

*ภาคผนวก ค : เอกสารสอบเทียบความถูกต้อง
ของเครื่องมือเก็บตัวอย่าง*

ANALYTICAL BALANCE (DU)

Model. : XS205DU

Serial No. : 1126323724

NSC-TS1-TS17025
CALIBRATION 0152

Page 1 of 4

Certificate No. : 23-006683

Sample Code : 23-02820-006

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapiban 8 Rd., Nongkham,
Sriracha, Chonburi 20230

Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.
(Analytical Balance Room)

Equipment : ELECTRONIC BALANCE

Manufacturer : METTLER TOLEDO

Model : XS205DU

Serial No. : 1126323724

ID No. : LABE 05/1

Date of Receipt : 20 January 2023

Date of Calibration : 20 January 2023

Calibrated by : Mr. Thanadol Pholthep
Scientist

Issue date : 25 January 2023

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC)

NSC-TS1-TS17025
CALIBRATION 0152

Page 2 of 4

Certificate No. : 23-006683

Sample Code : 23-02820-006

REPORT OF CALIBRATION

Equipment : ELECTRONIC BALANCE
Manufacturer : METTLER TOLEDO
Model : XS205DU
Capacity : Max 81 g / 220 g
Resolution : 0.01 mg / 0.1 mg
Serial No. : 1126323724
ID No. : LABE 05/1

Result of Calibration

1. Test weight and repeatability of reading

Repeatability is a measure of the ability of a balance to supply the same result in repetitive weighings with one and the same load under the same measurement condition. The measurement of the repeatability must include both the balance specifications and the ambient (vibration, fluctuating air current/temperature/humidity, etc.) Operator handling of the balance is also included in the standard deviation.

Unit : g	Range : 80	<input type="checkbox"/> Before adjustment	<input type="checkbox"/> After adjustment
Nominal value	40	90	*
Standard weight	40.000042	80.000045	*
Average reading of indicator	40.000015	90.000019	*
Standard deviation	0.000004	0.000007	*
Unit : g	Range : 200	<input type="checkbox"/> Before adjustment	<input type="checkbox"/> After adjustment
Nominal value	100	200	*
Standard weight	100.000022	200.000199	*
Average reading of indicator	100.00001	200.00004	*
Standard deviation	0.000004	0.000008	*

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Certificate No. : 23-006683
Sample Code : 23-02820-006

REPORT OF CALIBRATION

Result of Calibration

2. Sensitivity or value of a scale division

Change in the output variable of a measuring instrument divided by the associated change in the input variable.

Unit : g		Range : 200	
Test Point	Sensitivity, S	Test Point	Sensitivity, S
0	0.99800	0	0.9980
40	0.99800	100	0.9980
80	0.99800	200	0.9980

3. Departure of indication from nominal value, Linearity

Unit : g		Range : 200	
Nominal Value	Standard Value	Average Reading of Indicator	Correction Value
Unload	0.000000	0.00000	0.00000
0.01	0.0100036	0.01000	0.00000
0.1	0.1000062	0.10000	0.00001
1	1.0000036	1.00001	-0.00001
5	5.0000044	5.00003	-0.00003
10	10.0000000	10.00007	-0.00007
20	20.0000016	20.00011	-0.00009
50	50.0000029	50.00013	-0.00010
100	100.0000022	100.00001	-0.00001
150	150.0000051	150.00001	0.00000
200	200.0000199	200.00003	-0.00001

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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%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003.

Certificate No. : 23-006683
Sample Code : 23-02820-006

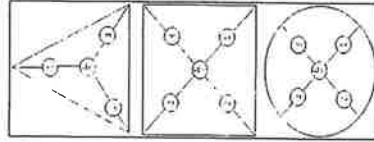
REPORT OF CALIBRATION

Result of Calibration :

4. Eccentric or off-centre loading

Deviation of the measurement value through off - center (eccentric) loading. The corner load increases with the weight of the load and its removal from the center of the pan support.

Weighing pan		Test weight : 50 and 100	
		Unit : g	
Range	Position	Reading of indicator	Reading of indicator
80	1	50.00014	100.0001
	2	50.00014	99.9998
	3	50.00006	100.0000
	4	50.00010	100.0001
	5	50.00017	100.0001
	6	50.00014	100.0001
Maximum difference		0.00008	0.0003



Condition of Calibration

6. Ambient conditions		Min	Max
Temperature (°C)		21.3	22.4
Relative Humidity (%Rh)		38.2	40.4
Air pressure (hPa)		1008.4	1010.1

1. Calibration Method : WI-CL-004 base on UKAS LAB 14: 2019

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

3. Condition of Calibration item: Normal

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

- Through the reference standard laboratory of Asia Medical and Agricultural Laboratory and Research Center Public

Company Limited (Instrument number 1).

5. Reference standard instrument :

Instrument
1) STANDARD WEIGHT 1 mg to 1 kgClass
E2ID No.
LB-WE-57Certificate No.
22-060639Due Date
27 June 2023

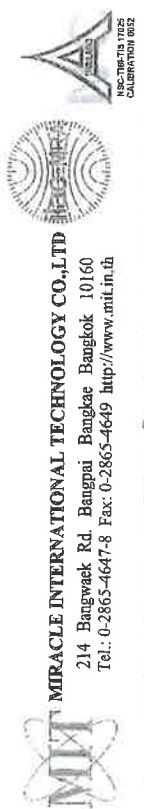
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- End of Report -

BAROMETER

Equipment : Analog Barometer

ID No. / Tag No. : BM001/41



CALIBRATION CERTIFICATE



Certificate No. : L202305085-002
Date Issued : 16-May-23

Customer : Eastern Thai Consulting 1992 Co., Ltd.
683 Moo 11 Sukhapibarn 8 Rd., Nongkham, Sriracha, Chonburi 20230

Equipment : Analog Barometer

Manufacturer : Barigo
Model :
Serial No. :
ID No./Tag No. : BM001/41
Date Received : 11-May-23
Date Calibrated : 15-May-23
Calibrated by : Mr. Jann Khaothong

Calibration Method or Calibration Procedure Used

In-house method : CP-21 base on DKD-R 6-1: Edition 3 2014.

