

เอกสารแนบ 6

เอกสารสอบเทียบ
เครื่องมือที่ใช้ในการวิเคราะห์



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



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 BAAAN 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.



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

Certificate No. Q25018254

F3-011-05/12-23

page 1 of 3



@clcalibration



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



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. W1-305-46 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)"

Certificate No. Q25018254

F3-011-05/12-23

page 2 of 3



@clcalibration



CALIBRATION LABORATORY CO., LTD.

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



NSC-TISI-TIS 17025
CALIBRATION 0059
CLC



Accredited
ISO/IEC 17025



CALIBRATION LABORATORY CO., LTD.

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



NSC-TISI-TIS 17025
CALIBRATION 0059
CLC

CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

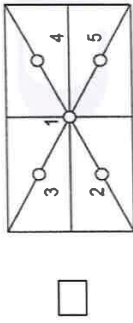
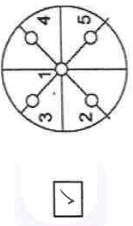
1. Error of indications

Nominal Test Value (g)	Conventional mass (g)	Display Value (g)	Error of Balance (g)	Uncertainty $\pm$ (mg)	Coverage factor <i>k</i>
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)				
	Position 1	Position 2	Position 3	Position 4	Position 5
100.0000	99.9999	100.0001	99.9999	99.9998	99.9998
Maximum Difference of Center Value (g)					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

Certificate No. Q25018254

F3-011-05/12-23

page 3 of 3



@clcalibration

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : BALANCE
MANUFACTURER : SHIMADZU
MODEL / TYPE : AP225WD
SERIAL NO. : D316300692[L/A-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.



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

Certificate No. Q25018253

F3-011-05/12-23

page 1 of 3



@clcalibration



CALIBRATION LABORATORY CO., LTD.

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



NSC-TISI-TIS 17025
CALIBRATION 0059
CLC

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

Certificate No. Q25018253

F3-011-05/12-23

page 2 of 3



@clcalibration



CALIBRATION LABORATORY CO., LTD.

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



NSC-TISI-TIS 17025
CALIBRATION 0059
CLC

CONDITION OF CALIBRATION ITEM : 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

☐	☒
Display Value (g)	
Nominal Test Value (g)	Maximum Difference of Center Value (g)
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

Certificate No. Q25018253

F3-011-05/12-23

page 3 of 3



@clcalibration



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



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.



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

Certificate No. Q25042960

F3-011-05/12-23

page 1 of 3

F3-011-05/12-23

Certificate No. Q25042960

page 2 of 3



@clcalibration



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 01.5 Page 5 of 68

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

End of Certificate



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.



This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the

International System of Units (SI)





CALIBRATION LABORATORY Co., LTD.
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



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

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-CPH-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 multiplied by the coverage factor complies with the table which for a normal distribution corresponds to a coverage probability of approximately 95 %.
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

Certificate No. Q25027140

F3-011-05/12-23

page 2 of 4



@clcalibration

1. HOT AIR OVEN PERFORMANCE

CALIBRATION DATA

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

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.

Certificate No. Q25027140

F3-011-05/12-23

page 3 of 4



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



ISO/IEC 17025

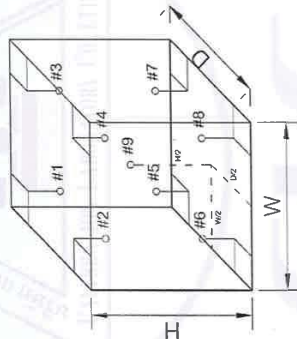
CALIBRATION DATA

2. TEMPERATURE DISTRIBUTION

DUC	Setting (° C)	Measured Temperature (° C)@Probe No.9 is Ref.								Uncertainty ± (° C)	Coverage factor k
		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	2.00
180.0	180.0	179.19	179.91	178.87	179.17	179.38	179.38	178.90	179.22	179.63	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

Certificate No. Q25027140

F3-011-05/12-23

page 4 of 4



@clcalibration



ISO/IEC 17025

CALIBRATION LABORATORY CO., LTD.

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



NSC-TS1-TR 17025
CALIBRATION MS9
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

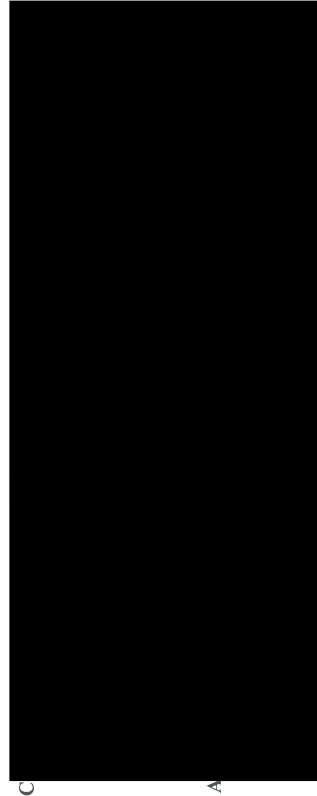
CUSTOMER : ENVIRONMENTAL MEASUREMENTS CO., LTD.

5/45 BAAAN 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.



This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the

International System of Units (SI)

Certificate No. Q25018255

F3-011-05/12-23

page 1 of 4



@clcalibration



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



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

Certificate No. Q25018255

F3-011-05/12-23

page 2 of 4



@clcalibration



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



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

Certificate No. Q25018255

F3-011-05/12-23

page 3 of 4



@clcalibration



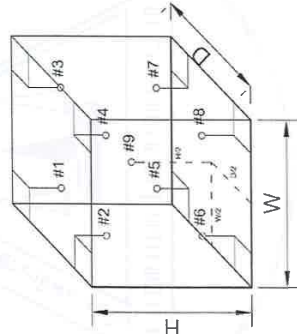
CALIBRATION DATA

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	20.0	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



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.

Calibrated By : Sukrasem Sechanart



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





CALIBRATION LABORATORY CO., LTD.

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 Email:sae@cal-laboratory.com



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 : $(25 \pm 2.5) ^\circ\text{C}$ Relative Humidity : $(50 \pm 15) \% \text{ RH}$

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-222 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.

Certificate No. Q25042961

F3-011-05/12-23

page 2 of 4



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 Email:sae@cal-laboratory.com



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)"

Certificate No. Q25042961

F3-011-05/12-23

page 3 of 4



@clcalibration



@clcalibration



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 Email: sale@cal-laboratory.com



Accredited
ISO/IEC 17025

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 Ø 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.

Certificate No. Q25042961

F3-011-05/12-23

End of Certificate

page 4 of 4



@calibration



SP METROLOGY SYSTEM (THAILAND) CO., LTD.

a Trescal company



ID LINE : IEC17025

Certificate of Calibration

Certificate Number : SPR250500111-3

Page : 1 of 3

Customer : ENVIRONMENTAL MEASUREMENTS CO., LTD.

5/45 Baan Klang Krung Biz Town, Soi Sinagarindra 46/1 (Pramote),

Nongbon Sub-district, Prawet District, Bangkok 10250

Equipment Name : Refrigerator
Manufacturer : Medicoool
Model : BB-117
Serial Number : BB117-190725001
ID. Number : LA-003

Environmental Conditions

Ambient Temperature : $25\text{ }^{\circ}\text{C} \pm 10\text{ }^{\circ}\text{C}$ Received Date : 02 May 2025
Relative Humidity : $60\text{ } \% \pm 20\text{ } \%$ 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 System (Thailand).

Calibrated by : Mr. Keerati Bunyawat

Calibration Officer



ID LINE : IEC17025

Calibration Report

Certificate Number : SPR25050011-3

Page : 2 of 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.

