3 standard Data loggers with RTD into its autoclave and calibration according to W-TE-018 based on BS 2646-1:2021, Autoclaves for sterilization in laboratories Part 1: Design, construction, safety and performance - Specification.
   - The temperature scale used was based on ITS - 90.
   - All data show below were final values and the initial data may be obtained upon request.
2. Reference Standard Instrument :

Instrument	Model	Serial No.	Certificate No.	Due Date	Through
Digital Thermometer with RTD (Data Logger)	HiTemp140-PT	T20627	NC-25-03-18-181	11-Mar-26	MADGETECH, INC.
	OM-CP-HITEMP-140	R56916	2502081-002-01	11-Mar-26	NATIONAL FOOD INSTITUTE
	PRTemp140	R38546	2501835-001-01	22-Feb-26	NATIONAL FOOD INSTITUTE

3. This certificate is traceable to International System of Units (SI Units).
4. This certificate was certified only for the instrument we calibrated.
5. This result of calibration was found accurate as shown on date and place of calibration only.
6. This standard does not apply to sterilizers or disinfectors used for medical, dental, pharmaceutical.
7. Condition of Calibrated item : Good
   UUC Description : Setting program function sterilization : STERILIZE/NORMAL
   Time of sterilization 20 Minute At 115 and 121 °C
8. Result of Calibration : [X] Without adjustment [ ] After adjustment

[redacted]

F-CS-012 Revision: 01 Date: 20-04-65

2008 ซอยอรุณอมรินทร์ 36 ถนนอรุณอมรินทร์ แขวงบางยี่ขัน เขตบางพลัด กรุงเทพมหานคร 10700
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เอกสารไม่ควบ
[redacted]

สถาบันอาหาร
ศูนย์บริการห้องปฏิบัติการสถาบันอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center

NSC-TISI-TIS 17025 CALIBRATION 0061

Calibration Report

Certificate No.: 2503287-001-01
Equipment: Autoclave
Model: CL-40L Serial No.: 810010
Resolution: 1 °C ID No.: UAE.MIC.032/2565
Manufacturer: ALP
Date of Calibration: 5 June 2025

Calibration point: 115 and 121 °C

Calibration result:

Calibration Condition	Temperature (°C)	Relative Humidity (%)	Line Voltage (Volt)
Min	25.8	50	225
Max	26.8	59	235

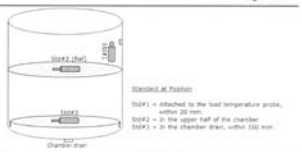

Table1 : Reporting of Temperature

Calibration Point (°C)	Measured Temperature (°C) @ Sensor No. (Sensor No.2 is REF)			Uncertainty ± (°C)
	Std.# 1	Std.# 2 (Ref)	Std.# 3	
115	115.46	115.43	115.42	0.70
121	121.59	121.54	121.51	0.70

Table 2 : Reporting of Characterization Result

UUC* Setting (°C)	UUC* Reading				Stability ± (°C)	Uniformity (°C)	Overall Variation (°C)
	Min (°C)	Max (°C)	Average (°C)	MPa			
115	115	115	115	0.08	0.24	0.17	0.50
121	121	121	121	0.12	0.24	0.19	0.52

Note

The quoted uncertainty include " Stability " and " Loading effect (20% of Uniformity)"

UUC* = Unit Under Calibration

Stability = One-half of the greatest maximum difference of measured temperatures at any one sensors, for at least half an hour after reaching steady state.

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.

Overall Variation = The difference of the maximum and minimum measured tempe[redacted]

The report uncertainty of measurement was based on standard uncertainty multiplie[redacted] a level of confidence of approximately 95 %.

--------- End ---------

F-CS-012 Revision: 01 Date: 20-04-65

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เอกสารไม่ควบ
[redacted]

สุดสาหกรรมฟื้นนานูลอิเล็กเฟื่อสถานีนอาหาร
ศูนย์บริการห้องปฏิบัติการสุดสาหกรรมอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center

NSC-TISI-TIS 17025 CALIBRATION 0061

Calibration Certificate

Certificate No.: 2502227-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakhanong, Bangkok 10260

Equipment: Electronic Balance

Manufacturer: OHAUS

Model: PX623

Serial No.: C236754745

ID No.: UAE.MIC.055/2565

Order No.: 2502227

Operation No.: 2502227-001

Date of Receipt: 19 March 2025

Date of Calibration: 19 March 2025

[redacted]

The uncertainties are for a confidence probability of approximately 95%

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the National Food Institute.

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Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center

NSC-TISI-TIS 17025 CALIBRATION 0061

Calibration Report

Certificate No.: 2502227-001-01

Equipment: Electronic Balance
Model: PX623
Serial No.: C236754745
Capacity: 620
Manufacturer: OHAUS
Resolution: 0.001
ID No.: UAE.MIC.055/2565

Date of Calibration: 19 March 2025

Calibration Results: **(Continued)**

Calibration Range: 0-600 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value:

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor k
Unload	0.0000	0.000	0.000	0.00086	2.00
1	1.0000	1.000	0.000	0.00086	2.00
5	5.0000	4.999	0.001	0.00086	2.00
10	10.0000	10.000	0.000	0.00086	2.00
20	20.0000	20.000	0.000	0.00086	2.00
50	50.0000	50.000	0.000	0.00087	2.00
100	100.0001	100.000	0.000	0.00087	2.00
200	200.0001	200.001	-0.001	0.00090	2.00
300	300.0002	300.001	-0.001	0.00094	2.00
400	400.0003	399.999	0.001	0.0011	2.00
500	500.0003	499.999	0.001	0.0011	2.00
600	600.0004	600.000	0.000	0.0012	2.00

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

---------- End ----------

[redacted]

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[redacted]

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NSC-TISI-TIS 17025 CALIBRATION 0061

Calibration Report

Certificate No.: 2502227-001-01

Equipment: Electronic Balance
Model: PX623
Serial No.: C236754745
Capacity: 620
Manufacturer: OHAUS
Resolution: 0.001
ID No.: UAE.MIC.055/2565

Date of Calibration: 19 March 2025

Environment Condition: Ambient Temperature: 22.8 ± 0.3 °C Relative Humidity: 51 ± 0.95 %

Place of Calibration: 301, UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-MA-001 In-House Method based on UKAS Lab 14 : 2019
2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1mg to 200g	B505567572	TCS	M24041005	19 April 2025
Standard Weight Class E2	500g	B505567696	TCS	M24041015	19 April 2025
Instrument	**Model**	**Serial No.**	**Calibrated By**	**Certificate No.**	**Due Date**
Thermo-Hygro Meter	608-H1	NFI.BTH 017/23	Quality Reborn	QR25-0542	10 February 2026

3. This certification is traceable to SI UNIT
4. This certificate was certified only for the instrument we calibrated.
5. This result of calibration was found accurate as shown on date and place of calibration only.

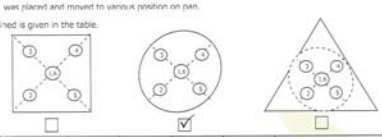
Calibration Results:

1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
300	0.00042
600	0.00048

2. Off-Center Error:

A mass of 200 g was placed and moved to various position on pan.
The balance reading obtained is given in the table.



☐ ☑ ☐

1 (g)	2 (g)	3 (g)	4 (g)	5 (g)	6 (g)	(Maximum Difference) (g)
200.002	200.003	200.001	200.001	200.002	200.002	0.001

[redacted]

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