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

Result of Calibration

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

This certificate may not be reproduced other than in full except with the prior written approval of the Miracle International Technology Company Limited.



Approved by: *Sarayuth*
(Mr. Sarayuth Toehua)

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Certificate No : L202305085-002
Environment : Ambient Temperature : (25 ± 2)°C
Relative Humidity : (50 ± 15)%RH

STD Reading mbar	UUC Reading (mbar) Before Adjusted	UUC Reading (mbar) After Adjusted	UUC Error mbar	Uncertainty ± mbar
990.00	990.0	-	0.00	0.61
1000.00	1000.0	-	0.00	0.61
1010.00	1010.0	-	0.00	0.61
1020.00	1020.0	-	0.00	0.61
1030.00	1030.0	-	0.00	0.61

STD = Standard

UUC = Unit Under Calibration

Calibrated condition :

Pressure Medium : Air : Density = 1.19 kg/m³ @ 20°C, 1 bar
Mounting Position : Vertical
Reference Level : at center of its dial
Conversion Factor : Multiply by 1.0 E+02 - Pa unit

Description of UUC :

Range : 990 - 1030 mbar Absolute
Calibration Range : 990 - 1030 mbar Absolute
Scale Interval : 1 mbar
Resolution : 0.5 mbar Absolute

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

IRPC Certificate No. CL1-P220104 for Reference Pressure Monitor Serial No. 1598, Due 11-Nov-23

End of Certificate

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Hot Air Oven

Model : UFE 500

Serial No. : G511.0182



ASIA MEDICAL AND
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REPORT OF CALIBRATION

Page 2 of 3
Certificate No. : 23-006679
Sample Code : 23-02820-002

Results of Calibration

Resolution : 0.5 °C

1. Reporting of Temperature

Calibration point (°C)	UUC* setting (°C)	UUC* reading (°C)	Measured temperature at each positions (°C)								Uncertainty ± (°C)	Coverage factor k	
			# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8			# g ^{ref}
104	103.5	103.5	104.10	104.08	103.87	103.99	104.08	104.08	103.96	104.01	103.84	0.47	2.00

2. Characterization results

Calibration point (°C)	Stability ± (°C)	Uniformity (°C)	Overall variation (°C)
104.0	0.08	0.32	0.39

Notes

UUC* = Unit Under Calibration



ASIA MEDICAL AND
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CERTIFICATE OF CALIBRATION

Page 1 of 3
Certificate No. : 23-006679
Sample Code : 23-02820-002

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.

683 Moo 11, Sukhaphan 8 Rd., Nongkham,

Siracha, Chonburi 20230

Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.

(Hot Lab)

Equipment : Temperature controlled enclosures (Hot air oven)

Manufacturer : Memmert

Model : UFE 500

ID No. : LABE 17/4

Date of Calibration : 20 January 2023

Condition of Calibration

1. Environment	1.1 Ambient temperature	Maximum : 27.9 °C	Minimum : 25.3 °C
1.2 Relative humidity	Maximum : 50.9 %	Minimum : 38.5 %	
1.3 Line voltage supplied	Maximum : 221.9 VAC	Minimum : 218.5 VAC	

2. Calibration method

TLAS-G-20: Guidelines for calibration and checks of temperature controlled enclosures.

3. Reference standard instrument

Instrument	ID No.	Certificate No.	Due Date
Data Acquisition With Sensor (RTD-PT100)	LB-DA-11 (RTD-138 to RTD-146)	22-040309	21 April 2023

4. This certificate is traceable to the international system of unit (SI Unit).

The measurement is traceable to Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.

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

6. Condition of calibration item : Normal

Calibrated by

Mr. Sarawoot Thammo

Scientist

24 January 2023

Issue date

(Mr. Somchai Neampunt)

Signed for Director

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

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

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Effective Date 15/10/21

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Rev.01

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REPORT OF CALIBRATION

Results of Calibration

Notes

1. Sensor installation locations
 - 1.1 All sensors at any corners or walls should be positioned 5 cm (a x b x c) from the wall.
 - 1.2 The reference sensor is preferably located of the geometric center of the chamber.
2. Interior dimensions approx of chamber :
W = 56 cm ; D = 40 cm ; H = 48 cm
3. Air valve or fresh air level : Off
4. Fan level : Open
5. The quoted uncertainty includes "Stability of chamber and loading effect in chamber at 20% of uniformity".
6. 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.
7. Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.
8. Overall variation - the difference of the maximum and the minimum measured temperatures throughout observation time.
9. UUC* reading - the average reading of indicating device that forms the integral part of the enclosure.
10. Calibration results without adjustment.

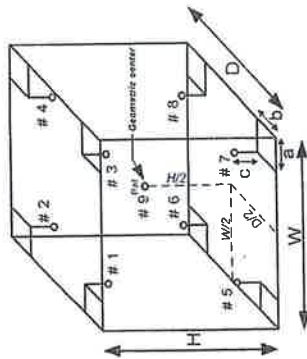


Figure: Example of sensor installation Positions

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%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003

- End of Report -

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ORIFICE TRANSFER STANDARD CERTIFICATION

WORKSHEET TE-5025A

ROOTSMETER S/N 0438320



TISCH ENVIRONMENTAL, INC.
145 SOUTH MIAMI AVE
VILLAGE OF CLEVELAND, OH
45002
513.467.9000
877.263.7610 TOLL FREE
513.467.9009 FAX

ORIFICE TRANSFER STANDARD CERTIFICATION WORKSHEET TE-5025A

Date - Mar 24, 2016 Rootmeter S/N 0438320 Ta (K) - 295
Operator Tisch Office I.D. - 0136 Pa (mm) - 742.95