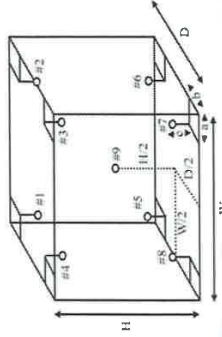


ID LINE : IEC17025

Result of Calibration

Certificate Number : SPR25050011-3

Page : 3 of 3



Temperature Accuracy in the Measurement Zone.

Unit : °C

UUC Setting	Measured Temperature (°C) @ 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 -



CALIBRATION LABORATORY Co., LTD.

210-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-0353-4 Fax: 02-578-2672 www.cah-laboratory.com E-mail:sale@cah-laboratory.com



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.



the International System of Units (SI)

Certificate No. Q25041416

F3-011-05/12-23

page 1 of 3



@clcalibration



CALIBRATION LABORATORY Co., LTD.

210-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-0353-4 Fax: 02-578-2672 www.cah-laboratory.com E-mail:sale@cah-laboratory.com



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

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. I7115653, I7115654.
2. Precision Thermometer, ASL Model F250 S/N. 1334023800.
3. IPRT, Wika, ASL Model CTP5000-450-D, T100-250-ID 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)"

Certificate No. Q25041416

F3-011-05/12-23

page 2 of 3



@clcalibration



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 $\pm$ (°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



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

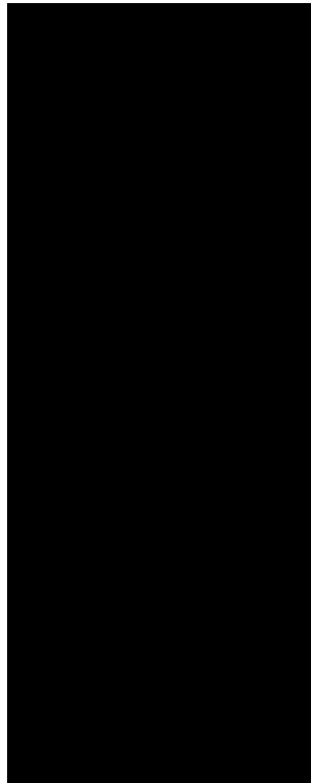
CUSTOMER : ENVIRONMENTAL MEASUREMENTS CO., LTD.

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.



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





CALIBRATION LABORATORY Co., LTD.

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.ccl-laboratory.com E-mail: sale@ccl-laboratory.com



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

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)"

Certificate No. Q25041414

F3-011-05/12-23



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.ccl-laboratory.com E-mail: sale@ccl-laboratory.com



ANAB
ACCREDITED
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 ($^{\circ}\text{C}$)	Actual Temperature ($^{\circ}\text{C}$)	DUC Reading ($^{\circ}\text{C}$)	Correction ($^{\circ}\text{C}$)	Uncertainty $\pm$ ($^{\circ}\text{C}$)
20.0	20.00	19.6	+0.40	0.27
25.0	25.00	24.5	+0.50	
30.0	30.00	29.5	+0.50	

2. CORRECTION OF HUMIDITY

STD Temperature ($^{\circ}\text{C}$)	STD Reading (%RH)	DUC Reading (%RH)	Correction (%RH)	Uncertainty $\pm$ (%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

Certificate No. Q25041414

F3-011-05/12-23





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 BAAK 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.

Calibrated By : **Oranut Kamchatphai**



International System of Units (SI)

Certificate No. Q25041415

F3-011-05/12-23

page 1 of 3



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

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)"

Certificate No. Q25041415

F3-011-05/12-23

page 2 of 3



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 01.5 Page 60 of 68

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

End of Certificate



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

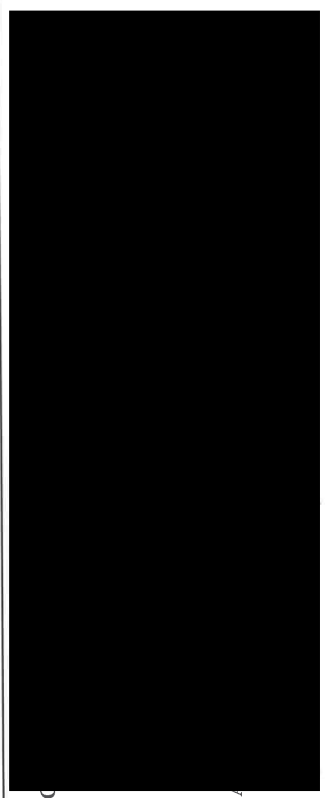
CUSTOMER : ENVIRONMENTAL MEASUREMENTS CO., LTD.

5/45 BAAN KIANG 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.



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





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. W1-305-135 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)"

Certificate No. Q25018258

F3-011-05/12-23

page 2 of 4



@clcalibration



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

Certificate No. Q25018258

F3-011-05/12-23

page 3 of 4



@clcalibration



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.cahlaboratory.com E-mail:sale@cahlaboratory.com



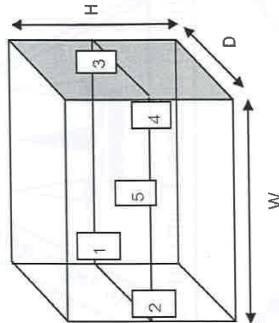
CALIBRATION DATA

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

Certificate No. Q25018258
F3-011-05/12-23



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.cahlaboratory.com E-mail:sale@cahlaboratory.com



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

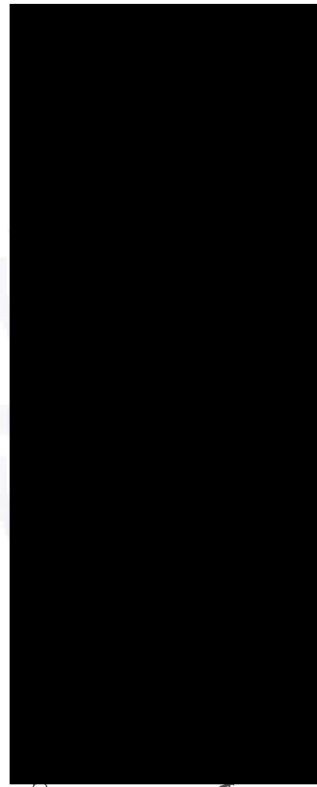
CUSTOMER : ENVIRONMENTAL MEASUREMENTS CO., LTD.

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.



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

Certificate No. Q25018257
F3-011-05/12-23





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.cah-laboratory.com E-mail:sale@cal-laboratory.com



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. W1-305-135 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)"

Certificate No. Q25018257

F3-011-05/12-23

page 2 of 4



@clcalibration



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.cah-laboratory.com E-mail:sale@cal-laboratory.com



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

Certificate No. Q25018257

F3-011-05/12-23

page 3 of 4



@clcalibration



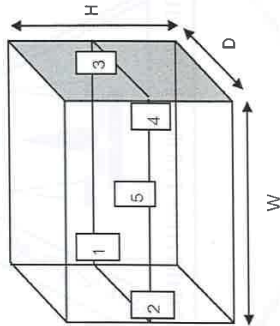
CALIBRATION DATA

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

Certificate No. Q25018257

F3-011-05/12-23

page 4 of 4



Analyzer Performance Test

Calibrated Date: 30 April 2025

Instruments Information

Analyzer Type : CO Analyzer
Model : 48C
Manufacturer : Thermo Environmental
Serial Number : 0604815180

Calibrator Unit

Dilutor Model : Dasibi Model 5008
Serial Number : 705
ZERO AIR Generator : API MODEL 701
Serial Number : 1924