PLATE OR Run #	VOLUME START (m3)	VOLUME STOP (m3)	DIFF VOLUME (m3)	DIFF TIME (min)	METER		ORIFICE	
					DIFF Hg (mm)	DIFF H2O (in.)	DIFF Hg (mm)	DIFF H2O (in.)
1	NA	NA	1.00	1.3400	3.2	2.00	3.2	2.00
2	NA	NA	1.00	0.9510	6.3	4.00	6.3	4.00
3	NA	NA	1.00	0.8510	7.8	5.00	7.8	5.00
4	NA	NA	1.00	0.8130	8.6	5.50	8.6	5.50
5	NA	NA	1.00	0.6690	12.6	8.00	12.6	8.00

DATA TABULATION

Vstd	(x axis) Qstd	(y axis)	Va	(x axis) Qa	(y axis)
0.9832	0.7337	1.4054	0.9957	0.7430	0.8911
0.9791	1.0296	1.9875	0.9915	1.0426	1.2603
0.9770	1.1481	2.2271	0.9894	1.1626	1.4090
0.9760	1.2006	2.3305	0.9884	1.2157	1.4778
0.9707	1.4510	2.8107	0.9830	1.4694	1.7825
Qstd slope (m)	1.96262		Qa slope (m)	1.22896	
intercept (b)	-0.03249		intercept (b)	-0.02060	
coefficient (r)	0.99993		coefficient (r)	0.99993	
y axis = SQRT (H2O(Pa/760)) (298/Ta)]			y axis = SQRT (H2O(Ta/Pa))		

CALCULATIONS

$$Vstd = \text{Diff. Vol} [(Pa - \text{Diff. Hg}) / 760] (298/Ta)$$

$$Qstd = Vstd / \text{Time}$$

$$Va = \text{Diff Vol} [(Pa - \text{Diff Hg}) / Pa]$$

$$Qa = Va / \text{Time}$$

For subsequent flow rate calculations:

$$Qstd = 1/m \{ [SQRT (H2O (Pa/760) (298/Ta))] - b \}$$

$$Qa = 1/m \{ [SQRT (H2O (Ta/Pa))] - b \}$$

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THERMO-HYGROMETER

Model : 608-H1

Serial No. : 45106737

NSC-TISI-TSI17025
CALIBRATION 0152

Page 1 of 2

Certificate No. : 23-055203

Sample Code : 23-21440-001

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapibarn 8 Rd., Nongkham,
Siracha, Chonburi 20230

Location of Calibration : Asia Medical and Agricultural Laboratory and Research Center Public Company Limited
(Calibration laboratory)

Equipment : Digital thermo-hygrometer

Manufacturer : testo

Model : 608-H1

ID No. : LABE 09/7

Date of Receipt : 25 May 2023

Date of Calibration : 29 May 2023

Condition of Calibration

1. Environment
- 1.1 Ambient temperature : 23.0 °C ± 3.0 °C
- 1.2 Relative humidity : 55.0 % ± 15.0 %

2. Calibration method

- 2.1 In-house method: WI-CL-045 By comparison with thermometer standard / chilled mirror hygrometer in controlled chamber.
- 2.2 The calibration by comparison unit under calibration (UUC) to the thermometer standard / chilled mirror hygrometer in a chamber at the controlled temperature / relative humidity.

3. Reference standard instrument

Instrument	Model	ID No.	Certificate No.	Due Date
3.1 Chilled Mirror	Optidew Vision	LB-DP-02 & LB-DP-02 (DP)	TH-0157-22	05 December 2023
3.2 Digital Thermometer	Optidew Vision	LB-DP-02 & LB-DP-02 (Temp.)	23-014916	12 February 2024
3.3 Digital Thermometer	34972A	LB-DA-07 with RTD-89	22-095535	06 September 2023

4. This certificate is traceable to the international system of unit (SI Unit).

- 4.1 Instrument No. 3.1 through National Institute of Metrology (Thailand).
- 4.2 Instrument No. 3.2 and 3.3 through Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.

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

6. Condition of calibration item : Normal

Calibrated by Miss Pornsuda Lohabal

Scientist

Issue date 31 May 2023

(Mr. Somchai Neampunt)

Signed for Director

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

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

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NSC-TISI-TSI17025
CALIBRATION 0152

Page 2 of 2

Certificate No. : 23-055203

Sample Code : 23-21440-001

REPORT OF CALIBRATION

Results of Calibration

Temperature measurement

Resolution : 0.1 °C

Range : 0 °C to 50 °C

Calibration point °C	Average of standard reading		Unit under calibration		Expanded uncertainty °C
	Controlled humidity %RH	Temperature °C	Average reading °C	Correction value °C	
20	50	20.00	20.0	0.00	± 0.39
25	50	25.02	25.1	- 0.08	± 0.39
30	50	30.00	30.0	0.00	± 0.39

Humidity measurement

Resolution : 0.1 %RH

Range : 10 %RH to 95 %RH

Calibration point %RH	Average of standard reading		Unit under calibration		Expanded uncertainty %RH
	Air temperature °C	Calculated humidity %RH	Average reading %RH	Correction value %RH	
45	25.00	45.18	53.5	- 8.32	± 1.3
60	25.00	60.03	68.3	- 8.27	± 1.5
75	25.00	75.20	83.2	- 8.00	± 1.7

Notes

- Calibration results without adjustment.

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%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003

End of Report -

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CERTIFICATE OF ANALYSIS

EPA PROTOCOL GAS

Cylinder No. : EB0062815

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: E04N199E15ACX9C Reference Number: 82-401135335-1
Cylinder Number: E80082815 Cylinder Volume: 144.4 CF
Laboratory: 124 - Riverton (SAP) - NJ Cylinder Pressure: 2015 PSIG
PGVP Number: B52018 Valve Outlet: 660
Gas Code: CO,NO,NOX,SO2,BALN Certification Date: Mar 13, 2018
Expiration Date: Mar 13, 2026

Certification performed in accordance with EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012) document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration module. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder Below 100 psig, i.e. 6.7 megapascals.