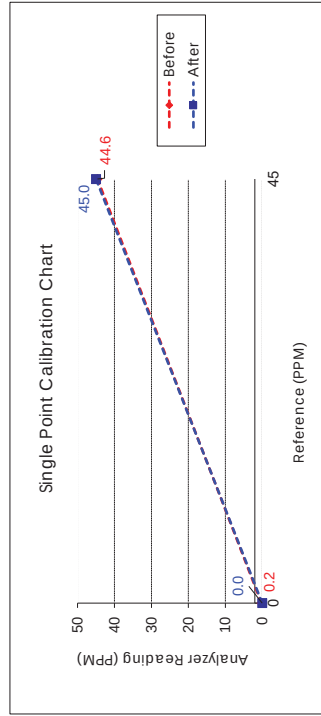
Standard Gas Concentration

Nitric Oxide (NO) 55.47 PPM
Sulphur Dioxide (SO₂) 55.11 PPM
Carbon Monoxide (CO) 4.535 PPM
Cylinder number EB0129027
Expire Date: 29 Oct. 2027

Environment : Temperature 25.5 °C Humidity: 51 %RH

Calibration Report

	Zero			Span		
	Reference (PPM)	Reading (PPM)	Drift (PPM)	Reference (PPM)	Reading (PPM)	Drift%
Before	0.0	0.2	0.2	45.0	44.6	-0.9
After	0.0	0.0	0.0	45.0	45.0	0.0



Calibrate By :



ENVIR SERVICE CO., LTD.
42 Ramintra 14 Yeak 9, Tha Raeng, Bang Khen, Bangkok 10230
Tel. 02-9435814-5 Fax. 02-9438201 www.envirservice.co.th

Analyzer Performance Test

Calibrated Date: 06 May 2025

Instruments Information

Analyzer Type : NO-NO2-NOx Analyzer
Model : 42C
Manufacturer : Thermo Environmental
Serial Number : 42C-78440-389

Calibrator Unit

Dilutor Model : Dasibi Model 5008
Serial Number : 705
ZERO AIR Generator : API MODEL 701
Serial Number : 1924
Standard Gas Concentration
Nitric Oxide (NO) 55.47 PPM
Sulphur Dioxide (SO2) 55.11 PPM
Carbon Monoxide (CO) 4.535 PPM
Cylinder number EB0129027
Expire Date: 29 Oct. 2027

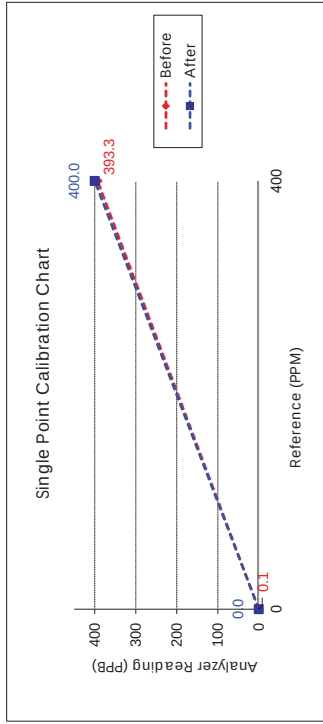
Environment : Temperature 25.5 °C Humidity 51 %RH

Calibration Report (Before Adjust)

Status	Zero			Span		
	Reference (PPB)	Reading (PPB)	Drift (PPB)	Reference (PPB)	Reading (PPB)	Drift%
NO	0.0	0.1	0.1	400.0	393.3	-1.7
NOX	0.0	0.0	0.0	400.0	394.5	-1.4

Calibration Report (After Adjust)

Status	Zero			Span		
	Reference (PPB)	Reading (PPB)	Drift (PPB)	Reference (PPB)	Reading (PPB)	Drift%
NO	0.0	0.1	0.1	400.0	400.0	0.0
NOX	0.0	0.0	0.0	400.0	400.0	0.0



Calibrate By



ENVIR SERVICE CO., LTD.
42 Ramintra 14 Yeak 9, Tha Raeng, Bang Khen, Bangkok 10230
Tel. 02-9435814-5 Fax. 02-9438201 www.envirservice.co.th

Analyzer Performance Test

Calibrated Date: 06 May 2025

Instruments Information

Analyzer Type : SO2 Analyzer
Model : 100A
Manufacturer : API
Serial Number : 353

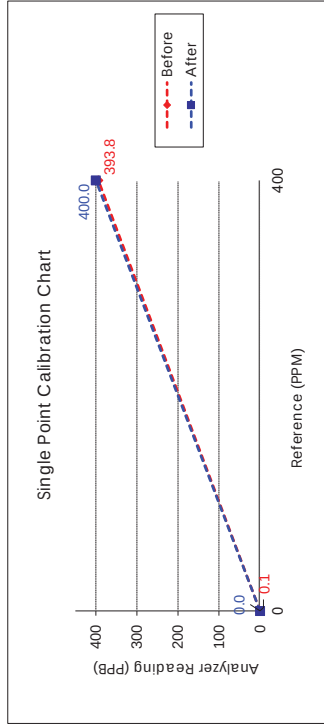
Calibrator Unit

Dilutor Model : Dasibi Model 5008
Serial Number : 705
ZERO AIR Generator : API MODEL 701
Serial Number : 1924
Standard Gas Concentration
Nitric Oxide (NO) 55.47 PPM
Sulphur Dioxide (SO2) 55.11 PPM
Carbon Monoxide (CO) 4.535 PPM
Cylinder number EB0129027
Expire Date: 29 Oct. 2027

Environment : Temperature 25.5 °C Humidity 51 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPB)	Reading (PPB)	Drift (PPB)	Reference (PPB)	Reading (PPB)	Drift%
Before	0.0	0.1	0.1	400.0	393.8	-1.6
After	0.0	0.0	0.0	400.0	400.0	0.0



Calibrate

Analyzer Performance Test

Calibrated Date: 22 April 2025

Instruments Information

Analyzer Type : CH4-NMHC-THC Analyzer
Model : APHA-360CE
Manufacturer : HORIBA
Serial Number : 4299956001

Calibrator Unit

Dilutor Model : Dasibi Model 5008
Serial Number : 705
ZERO AIR Generator : API MODEL 701
Serial Number : 1924
Standard Gas Concentration
Methane (CH4) 181.0 PPM
Propane 180.7 PPM
Cylinder number EB0123130
Expire Date: 3 Oct. 2027

Environment : Temperature 25.5 °C Humidity 51 %RH

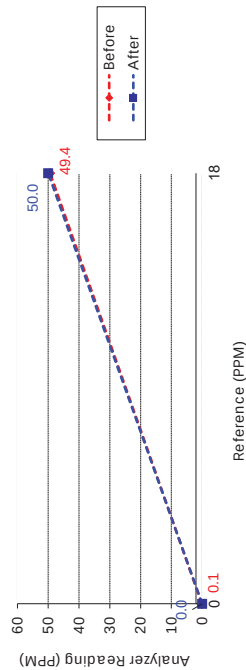
Calibration Report (Before adjust)

Status	Zero			Span		
	Reference (PPM)	Reading (PPM)	Drift (PPM)	Reference (PPM)	Reading (PPM)	Drift%
Methane	0.0	0.1	0.1	50.0	49.4	-1.2
NMHC	0.0	0.1	0.1	50.0	49.5	-1.0

Calibration Report (After adjust)

Status	Zero			Span		
	Reference (PPM)	Reading (PPM)	Drift (PPM)	Reference (PPM)	Reading (PPM)	Drift%
Methane	0.0	0.0	0.0	50.0	50.0	0.0
NMHC	0.0	0.0	0.0	50.0	50.0	0.0