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	50.00 PPM	50.55 PPM	G1	+/- 1.4% NIST Traceable	03/06/2018, 03/13/2018
NITRIC OXIDE	50.00 PPM	50.50 PPM	G1	+/- 1.4% NIST Traceable	03/06/2018, 03/13/2018
SULFUR DIOXIDE	50.00 PPM	51.01 PPM	G1	+/- 1.0% NIST Traceable	03/06/2018, 03/13/2018
CARBON MONOXIDE	2000 PPM	1977 PPM	G1	+/- 1.0% NIST Traceable	03/06/2018
NITROGEN	Balance				

CALIBRATION STANDARDS			
Type	Lot ID	Cylinder No	Concentration
NTRM	16060607	CC42564	50.42 PPM NITRIC OXIDE/NITROGEN
PRM	12367	APEX1099237	9.82 PPM NITROGEN DIOXIDE/AIR
SMIS	0315201604	CC503358	4.975 PPM NITROGEN DIOXIDE/NITROGEN
LTSM	16011025	CC473218	49.02 PPM SULFUR DIOXIDE/NITROGEN
ASTRM	12060735	CC356192	2498 PPM CARBON MONOXIDE/NITROGEN

The SRM, PRM or RGM noted above is only in reference to the GMS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT			
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration	
Nicolet 6700 APW1100391 CO	FTIR	Feb 06, 2018	
Nicolet 6700 APW1100391 NO	FTIR	Feb 15, 2018	
Nicolet 6700 APW1100391 NO2	FTIR	Feb 16, 2018	
Nicolet 6700 APW1100391 SO2	FTIR	Mar 01, 2018	

Triad Data Available Upon Request

NOTES: NET WEIGHT: 10.43lbs
GROSS WEIGHT: 60.93lbs
PO# 5218000763

This calibration std. has been certified in accordance with the May 2012 EPA Traceability Protocol. Document EPA-600/R-12/531. All testing processes and measurements conform to the requirements of ISO/IEC 17025 and to Airgas ISO 9001:2000 and relate only to items identified on this certificate. All gases are certified to be NIST Traceable with total uncertainty as detailed under Analytical Uncertainty. This document shall not be reproduced in full without written approval of the issuer.



TESTING CERT No. 3082.05

Don Moran
Approved for Release

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ANALYTICAL BALANCE (DU)

Model. : XS205DU

Serial No. : 1126323724



Certificate No. : 23-006683

Sample Code : 23-02820-006

CERTIFICATE OF CALIBRATION

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Sriracha, Chonburi 20230

Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.
(Analytical Balance Room)

Equipment : ELECTRONIC BALANCE

Manufacturer : METTLER TOLEDO

Model : XS205DU

Serial No. : 1126323724

ID No. : LABE 05/1

Date of Receipt : 20 January 2023

Date of Calibration : 20 January 2023

Calibrated by Mr. Thanadol Pholthep
Scientist

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Certificate No. : 23-006683

Sample Code : 23-02820-006

REPORT OF CALIBRATION

Equipment : ELECTRONIC BALANCE
Manufacturer : METTLER TOLEDO
Model : XS205DU
Capacity : Max 81 g / 220 g
Resolution : 0.01 mg / 0.1 mg
Serial No. : 1126323724
ID No. : LABE 05/1

Result of Calibration

1. Test weight and repeatability of reading

Repeatability is a measure of the ability of a balance to supply the same result in repetitive weighings with one and the same load under the same measurement condition. The measurement of the repeatability must include both the balance specifications and the ambient (vibration, fluctuating air current/temperature/humidity, etc.) Operator handling of the balance is also included in the standard deviation.

Unit : g	Range : 80	<input type="checkbox"/> Before adjustment	<input type="checkbox"/> After adjustment
<input checked="" type="checkbox"/> No adjustment	Nominal value	40	90
<input type="checkbox"/> Adjustment	Standard weight	40.000042	60.000045
	Average reading of indicator	40.00015	90.00019
	Standard deviation	0.000004	0.000007
Unit : g	Range : 200	<input type="checkbox"/> Before adjustment	<input type="checkbox"/> After adjustment
<input checked="" type="checkbox"/> No adjustment	Nominal value	100	200
<input type="checkbox"/> Adjustment	Standard weight	100.000022	200.000199
	Average reading of indicator	100.0001	200.0004
	Standard deviation	0.00004	0.00008

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Certificate No. : 23-006683

Sample Code : 23-02820-006

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REPORT OF CALIBRATION

Result of Calibration

2. Sensitivity or value of a scale division

Change in the output variable of a measuring instrument divided by the associated change in the input variable.

Unit : g

Range :		Range :	
Test Point	Sensitivity, S	Test Point	Sensitivity, S
0	0.99800	0	0.9980
40	0.99800	100	0.9980
80	0.99800	200	0.9980

3. Departure of indication from nominal value, Linearity

Unit : g

Nominal Value	Standard Value	Average Reading of Indicator	Correction Value	Expanded Uncertainty	Coverage Factor (k)
Unload	0.000000	0.00000	0.00000	0.000090	2.01
0.01	0.0100036	0.01000	0.00000	0.000093	2.01
0.1	0.1000062	0.10000	0.00001	0.000012	2.00
1	1.0000036	1.00001	-0.00001	0.000014	2.00
5	5.0000044	5.00003	-0.00003	0.000020	2.00
10	10.000000	10.00007	-0.00007	0.000032	2.00
20	20.000016	20.00011	-0.00009	0.000036	2.00
50	50.000029	50.00013	-0.00010	0.000067	2.00
100	100.000022	100.00001	-0.00001	0.00016	2.00
150	150.000051	150.00001	0.0000	0.00023	2.00
200	200.000199	200.00003	-0.0001	0.00028	2.00

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%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003.

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Certificate No. : 23-006683

Sample Code : 23-02820-006

Page 4 of 4

REPORT OF CALIBRATION

Result of Calibration :

4. Eccentric or off-centre loading

Deviation of the measurement value through off - center (eccentric) loading. The corner load increases with the weight of the load and its removal from the center of the pan support.

Weighting pan ☐ Circle ☐ Triangular ☒ Rectangular

Test weight : 50 and 100
Unit : g

Range	Position	Reading of indicator	Reading of indicator
1	50.00014	100.00001	100.00001
2	50.00014	99.99988	99.99988
3	50.00006	100.00000	100.00000
4	50.00010	100.00001	100.00001
5	50.00017	100.00001	100.00001
6	50.00014	100.00001	100.00001
Maximum difference	0.00008	0.00003	0.00003

Condition of Calibration

1. Calibration Method : WI-CL-004 base on UKAS LAB 14: 2019
2. This result of calibration was found accurate as shown on date and place of calibration only.
3. Condition of Calibration item: Normal
4. This certification is traceable to the International System of Unit maintained at :-
Through the reference standard laboratory of Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (Instrument number 1).

5. Reference standard instrument :

Instrument

1) STANDARD WEIGHT 1 mg to 1 kg

Class

E2

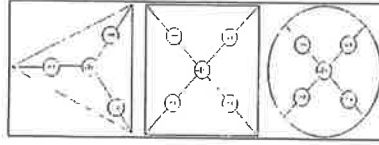
Certificate No.

22-060639

Due Date

27 June 2023

fmm



6. Ambient conditions	Min	Max
Temperature (°C)	21.3	22.4
Relative Humidity (%Rh)	39.2	40.4
Air pressure (hPa)	1008.4	1010.1

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End of Report -

ATOMIC ABSORPTION SPECTROPHOTOMETER

Model : PinAAcle 900F

Serial No. : PFBS22080801



PerkinElmer
For the Better

PER-INSTALLATION CHECKS:

- ☒ Verify that proper ventilation is installed and an adequate exhaust rate is accordance to PYL CFM N/A
- ☒ Verify that the gasses meet out PYL specifications---
- ☒ Verify that gas pressure regulators are installed with proper filters and pressure are set in accordance to PYL.
- ☒ Verify that the wiring in the lab meets our power and noise requirements specified in PYL.
- ☒ Verify that the lab environment conditions (room temperature, relative humidity) meet in our PYL specification
- ☒ Maintenance accessibility is adequate.
- ☒ Measured Mains Input Voltage under load is adequate per our PYL specifications (≥ 208 VAC)

PHYSICAL INSTALLATION:

- ☒ The instrument, cooling system, computer and any accessories are uncrated and installed on suitable bench
- ☒ Install all the electrical connections.
- ☒ Connect the gas hoses and tank regulators, set required pressures, and leak test as required.
- ☒ Install the burner System components. (PinAAcle Series 900T & 900F)
- ☒ Mount and connect the auto sample.
- ☒ Fill and connect the cooling system or connect external cooling according to specifications.
- ☒ Setup the computer and printer. Interconnect all cables between the computer, printer, and instrument.
- ☒ Setup and configure the computer to the instrument and install the software according to the installation chapter in the PinAAcle Service Manual.
- ☒ Record the furnace head voltage and manual temperature of 1200 Degrees Celsius.

INSTALLATION TESTING:

- ☒ Perform the following instrument performance tests according to the Installation and Test procedure.
Complete the Instrument Performance Test Data Sheet below.
 - PinAAcle900T, 900H & 900F
Flame Copper Sensitivity and Precision
 - PinAAcle900T & 900Z
Furnace Copper Characteristic Mass and Zeeman Ratio
 - PinAAcle900H
Furnace Chromium Characteristic Mass and Precision
- ☒ Make and electronic copy of the Instrument parameters file per SDB 900PIN_021 procedure on the customer computer

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PinAAcle 900 Series 900T, 900H, 900Z & 900F

Installation Checklist

Customer : EASTERN THAI CONSULTING Date Tested: 28-Nov-2022
NONGKHAM, SIRACHA
CHONBURI 20230

CRM # - CSE: Pattayut Wanwongka

UPON SITE ARRIVAL:

- ☒ Verify that the instrument was not damaged during shipment
- ☒ Unpack the PC and all other accessories. Record the following:

PinAAcle Instrument Model:	PinAAcle 900F	S/N	PFBS22080801
Auto Sample Model:	N/A	S/N	-
Computer Model:	DELL	S/N	37024013667
Cooling System Model:	N/A	S/N	-
Printer Model:	N/A	S/N	-
Misc.	FIAS 100	S/N	100S22081101

- ☒ Record the software and firmware revision below:
 - Syngistix Software for AA Version: 5.0.1.2029
 - PinAAcle Spectrometer Firmware Version: 1.5.0.0126
 - PinAAcle Furnace Firmware Version: N/A
- ☒ Check the model specific Shipping Kit packed separately for completeness.
Verify the shipping Kit with each instrument order includes all items listed.

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CUSTOMER ORIENTATION:

- ☒ Refer to the Customer Orientation Script for details
- ☒ Explain the warranty and customer replaceable parts policy
- ☒ Inform the customer of relevant PerkinElmer training courses, websites, and phone number

PinAAcle 900 Series 900T, 900H, 900Z & 900F

Installation Performance Test Data Sheet

Flame Sensitivity and Precision
(PinAAcle Series 900T, 900H & 900F)

With Stainless Steel Nebulizer

Sensitivity	Mean Absorbance ≥ 0.250	N/A
Precision	%RSD ≤ 0.30 %	N/A

With High Sensitivity Nebulizer

Sensitivity	Mean Absorbance ≥ 0.250 Abs.	0.3759
Precision	%RSD ≤ 0.40 %	0.25 %

THGA Furnace Copper Characteristic Mass and Zeeman Ratio
(PinAAcle 900T & 900Z)