Single Point Calibration Chart



Calibrate By

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*
เครื่องใช้ในห้องปฏิบัติการคุณภาพน้ำ								
1	UV-Vis Spectrophotometer	Color (SCM), Fluoride	Agilent	Cary60-028606 / MY15410009	DQE Services Co.,Ltd.	SP25-019	26 May 25	29 May 26
2	UV-Vis Spectrophotometer	Chemical Oxygen Demand	HiTech	U-5100 / 2344-008	DQE Services Co.,Ltd.	SP25-024	17 Jun 25	16 Jun 26
3	DO Reactor (Reading Block)	Nitrate, Phosphorus	HiTech	U-5100 / 2344-008	DQE Services Co.,Ltd.	SP25-024	17 Jun 25	16 Jun 26
4	Cyanuric Acid Portable Photometer	Nitrogen-Ammonia	Hanna	HI9800-02 / HI08500	Hanna Instruments (Thailand) Ltd.	HT-2510-0375	7 Mar 25	6 Mar 26
5	Atomic Absorption Spectrophotometer (AAS)	Nitrogen-Nitrate	Hanna	HI97722C / 90560598111	Hanna Instruments (Thailand) Ltd.	HT-2511-0437	24 Mar 25	23 Mar 26
6	Atomic Absorption Spectrophotometer (AAS)	Cyanuric acid	Agilent	System G19093A	Thailand Institute of Scientific and Technological Research (TISTR)	MIT-ACL-18-312188	3 Feb 25	2 Feb 26
7	Inductively Coupled Plasma (ICP)	Iron, Cadmium, Chromium, Copper, Iron, Manganese, Zinc, Potassium	Perkin Elmer	Perkin Elmer 900F / PF830031902	Perkin Elmer Co.,Ltd.	PerkinElmer 900F Preventive Maintenance Checklist	29 Apr 25	28 Apr 26
8	Cold Vapor Atomic Absorption Spectrophotometer (EVAAS)	Calcium, Lead, Mercury	Agilent	System G19093A	Thailand Institute of Scientific and Technological Research (TISTR)	MIT-ACL-18-312188	3 Feb 25	2 Feb 26
9	Digastor Unit	Mercury (Pd)	Agilent	System G19093A	Thailand Institute of Scientific and Technological Research (TISTR)	MIT-ACL-18-312188	3 Feb 25	2 Feb 26
10	Dissolution Unit (Potassium Method)	Mercury (Pd)	Agilent	System G19093A	Thailand Institute of Scientific and Technological Research (TISTR)	MIT-ACL-18-312188	3 Feb 25	2 Feb 26

เอกสารไม่ควบคุม

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*
เครื่องใช้ในห้องปฏิบัติการคุณภาพน้ำ								
11	Incubator	Total Bacteria	Memmert	BP 280 / 16151087	National Food Institute, Ministry of Industry, Thailand	2502229-001-01	19 Mar 25	18 Mar 26
12	Incubator	Total Coliform Bacteria	Memmert	BP 280 / 16151087	National Food Institute, Ministry of Industry, Thailand	2502229-001-01	19 Mar 25	18 Mar 26
13	Water Bath	Fecal Coliform Bacteria	Memmert	BP 280 / 16151087	National Food Institute, Ministry of Industry, Thailand	2502229-001-01	19 Mar 25	18 Mar 26
14	Water Bath	Escherichia coli	Memmert	BP 280 / 16151087	National Food Institute, Ministry of Industry, Thailand	2502229-001-01	19 Mar 25	18 Mar 26
15	Auto Clave	Pseudomonas Aeruginosa	ALP	CL-40L / 808763	National Food Institute, Ministry of Industry, Thailand	2502229-001-01	19 Mar 25	18 Mar 26
16	Auto Clave	Staphylococcus Aureus	ALP	CL-40L / 808763	National Food Institute, Ministry of Industry, Thailand	2502229-001-01	19 Mar 25	18 Mar 26
17	Analytical Balance		CHAUSS	FX623 / C276714745	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.

เอกสารไม่ควบคุม

DQE Services

32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Ladprao, Bangkok 10230

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

NAC

NAC TIR 17025 CALIBRATION DATA

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

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.

เอกสารไม่ควบคุม

FM-708-02 R01 1/11/2021

DQE Services

32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Ladprao, Bangkok 10230

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

NAC

NAC TIR 17025 CALIBRATION DATA

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
Absorbance Standard set	25760	115663	25 October 2025
Absorbance 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 Sarna 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.

เอกสารไม่ควบคุม

FM-708-02 R01 1/11/2021

6/24

DQE Services Co.,Ltd.

DQE Services

32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230

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

ISO 9001:2015

ISO 17025:2017

ISO 13528:2015

LABORATORY DATA

REPORT OF CALIBRATION

Certificate No. : SP25-019

Page 3 of 5

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

เอกสารไม่ควบคุม

FM-700-02 R01 1/11/2021

DQE Services Co.,Ltd.

DQE Services

32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230

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

ISO 9001:2015

ISO 17025:2017

ISO 13528:2015

LABORATORY DATA

REPORT OF CALIBRATION

Certificate No. : SP25-019

Page 4 of 5

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

เอกสารไม่ควบคุม

FM-700-02 R01 1/11/2021

DQE Services Co.,Ltd.

DQE Services

32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230

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

ISO 9001:2015

ISO 17025:2017

ISO 13528:2015

LABORATORY DATA

REPORT OF CALIBRATION

Certificate No. : SP25-019

Page 5 of 5

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 Available
- 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

FM-700-02 R01 1/11/2021

DQE Services Co.,Ltd.

DQE Services

32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230

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

ISO 9001:2015

ISO 17025:2017

ISO 13528:2015

LABORATORY DATA

CERTIFICATE OF CALIBRATION

Certificate No. : SP25-024

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 : 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

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.

เอกสารไม่ควบคุม

FM-700-02 R01 1/11/2021

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

REPORT OF CALIBRATION

Certificate No. : SP25-024 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
Absorbance Standard set	25760	115663	25 October 2025
Absorbance 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

FM-708-02 R01 1/11/2021

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

REPORT OF CALIBRATION

Certificate No. : SP25-024 Page 3 of 5

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

FM-708-02 R01 1/11/2021

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

REPORT OF CALIBRATION

Certificate No. : SP25-024 Page 4 of 5

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

FM-708-02 R01 1/11/2021

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

REPORT OF CALIBRATION

Certificate No. : SP25-024 Page 5 of 5

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 Calibration

- N/A = Not Available

- 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

FM-708-02 R01 1/11/2021

6/26

Certificate No. : HIT-2510-0375

Page : 1 of 2

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 : RE25040I

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.

Ca

This certificate was certified only for the instrument we calibrated.

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

** This certificate may not be reproduced other than in full, except with the prior written **
approval of the head of Hanna Instrument (Thailand) เอกสารไม่ควบคุม

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	AI.07155	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)	(2A)	(3A)	(4A)	(5A)
150.407	150.377	150.269	150.402	150.422
(1B)	(2B)	(3B)	(4B)	(5B)
150.426	150.394	150.644	150.690	150.542
(1C)	(2C)	(3C)	(4C)	(5C)
150.477	150.303	150.627	150.257	150.176
(1D)	(2D)	(3D)	(4D)	(5D)
150.462	150.456	150.199	150.406	150.102
(1E)	(2E)	(3E)	(4E)	(5E)
150.185	150.513	150.235	150.460	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 **

เอกสารไม่ควบคุม

Certificate No. : HIT-2513-0437

Page : 1 of 2

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.

Ca

This certificate was certified only for the instrument we calibrated.

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

** This certificate may not be reproduced other than in full, except with the prior written **
approval of the head of Hanna Instrument (Thailand) เอกสารไม่ควบคุม

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 Udornasuk 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 traceable to National Institute of Standards and Technology (NIST) by The Analytical Chemistry Laboratory.

The results are attached herewith.

Director of Analytical Chemistry Laboratory

Ref. 2015268013000459001

Issued Date : 7 March 2025

The results relate only to the items tested/calibrated or value assigned.

Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

Head Office
35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,
Changwat Pathumthani 12120, Thailand
Tel. (66) 0 2577 9036
Fax. (66) 0 2577 9009

Office/Laboratory
668 Mu 2 Tambon Bangpoomai, Amphoe Muang Samutprakan,
Changwat Samutprakan 10280, Thailand
Tel. (66) 0 2323 1672-80 ext. 115, 116
(66) 08 3219 9440
E-mail : mtg@tistr.or.th Website : www.tistr.or.th

Office
196 Phahonyothin Road, Ladysao, Chatuchak,
Bangkok 10900, Thailand
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217
(66) 0 2577 9009

เอกสารไม่ควบคุม

FM.BLMTC.002 Rev.5



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

Continue 2 / 5

INDUSTRIAL METROLOGY AND TESTING SERVICE CENTRE

The results relate only to the items tested/calibrated or value assigned.

Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

Head Office
35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,
Changwat Pathumthani 12120, Thailand
Tel. (66) 0 2577 9036
Fax. (66) 0 2577 9009

Office/Laboratory
668 Mu 2 Tambon Bangpoomai, Amphoe Muang Samutprakan,
Changwat Samutprakan 10280, Thailand
Tel. (66) 0 2323 1672-80 ext. 115, 116
(66) 08 3219 9440
E-mail : mtg@tistr.or.th Website : www.tistr.or.th

Office
196 Phahonyothin Road, Ladysao, Chatuchak,
Bangkok 10900, Thailand
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217
(66) 0 2577 9009

เอกสารไม่ควบคุม

FM.BLMTC.002 Rev.5



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	0.9120	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				
	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				
Cr	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				
	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				
Fe	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				
	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				
	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				
Mn	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				
	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				
Ni	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				
	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				

Continue 3 / 5

INDUSTRIAL METROLOGY AND TESTING SERVICE CENTRE

The results relate only to the items tested/calibrated or value assigned.

Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

Head Office
35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,
Changwat Pathumthani 12120, Thailand
Tel. (66) 0 2577 9036
Fax. (66) 0 2577 9009

Office/Laboratory
668 Mu 2 Tambon Bangpoomai, Amphoe Muang Samutprakan,
Changwat Samutprakan 10280, Thailand
Tel. (66) 0 2323 1672-80 ext. 115, 116
(66) 08 3219 9440
E-mail : mtg@tistr.or.th Website : www.tistr.or.th

Office
196 Phahonyothin Road, Ladysao, Chatuchak,
Bangkok 10900, Thailand
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217
(66) 0 2577 9009

เอกสารไม่ควบคุม

FM.BLMTC.002 Rev.5

Head Office
35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,
Changwat Pathumthani 12120, Thailand
Tel. (66) 0 2577 9036
Fax. (66) 0 2577 9009

Office/Laboratory
668 Mu 2 Tambon Bangpoomai, Amphoe Muang Samutprakan,
Changwat Samutprakan 10280, Thailand
Tel. (66) 0 2323 1672-80 ext. 115, 116
(66) 08 3219 9440
E-mail : mtg@tistr.or.th Website : www.tistr.or.th

Office
196 Phahonyothin Road, Ladysao, Chatuchak,
Bangkok 10900, Thailand
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217
(66) 0 2577 9009

เอกสารไม่ควบคุม

FM.BLMTC.002 Rev.5

11.6/28

Request No. 25-68 / 0320

4 / 5

MTC. ACL. No. 372 / 68

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

INDUSTRIAL METROLOGY AND TESTING SERVICE CENTRE

The results relate only to the items tested/calibrated or value assigned.
Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FM.BLMTC.002 Rev.5

Head Office
35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,
Changwat Pathumthani 12120, Thailand
Tel. (66) 0 2577 9036
Fax. (66) 0 2577 9009

Office/Laboratory
668 Mu 2 Tambon Bangpooai, Amphoe Muang Samutprakan,
Changwat Samutprakan 10280, Thailand
Tel. (66) 0 2323 1672-80 ext. 115, 116
(66) 08 3219 9440
E-mail : mtg@tistr.or.th Website : www.tistr.or.th

Office
196 Phahonyothin Road, Ladysao, Chatchak,
Bangkok 10900, Thailand
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217
(66) 0 2579 1121-30 ext. 5219, 5225, 5217
E-mail : mtg@tistr.or.th Website : www.tistr.or.th

เอกสารไม่ควบคุม

Request No. 25-68 / 0320

5 / 5

MTC. ACL. No. 372 / 68

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

Remark : The reported uncertainty is an expanded uncertainty calculated using a coverage factor of 2 ($k = 2$)
which gives a level of confidence of approximately 95%

Director of Analytical Chemistry Laboratory
Issued Date : 7 March 2025

INDUSTRIAL METROLOGY AND TESTING SERVICE CENTRE
End of Certificate

The results relate only to the items tested/calibrated or value assigned.
Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FM.BLMTC.002 Rev.5

Head Office
35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,
Changwat Pathumthani 12120, Thailand
Tel. (66) 0 2577 9036
Fax. (66) 0 2577 9009

Office/Laboratory
668 Mu 2 Tambon Bangpooai, Amphoe Muang Samutprakan,
Changwat Samutprakan 10280, Thailand
Tel. (66) 0 2323 1672-80 ext. 115, 116
(66) 08 3219 9440
E-mail : mtg@tistr.or.th Website : www.tistr.or.th

Office
196 Phahonyothin Road, Ladysao, Chatchak,
Bangkok 10900, Thailand
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217
(66) 0 2579 1121-30 ext. 5219, 5225, 5217
E-mail : mtg@tistr.or.th Website : www.tistr.or.th

เอกสารไม่ควบคุม



PinAAcle 900F Preventive Maintenance Report

Company Name: UAE Consultant Co., LTD.

Instrument Location: 41 Sukumvit Rd.,

Phra Khanong, Bangkok 10260

Instrument Serial No.: PFBS20031902

Date: 29-Apr-2025

เอกสารไม่ควบคุม

PinAAcle 900F Preventive Maintenance (PM)

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

Part Number	Release	Publication Date	
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.

Copyright Information

This document contains proprietary information that is protected by copyright. All rights are reserved.
No part of this publication may be reproduced in any form whatsoever or translated into any language without the prior, written permission of PerkinElmer, Inc.
Copyright © 2013 PerkinElmer, Inc.

Trademarks

Registered names, trademarks, etc. used in this document, even when not specifically marked as such, are protected by law. PerkinElmer is a registered trademark of PerkinElmer, Inc. All other trademarks and registered trademarks not owned by PerkinElmer, Inc. or its subsidiaries that are depicted herein are the property of their respective owners. Except as specifically set forth in its terms and conditions of sale, PerkinElmer makes no Warranty of any kind with regard to this document, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose.
PerkinElmer shall not be liable for incidental or consequential damages in connection with the furnishing or use of this document.

เอกสารไม่ควบคุม

Component List

Component / Specific Model	Serial #	Configuration Notes
PinAAcle900F	PF8520031902	Syngistix V4.0.1.1935
FIAS100	100524040501	

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

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.
- ☒ 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 guided in the Hardware Guide.
- ☒ Check burner head dimensions with the feeler gauge as stated in the Maintenance chapter section on cleaning the burner head and checking slot 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 N2O-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.

เอกสารไม่ควบคุม

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

เอกสารไม่ควบคุม

7. Flame Interlock Check:

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

Parameter	Specification	Test Results	Pass/Fail
Flame Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Drain Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Nebulizer Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
C ₂ H ₂ Pressure Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Air Pressure Sensor	Air/C ₂ H 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

เอกสารไม่ควบคุม

8.4 D₂ 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.

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.