Copper Characteristic Mass

Characteristic Mass	14 ± 2.5 pg	N/A
Zeeman Ratio	0.52 ± 0.04	N/A
Precision	%RSD $\leq 2.0\%$	N/A %
A.C Voltage measurement under load (Atomization)	≥ 208 VAC	231 VAC

HGA Furnace Chromium Characteristic Mass and Precision
(PinAAcle 900H)

Chromium Characteristic Mass

Characteristic Mass	3 ± 0.8 pg	N/A
Precision	$\leq 2.0\%$	N/A
A.C Voltage measurement under load (Atomization)	≥ 207 VAC	N/A

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9. Mn Resolution Peak to Valley Ratio

HCL Sample Intensity (Valley) / HCL Sample Intensity (Peak) < 0.40 (40%) N/A

HCL Reference Intensity (Valley) / HCL Reference Intensity (Peak) < 0.40 (40%) N/A

Furnace Mode (900Z)

HCL Sample Intensity (Valley) / HCL Sample Intensity (Peak) < 0.40 (40%) N/A

10. Furnace and Baffles Alignment Check w/ Cu (900T/Z/H)

PK Area - AA < 0.005 A-s N/A

PK Area - BG < 0.005 A-s N/A

11. Furnace auto sample check valve test (900T/Z/H)

Place sample probe onto rinse alignment and for 2 minutes and watch for backwards flow of rinse solution

Does rinse solution go backward? Y/N N/A

Optional Test Check

[Flame only Verification - 900T/H/F]

12. Gas box calibration check default flow settings

Fuel flow N/A 20-22

Oxidant flow N/A around 43

Nebulizer Pressure N/A 29-29.5

[Furnace only Verification] *Note test 13&14 should be done simultaneously

13. Voltage drop*

2300C Atomization test N/A spec < 16 volts

14. Cr heating rate*: By design the ASCOM PS will output the right DC voltage regardless of the incoming voltage, so that is not the purpose of this test. We are using this to check the conductivity of the furnace head and the function of the pyrometer.

10ppb Cr standard @ 2300C Peak Height/Peak Area N/A > 1.3

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PinAACLE 900 Added Installation Test Checklist:

Model: PinAACLE 900T Serial Number: PFBSZ2080801
 Software Version: 5.0.1.2029 Spectrometer FW Version: 1.5.0.0126
 Furnace FW Version: N/A
 Instrument Control PCB revision: 3

NOTE: First 12 test checks are mandatory

1. 0.2, 0.7 & 2.0 Silitis and 8 Lamp turret position calibration.

Check ☒

2. Cu energy & Capacitance:

Cu 324.75nm Line: Energy can vary by model and configuration, but Capacitance should be > 7pF.

Capacitance= 7.0 pF

3. Wavelength Calibration Passed (As, Cu, Ba, K < 6 steps)

Yes ☒

No ☐

4. Wavelength Accuracy Check

AS 193.70 nm +/- 0.12 nm	(193.58-193.82)	193.7 nm
Cu 324.75 nm +/- 0.12 nm	(324.63-324.87)	324.7 nm
Ba 553.55 nm +/- 0.12 nm	(553.43-553.67)	553.5 nm
K 766.49 nm +/- 0.12 nm	(766.37-766.61)	766.5 nm

5. HCL Sample to HCL Reference Ratio with Cu

30:70	N/A	HCL = 0.43, spec 0.18-0.58, target 0.34-0.52
30:70	N/A	D2 spec = 1.0-4.3
50:50	0.85	HCL = 1.0, spec 0.42-1.35, target 0.90-1.15
50:50	0.97	D2 spec = 0.43-1.84

6. Monochromator Bleed cover with Cu: Must be done with drak current checked (on)

Sample beam blocked value 19 spec < 60 counts, ideally < 20
 Reference beam blocked value (900TH) N/A spec < 60 counts, ideally < 20

7. Cu Flame Double-Beam Check

Mean_15 mA - Mean_10 mA =< 0.004C 0.0024

8. Low UV Energy & Capacitance check: check on on all

Cu 216.5 nm	1.0	> 1 pF Energy = <u>85</u>	below 50 may be a problem
*Pb 217.0 nm	N/A	> 1 pF Energy = <u>N/A</u>	below 50 may be a problem
*Zn 213.0 nm	N/A	> 1 pF Energy = <u>N/A</u>	below 50 may be a problem

* Option tests

N/A for PinAACLE 900Z. Flame double-beam ode test

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Comments:

PerkinElmer Service Engineer Signature:  Date: 28-11-22

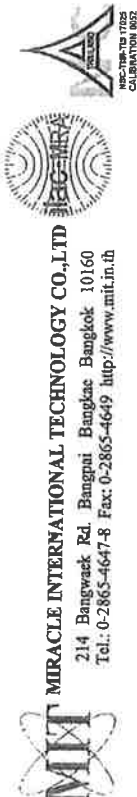
Patrayut Wanwongka

COPY

BAROMETER

Equipment : Analog Barometer

ID No. / Tag No. : BM001/41



MIRACLE INTERNATIONAL TECHNOLOGY CO., LTD.
214 Bangwaek Rd. Bangnai Bangkok 10160
Tel.: 0-2865-4647-8 Fax: 0-2865-4649 <http://www.mit.in.th>



CALIBRATION CERTIFICATE

Certificate No. : L202305085-002
Date Issued : 16-May-23

Customer : Eastern Thai Consulting 1992 Co., Ltd.
683 Moo 11 Sukhapibarn 8 Rd., Nongkham, Sriracha, Chonburi 20230

Equipment : Analog Barometer

Manufacturer : Barigo
Model : -
Serial No. : -
ID No./Tag No. : BM001/41
Date Received : 11-May-23
Date Calibrated : 15-May-23
Calibrated by : Mr. Jame Khaothong

Calibration Method or Calibration Procedure Used

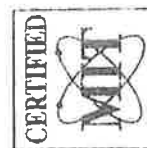
In-house method : CP-21 base on DKD-R 6-1: Edition 3 2014.