Review of Preventive Maintenance:

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม



PerkinElmer Scientific (Thailand) Co., Ltd.
290 Soi Sornvijai 4
Khwang Bangkapi, Khwa Huay Kwang
Bangkok 10310
Thailand
Tel: 66 2719 6420 ; Fax: +66 2 319 7900
http://www.perkinelmer.com

Service Report

Work Order Number	Activity Code	Billing Type	Requested Start Date	Model	Serial Number
WO-03129047	Planned Maintenance	Contract	10/01/2568 11:06 a.m.	AAAS200051	PFBS20031902
Service Representative Name	Contract Number	Expiry Date	Equipment ID	System ID	
Kanan, Chayanon	SC-0035564109	31/10/2025	N/A	N/A	
UGI Number					
N/A					
Equipment Location			Bill To Name		
บริษัท อู่เรือเคที เฟอร์นิเจอร์ จำกัด			บริษัท อู่เรือเคที เฟอร์นิเจอร์ จำกัด		
อาคารพาณิชย์ เขตคลองเตย กรุงเทพมหานคร 10110			อาคารพาณิชย์ เขตคลองเตย กรุงเทพมหานคร 10110		
Customer Contact			Email		
K. ฤทธิธำพร เสงี่ยมกุล (krunsums)			richakom.prasert1996@gmail.com		
Phone Number			Purchase Order		
095-5580049			HPO-250100002		
Fax Number					
N/A					

Work Description

- PM 2/2 (AAurFlexA)
- Cleaning Cell, Chamber, Filter
- Wavelength Calibrate : Pass
- Wavelength Scan As,Cu,Ba,K,Ni : Pass
- Align cell with Hg : OK

Start Date	End Date	Work Description
28/9/2025	28/9/2025	

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	28/9/2025	4

Work Complete	Customer Signature	Technician Signature
Yes ☒ No ☐		
PMOQ/PM Left with Customer		
Yes ☐ No ☒		

Terms & Conditions

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.

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม

Atomic Absorption/FIAS 100/400 Preventive Maintenance (PM)				
Company Name:		United Analyst and Engineering Consultant Co., LTD.		
Address (Instrument Location):		41 Sukumvit 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	
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.

Copyright Information

This document contains proprietary information that is protected by copyright. All rights are reserved. No part of this publication may be reproduced in any form whatsoever or translated into any language without the prior, written permission of PerkinElmer, Inc. Copyright © 2013 PerkinElmer, Inc.

Trademarks

Registered names, trademarks, etc. used in this document, even when not specifically marked as such, are protected by law. PerkinElmer is a registered trademark of PerkinElmer, Inc. All other trademarks and registered trademarks not owned by PerkinElmer, Inc. or its subsidiaries that are depicted herein are the property of their respective owners. Except as specifically set forth in its terms and conditions of sale, PerkinElmer makes no warranty of any kind with regard to this document, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. PerkinElmer shall not be liable for incidental or consequential damages in connection with the furnishing or use of this document.

เอกสารไม่ควบคุม

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.

เอกสารไม่ควบคุม

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.

เอกสารไม่ควบคุม

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.

Review of Preventive Maintenance:

เอกสารไม่ควบคุม

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

เอกสารไม่ควบคุม



PerkinElmer Scientific (Thailand) Co., Ltd.
290 Soi Soonthajai 4
Khwang, Bangkapi, Khat Huay Kwang
Bangkok, 10310
Thailand
Tel: 66 2719 6420 ; Fax: +66 2 319 7900
http://www.perkinelmer.com

Service Report

Work Order Number	Activity Code	Billing Type	Requested Start Date	Model	Serial Number
WO-03051971	Preventive Maintenance	Contract	10/03/2568 23:08 น.	80508570	150524040501
Service Representative Name	Contract Number	Expiry Date	Equipment ID	System ID	
Kanjan, Chayanon	SC-0038650090	24/05/2025	N/A	N/A	
UDI Number					
N/A					
Equipment Location			Bill To Name		
บริษัท อุตสาหกรรม และพาณิชย์ จำกัด อาคารพาณิชย์ 10280 ถนน สุขุมวิทซอย 51 10280 TH			บริษัท อุตสาหกรรม และพาณิชย์ จำกัด อาคารพาณิชย์ 10280 ถนน สุขุมวิทซอย 51 10280 TH		
Customer Contact	Phone Number	Fax Number	Email	Purchase Order	
K. Nishakorn Samrit	095-5580249	N/A	perkinelmer.th@gmail.com	HPO-340400211	

Work Description			
- PM 22 Warranty - Cleaning Port Valve, Manifold, Tuning - Run In 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

Work Complete	Customer Signature	Technician Signature
Yes ☒ No ☐ PM/OQ/SPV Left with O		
Yes ☐ No ☒		

เอกสารไม่ควบคุม

Customer Acknowledgment of receipt of the above repair / replacement.
Special Terms and Conditions: This is not an invoice.
Terms will be applied to your invoice if applicable.

เอกสารไม่ควบคุม

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.

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.

Revision: A.02, Issued: 21 January 2022
 Document Number: G8014-90075
 © Agilent Technologies, Inc. 2022

Page 1 of 14



952568 WO-03126049

Page 2 of 2

เอกสารไม่ควบคุม

เอกสารควบคุม, 6

Agilent 5100, 5110 Preventive Maintenance Checklist



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.

Revision: A.02, Issued: 21 January 2022
 Document Number: G8014-90075
 © Agilent Technologies, Inc. 2022

Page 2 of 14



เอกสารควบคุม, 6

Agilent 5100, 5110 Preventive Maintenance Checklist



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

Revision: A.02, Issued: 21 January 2022
 Document Number: G8014-90075
 © Agilent Technologies, Inc. 2022

Page 3 of 14



เอกสารควบคุม, 6

16.6/34

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.

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 8015 A	M4 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

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.

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.

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

เอกสารควบคุม, 6

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

เอกสารควบคุม, 6

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.

เอกสารควบคุม, 6

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	1783.8	2579.2	2210.8	3562.9
Mn 257.610 nm SRBR	9670.5	19614.9	10983.0	17894.4
Al 396.152 nm SBR	5.2	8.0	7.0	7.4
K 766.491 nm SBR	3.0	14.6	3.4	5.7

* 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

เอกสารควบคุม, 6

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	0.106 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	233.61 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

Revision: A.02, Issued: 21 January 2022
Document Number: G8014-90075
© Agilent Technologies, Inc. 2022

Page 12 of 14



เอกสารควบคุม, 6

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	1
Purge Gas Filter	G8010-60136	All	1
Air inlet filter	G8000-68002	All	1
High Capacity Air Filter	G8010-60189	Optional	1
Rotor seal for 6-7 port valve for AVS6/7	G8494-60002	G8494A/G8495	1
Rotor seal for 4 port valve for AVS4	G8493-60002	G8493A	1
Rinse solution to rinse station 2.5mm id x 1m	G8410-80123	SPS 4	1
Barb connector 2.5mm-1.5mm ID	G8410-80124	SPS 4	1
PVC waste tubing, 8mm od x 5mm id, 2m	G8410-80122	SPS 4	1
Additional Parts may be required from engineer's stock:			
X axis drive belt	5410047500	SPS 3	1
Z axis drive belt	5410047400	SPS 3	1
Peristaltic pump tubing, PVC SolvaFlex, 3 bridged,	3710049000	SPS 4	1

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
------------------	-------------	------------------------------	-------------------

Revision: A.02, Issued: 21 January 2022
Document Number: G8014-90075
© Agilent Technologies, Inc. 2022

Page 13 of 14



เอกสารควบคุม, 6

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:

6009 00460

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.