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

Result of Calibration

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

This certificate may not be reproduced other than in full except with the prior written approval of the Miracle International Technology Company Limited.



Approved by: *Sarayuth T.*
(Mr. Sarayuth Tochua)

Page 1 of 2

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Certificate No : L202305085-002
Environment : Ambient Temperature : $(25 \pm 2)^{\circ}\text{C}$
Relative Humidity : $(50 \pm 15)\%\text{RH}$

STD Reading mbar	UUC Reading (mbar) Before Adjusted	UUC Reading (mbar) After Adjusted	UUC Error mbar	Uncertainty \pm mbar
990.00	990.0	-	0.00	0.61
1000.00	1000.0	-	0.00	0.61
1010.00	1010.0	-	0.00	0.61
1020.00	1020.0	-	0.00	0.61
1030.00	1030.0	-	0.00	0.61

STD = Standard

UUC = Unit Under Calibration

Calibrated condition :

Pressure Medium : Air : Density = 1.19 kg/m^3 @ 20°C , 1 bar
Mounting Position : Vertical
Reference Level : at center of its dial
Conversion Factor : Multiply by $1.0 \text{ E}+02$ - Pa unit

Description of UUC :

Range : 990 - 1030 mbar Absolute
Calibration Range : 990 - 1030 mbar Absolute
Scale Interval : 1 mbar
Resolution : 0.5 mbar Absolute

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

IRPC Certificate No. CL1-P220104 for Reference Pressure Monitor Serial No. 1598, Due 11-Nov-23

End of Certificate

Page 2 of 2

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Hot Air Oven

Model. : UM 400

Serial No. : 900982

REPORT OF CALIBRATION

Results of Calibration

Resolution : 0.1 °C

1. Reporting of Temperature

Calibration point (°C)	UUC* setting (°C)	UUC* reading (°C)	Measured temperature at each positions (°C)								Uncertainty ± (°C)	Coverage factor k
			# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	# 9	
85	85.0	85.0	85.18	85.04	84.62	84.82	85.03	85.04	85.00	84.96	85.08	2.00

2. Characterization results

Calibration point (°C)	Stability ± (°C)	Uniformity (°C)	Overall variation (°C)
85	0.07	0.49	0.68

Notes

- UUC* = Unit Under Calibration

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapibon 8 Rd., Nongkham,
Siracha, Chonburi 20230

Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.
(Hot Lab)

Equipment : Temperature controlled enclosures (Hot air oven)

Manufacturer : Memmert

Model : UM 400

ID No. : LABE 17/1

Date of Receipt : 21 February 2023

Date of Calibration : 21 February 2023

Condition of Calibration

1. Environment	1.1 Ambient temperature	Maximum : 31.2 °C	Minimum : 28.7 °C
	1.2 Relative humidity	Maximum : 50.2 %	Minimum : 40.1 %
	1.3 Line voltage supplied	Maximum : 223.9 VAC	Minimum : 221.5 VAC

2. Calibration method

TLAS-G-20: Guidelines for calibration and checks of temperature controlled enclosures.

3. Reference standard instrument

Instrument	ID No.	Certificate No.	Due Date
Data acquisition with sensor (RTD-PT100)	LB-DA-12 (RTD-158 to RTD-166)	22-040312	02 May 2023

4. This certificate is traceable to the international system of unit (SI Unit).

The measurement is traceable to Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.

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

6. Condition of calibration item : Normal

Calibrated by : Mr. Sarawoot Thammo
Scientist

Approved by : (Mr. Somchai Neampunt)
Signed for Director

Issue date : 24 February 2023

The uncertainties are for a confidence probability of approximately 95%.
The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

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REPORT OF CALIBRATION

Results of Calibration

Notes

1. Sensor installation locations
 - 1.1 All sensors at any corners or walls should be positioned 5 cm (a x b x c) from the wall.
 - 1.2 The reference sensor is preferably located of the geometric center of the chamber.
2. Interior dimensions approx of chamber :
W = 40 cm ; D = 28 cm ; H = 39 cm
3. Air valve or fresh air level : Off
4. Fan level : Open
5. The quoted uncertainty includes " Stability of chamber and loading effect in chamber at 20% of uniformity ".
6. 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.
7. Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.
8. Overall variation - the difference of the maximum and the minimum measured temperatures throughout observation time.
9. UUC* reading - the average reading of indicating device that forms the integral part of the enclosure.
10. Calibration results without adjustment.

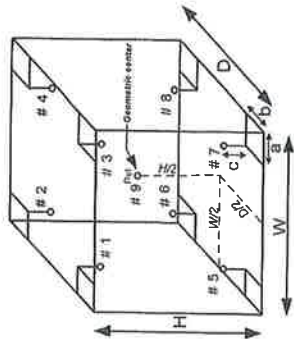


Figure: Example of sensor installation Positions

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%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003.

- End of Report -

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INDUCTIBELY COUPLED PLASMA SPECTROMETER

Model : Prodigy 7

Serial No. : P70177



บริษัท แอปพลิเคชัน สี่พันเจ็ด จำกัด
Application Define Company Limited
133/318 ถนนพหลโยธิน แขวงสามยุค เขตเมืองใหม่ กรุงเทพมหานคร 10510
Tel: (66)8455-5191 E-mail: support@apdefine.co.th Website : http://www.apdefine.co.th
เลขประจำตัวผู้เสียภาษี 0105556032491