Revision: A.02, Issued: 21 January 2022
Document Number: G8014-90075
© Agilent Technologies, Inc. 2022

Page 14 of 14



เอกสารควบคุม, 6

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 (460.793 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	

Page 2 of 4

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	

Page 3 of 4

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	

Page 4 of 4

Milestone DMA-80 Service Protocol

SITHIPORN
associates

DMA-80 DIRECT MERCURY ANALYZER System



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

DMA-80 Direct Mercury Analyzer

SERVICE PROTOCOL REPORT

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

Customer information:

Company:	บุญเลิศ แอนนาลิสต์ฯ จก. (สนง.ใหญ่)
Department:	LAB
Person in charge:	คุณ ภูษณ์ 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-G40 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, ่ว

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, ่ว

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:

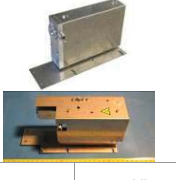
	Good	Damaged	Corroded
Tubing	✓		
Silicon joints	✓		
O-rings	✓		
Cuvette sealing O-rings	✓		
Gas connections	✓		
Valves	✓		
Sample boat carrier	✓		
Catalyst flange	✓		

เอกสารควบคุม, ่ว

				
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
Tricon 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).

เอกสารควบคุม, ่ว

	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. <i>In case of analysis of sample with high organic concentration the lifetime of the catalyst can be less than 6 months.</i>		✓
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		✓

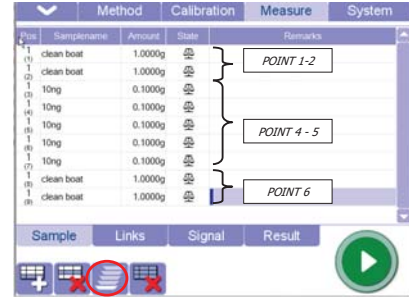
Page 6

เอกสารคุณไม่, ่ว

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.

- Run minimum 2 blanks on the same sample boat (quartz if possible) in manner to clean it
- Run blanks until absorbance value (Height) decrease under 0.0030 in cell 1
- 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
- Weight approximately 100µg of the fresh 100µg/L – Standard (10ng) and start the analysis as a single measurement mode
- Repeat five times the test
- Run again two blanks measurements

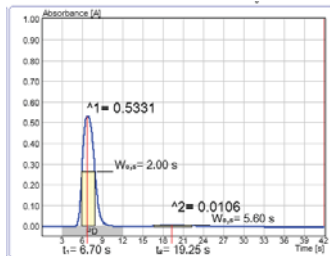


Now, it is possible to evaluate:

- Peaks

Page 7

เอกสารคุณไม่, ่ว



- 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.

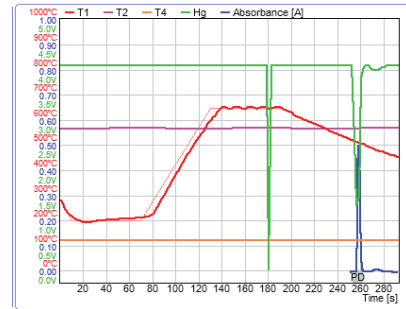
- Results

Pos	Sample name	Amount	State	Height	Hg [ng]	[µg/kg]	CV	Σ
1	Stability 10ng		M		100.280	1.0000		
2	Stability 10ng	0.1000g	✓	0.4931	9.9095	99.0951	1.0000	Σ
3	Stability 10ng	0.1000g	✓	0.4965	9.9934	99.9335	1.0000	Σ
4	Stability 10ng	0.1000g	✓	0.4991	10.059	100.597	1.0000	Σ
5	Stability 10ng	0.1000g	✓	0.4976	10.022	100.221	1.0000	Σ
6	Stability 10ng	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



- 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 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	✓

Page 8

เอกสารคุณไม่, ่ว

Page 9

เอกสารคุณไม่, ่ว

Remarks:

Working hours of Service Engineer	
-----------------------------------	--

Service Engineer Name	Signature	Date
ชานันต์เฉลิม วัณณศิริ	ชานันต์เฉลิม วัณณศิริ	31-01-2025

Laboratory Manager / Operator acceptance signature:	
---	--

Page 10

เอกสารคุณไม่, ่ว

Verification Certificate

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

Page 1 of 4

Equipment: Digestion Unit (Heating Block)
Manufacturer: FOSS
Model: Tecator Digester 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

Calibrated by Mr.Worapob Sookthong
Scientist
Approved by [Signature]
 Manager, Division of Calibration Laboratory
 Responsible for the Technical Management Team
Date of Issue: 29 January 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

เอกสารคุณไม่, ่ว

Verification Report

Certificate No.: 2501440-001-01
Equipment: Digestion Unit (Heating Block)
 Model: Tecator Digester 2520 Serial Ng.: 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

Page 2 of 4

Condition of this results of Calibration:

- 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	3497DA	MY449555/9M41194453	TC24/0063	5-Jun-2025	N.M. Technical Center Laboratory
	Type R	S/CH1, R/CH2, R/CH3			

- This certificate is traceable to International System of Units (SI Units).
- This certificate was certified only for the instrument used.
- 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 : ☒ Without adjustment ☐ After adjustment

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

Verification Report

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

Page 3 of 4

Calibration point:

Calibration result:

Table 1 : 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 factor providing a level of confidence of approximately 95 %.

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

เอกสารคุณไม่, ่ว



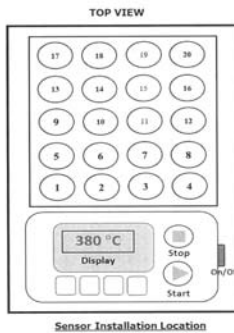
มูลนิธิสถาบันอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center

Verification Report

Certificate No.: 2501440-001-01
Equipment: Digestion Unit (Heating Block)
Model: Tecator Digester ; 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: Continued

Page 4 of 4

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



TOP VIEW

Sensor Installation Location

FCS-012 Revision: 01 Date: 20-04-65

2008 36, Anurak Road, Bang Yai Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand
Tel: +66(0) 2422 8600 Fax: +66(0) 2422 8545

เอกสารแนบ



FOSS

Customer Service Report

Date: 25 February 2025
Job No.: 11732
Instrument: KTG Distillator
Report No.: 13851
Customer: VAE
Address: Ban Nok
Serial: 91905373

Start Finish: 09:00 - 12:00
Travel To Customer (Hrs): 2hrs
Labour (Hrs): 09:00 - 12:00
Travel From Customer (Hrs): 2hrs

Application	Special	Standard
Distributor	Courtesy Visit	Installation
Digital Service	PMA Onboarding	Quote
Internal	Warranty	Repair
Investigate	Sales Support	Remote

PMA Type	Smartcare	Smartcare Pro	Fosscore
	Smartcare Advance	Fosscore Pro	N/A

Details of Work / Test
pm kit 12 MD
- test before pm
- cleaning kit, stomach
- flushing alkali pump
- replace pm kit 12 MD
- test operation
- distillation 80 = 95 ml Cal to 80 ml
- distillation 5 min 150-170 ml
- alkali 80 = 80 ml
- Receiver not vsc 11
- all pass

Part No.	Batch	Description	Qty
60100106	09.12.2024	pm kit kjeltec 9 Distillator	1

I confirm this report is accurate and complete.
Signed FOSS: [Signature]
Name: [Name]

Email: [Email] Customer Contact: [Customer Contact]

*Remark: [Remark]

Please scan QR code



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



Calibration Certificate

Certificate No.: 2502229-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road, Bangchack, Prakhonong, 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

Calibrated by: Mr.Jerawut Prapawuttipong
Scientist

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.

FCS-009 Revision: 01 Date: 20-04-65

2008 36, Anurak Road, Bang Yai Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand
Tel: +66(0) 2422 8600 Fax: +66(0) 2422 8545

เอกสารแนบ



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



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

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:

- 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

- This certificate is traceable to International System of Units (SI Units).
- This certificate was certified only for the instrument we calibrated.
- This result of calibration was found accurate as shown on date and place of calibration only.
- 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

FCS-012 Revision: 01 Date: 20-04-65

2008 36, Anurak Road, Bang Yai Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand
Tel: +66(0) 2422 8600 Fax: +66(0) 2422 8545

เอกสารแนบ



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 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 throughout observation time.
The report uncertainty of measurement was based on standard uncertainty multiplied by coverage factor of confidence of approximately 95 %.

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

Calibration Certificate

Certificate No.: 2502229-003-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road, Bangchack, Prakanong, 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

Calibrated by Mr.Yothin Charoensuk Scientist

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

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:

- 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

- This certificate is traceable to International System of Units (SI Units).
- This certificate was certified only for the instrument we calibrated.
- This result of calibration was found accurate as shown on date and place of calibration only.
- 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 ☐ Close Fan ☐ Not Available
7. Result of Calibration : ☒ Without adjustment ☐ After adjustment

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

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 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 temperature.
The report uncertainty of measurement was based on standard uncertainty multiplied by coverage factor of confidence of approximately 95 %.

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

Calibration Certificate

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

Page 1 of 3

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

Calibrated by Mr. Worapob Sooktong Approve
Scientist
WB
Date of Issue: 19 February 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

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		

Page 3 of 3

Calibration point: 44.5 °C

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

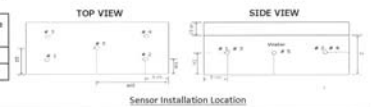


Table1 : Reporting of Temperature

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

Table 2 : Reporting of Characterization Result

UUC* Setting (°C)	UUC* Reading (°C)			Stability ± (°C)	Uniformity (°C)	Overall Variation (°C)
	MIN	MAX	Average			
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 sensor, 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 temperature.
 The report uncertainty of measurement was based on standard uncertainty multiplied providing a level of confidence of approximately 95 %.

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

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		

Page 2 of 3

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			

E-C5-012 Revision: 01 Date: 20-04-65

Calibration Certificate

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

Page 1 of 3

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

Calibrated by	Mr.Worapob Sooktong	Approved by	
	Scientist		Ma
	WB		Respo
Date of Issue:	19 February 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-C5-009 Revision: 01 Date: 20-04-65

Calibration Report

Certificate No.: 2501624-002-01
Equipment: Water Bath
Model: WNE14
Resolution: 0.1 °C
Manufacturer: MEMMERT
Serial No.: L416.0612
ID No.: UAE.MIC.003/2560
Date of Calibration: 10 February 2025
Page 3 of 3

Calibration point: 44.5 °C

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

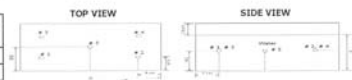


Table1 : Reporting of Temperature

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

Table 2 : Reporting of Characterization Result

UUC* Setting (°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 temperature.

The report uncertainty of measurement was based on standard uncertainty multiple providing a level of confidence of approximately 95 %.

----- End -----

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

2008 ซอย 36, ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10700
2008 Soi 36, Aun Amorn Road, Bang Yi Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand
Tel: +66(0) 2422 8668 Fax: +66(0) 2422 8545



Calibration Certificate

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

Page 1 of 3

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 **Approved by** [Signature]
Scientist

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 ซอย 36, ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10700
2008 Soi 36, Aun Amorn Road, Bang Yi Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand
Tel: +66(0) 2422 8668 Fax: +66(0) 2422 8545



Calibration Report

Certificate No.: 2501624-002-01
Equipment: Water Bath
Model: WNE14
Resolution: 0.1 °C
Manufacturer: MEMMERT
Serial No.: L416.0612
ID No.: UAE.MIC.003/2560
Date of Calibration: 10 February 2025
Page 2 of 3

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 was 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 : ☒ Without adjustment
☐ After adjustment

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

2008 ซอย 36, ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10700
2008 Soi 36, Aun Amorn Road, Bang Yi Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand
Tel: +66(0) 2422 8668 Fax: +66(0) 2422 8545



Calibration Report

Certificate No.: 2502229-007-01
Equipment: Autoclave
Model: CL-40L
Resolution: 0.1 °C
Manufacturer: ALP
Serial No.: 808763
ID No.: UAE.MIC.026/2563
Date of Calibration: 19 March 2025
Page 2 of 3

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 and 121.0 °C

8. Result of Calibration : ☒ Without adjustment
☐ After adjustment

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

2008 ซอย 36, ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10700
2008 Soi 36, Aun Amorn Road, Bang Yi Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand
Tel: +66(0) 2422 8668 Fax: +66(0) 2422 8545



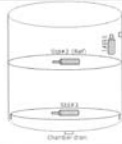
Calibration Report

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 and 121.0 °C

Page 2 of 3

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



Standard J.C. Position
STD1 = attached to the top temperature probe, within 20 mm.
STD2 = in the upper half of the chamber
STD3 = in the chamber door, within 100 mm.

Table 1 : 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 throughout observation time.
The report uncertainty of measurement was based on standard uncertainty multiplied by a level of confidence of approximately 95 %.

----- End -----

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

2008 ๒๕๕๑-๒๕๖๓ ๓๖ หมู่ ๑๐ ตำบลบ้านใหม่ อำเภอเมืองจันทบุรี จังหวัดจันทบุรี ๓๖๐๐๐
2008 Soi 36, Aun Amarn Road, Bang Yi Khan Subdistrict, Bang Phli District, Bangkok 10700, Thailand
Tel +66(0) 2422 8568 Fax +66(0) 2422 8545

Calibration Certificate

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

Page 1 of 3

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

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 ๒๕๕๑-๒๕๖๓ ๓๖ หมู่ ๑๐ ตำบลบ้านใหม่ อำเภอเมืองจันทบุรี จังหวัดจันทบุรี ๓๖๐๐๐
2008 Soi 36, Aun Amarn Road, Bang Yi Khan Subdistrict, Bang Phli District, Bangkok 10700, Thailand
Tel +66(0) 2422 8568 Fax +66(0) 2422 8545



FLM

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

Page 2 of 3

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:

- 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

- This certificate is traceable to International System of Units (SI Units).
- This certificate was certified only for the instrument we calibrated.
- This result of calibration was found accurate as shown on date and place of calibration only.
- This standard does not apply to sterilizers or disinfectors used for medical, dental, pharmaceutical.
- 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 : ☒ Without adjustment
☐ After adjustment

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

2008 ๒๕๕๑-๒๕๖๓ ๓๖ หมู่ ๑๐ ตำบลบ้านใหม่ อำเภอเมืองจันทบุรี จังหวัดจันทบุรี ๓๖๐๐๐
2008 Soi 36, Aun Amarn Road, Bang Yi Khan Subdistrict, Bang Phli District, Bangkok 10700, Thailand
Tel +66(0) 2422 8568 Fax +66(0) 2422 8545



FLM

Calibration Report

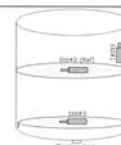
Certificate No.: 2503287-001-01
Equipment: Autoclave
Model: CL-40L Serial No.: 810010
Resolution: 1 °C ID No.: UAE.MIC.032/2565
Manufacturer: ALP

Date of Calibration: 5 June 2025

Page 3 of 3

Calibration point: 115 and 121 °C

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



Standard J.C. Position
STD1 = attached to the top temperature probe, within 20 mm.
STD2 = in the upper half of the chamber
STD3 = in the chamber door, within 100 mm.

Table 1 : 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 temperatures throughout observation time.
The report uncertainty of measurement was based on standard uncertainty multiplied by a level of confidence of approximately 95 %.

----- End -----

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

2008 ๒๕๕๑-๒๕๖๓ ๓๖ หมู่ ๑๐ ตำบลบ้านใหม่ อำเภอเมืองจันทบุรี จังหวัดจันทบุรี ๓๖๐๐๐
2008 Soi 36, Aun Amarn Road, Bang Yi Khan Subdistrict, Bang Phli District, Bangkok 10700, Thailand
Tel +66(0) 2422 8568 Fax +66(0) 2422 8545

FLM