CERTIFICATE OF INSTRUMENT PERFORMANCE

INSTRUMENT:		INDUCTIVELY COUPLED PLASMA SPECTROMETER	OK
BRAND:		Teledyne Leeman Labs	
MODEL:		Prodigy 7	
SERIAL NO.		P70177	
CUSTOMER:		บริษัท อีสเทิร์นไทย คอนกรีต 1992 จำกัด	OK
CHECKING:			
SPECTROMETER			
Wavelength Accuracy check by use emission line of Hg Lamp			
Mercury line 253.652 nm.			OK
Plasma View (Dual View)			
CMOS Detector check			
Align View by Mn line 257.610 nm.			
RF GENERATOR			OK
Incident Power 1,200 ±10 Watt Reading = 1200 Watt			
SAMPLE INTRODUCTION			OK
Plasma Torch, Injector, Spray chamber, Nebulizer			
Partialtic pump & Tubing			OK
EXHAUSTING & COOLING SYSTEM			
Safety Interlock Switch (Door, Argon pressure, Water pressure)			
Cooling System, water flowrate & low pressure switch			
Flowrate of Air blower			OK
COMPUTER & SOFTWARE			
Plasma Ignitation software & Analytical Software			
ANALYTICAL TEST			
Full Frame Capture & Echellogram check			OK
Calibration Cuve & QC Test			

DATE : Dec 12, 2022

Mr. Somchai Chumyung
Engineer Sign

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PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท อีสเทิร์นไทย คอนกรีต 1992 จำกัด	Date: Dec 12, 2022
Instrument: ICP-OES	Model: Prodigy 7
	S/N: P70177

1. Gas Supply /Water Re-circulator/Exhaust Hood Check:

Gas system: ตรวจสอบแรงดันแก๊สและทำการทึ่ม Argon Pressure: 5-10 psi Leak inspected (✓) No leak Nitrogen Pressure: 5-10 psi Leak inspected (✓) No leak Oxygen Pressure: 5-10 psi Leak inspected (✓) No leak	
() Change camera purge gas Dehydrator (1 times /years) Next time replacement 25/12/2562 เปลี่ยนตัวถักความชื้นดีไฮเดรต ทุก 1 ปี	
Water Chiller: RF generator flow rate 4.44 LPM Temperature 25.0 °C ตรวจอุณหภูมิ Leak inspected (✓) No leak ตรวจทดสอบการทึ่ม	
Water Chiller : Camera (✓) check water level and refill ตรวจระดับน้ำและเติมน้ำ (✓) change water เปลี่ยนน้ำ Temperature -31 °C ตรวจอุณหภูมิ	
Exhaust Hood Flow rate 2700 CFM (system request > 150)	

TELEDYNE LEEEMAN LABS
PURITY. PRECISION. PERFORMANCE.

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PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท อีทีพีไทย คอนสตรัคชั่น 1992 จำกัด	Date: Dec 12, 2022
Instrument: ICP-OES	Model: Prodigy 7
	S/N: P70177

2. Computer & Software Check

Description	Status
Interface Cable USB (✓) No broken	OK
Software Version	OK
(✓) Operation function check :	OK
(✓) Open /Save /Edit method	OK
(✓) Instrument Control	OK
(✓) Sequence	OK
(✓) Full Frame Capture (Echelle Mode)	OK
(✓) Auto alignment /Hg alignment	OK
(✓) Calibration Curve	OK
(✓) Re-Calculation	OK
(✓) Print Report	OK

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PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท อีทีพีไทย คอนสตรัคชั่น 1992 จำกัด	Date: Dec 12, 2022
Instrument: ICP-OES	Model: Prodigy 7
	S/N: P70177

3. Instrument Control

Description	Status
Optical view position: ตรวจสอบตำแหน่งพัฒนาที่ติดตั้งในเตาและมุมอง	
Hg Lamp Deltas	
X 2 Y - 9	OK
XUV 0	OK
Axial peak positions X 3325 Y 1225	OK
Radial peak positions X 4151 Y 1225	OK
Hg lamp peak positions X 2220 Y 2630	OK
Plasma Control ตรวจสอบการทำงานภาคจุดและดับพลาสมา	
(✓) Auto Start	OK
(✓) Extinguish	OK
(✓) RF power setting	OK
(✓) Igniter	OK
(✓) Air Knife	OK
Torch Gas ตรวจสอบการทำงานของระบบแก๊สที่ใช้ในเตาพลาสมา	
(✓) Coolant/Plasma Flow control	OK
(✓) Aux Flow	OK
(✓) Nebulizer Flow	OK
(✓) Optimize sample introduction function	OK
(✓) Peristaltic pump control	OK
(✓) Auto sampler Control	OK
(✓) Camera Support Module	OK
(✓) Diagnostic	OK

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PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท อีสเทิร์นไทย คอนสตรัคชั่น 1992 จำกัด	Date: Dec 12, 2022
Instrument: ICP-OES	Model: Prodigy 7

4. Cleaning & Replacement

Description	Status
(✓) O-Ring Torch replacement	OK
(✓) Pump Tubing replacement	OK
(✓) Glassware cleaning (Torch, Nebulizer, Spray chamber)	OK
(✓) Lube the roll peristaltic pump	OK
(✓) Optical windows cleaning	OK
(✓) Camera Water Re-circulator (water change/ refilled)	OK
(✓) RF Generator Water Re-circulator (water change/ refilled)	OK
(✓) Cleaning Electronics Board with spray cleaner	OK
(✓) Cleaning dust inside Unit	OK
(✓) Cleaning dust filter	OK

5. Safety Interlock

Description	Status
(✓) Door switch	OK
(✓) RF Water Re-circulator	OK
(✓) Camera Water Re-circulator	OK
(✓) Camera purge gas	OK
(✓) Argon pressure	OK
(✓) Nitrogen pressure	OK

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PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท อีสเทิร์นไทย คอนสตรัคชั่น 1992 จำกัด	Date: Dec 12, 2022
Instrument: ICP-OES	Model: Prodigy 7

6. Hardware Check with SALSA.EXE Diagnostics

Power Supply	Value	Status
-12 VDC (11 - 14.5 VDC)	-13.556	OK
+12 VDC (11 - 14.5 VDC)	+12.012	OK
+3.3VDC	3.266	OK
+5.0 VDC	4.945	OK
+13.5 VDC	13.489	OK

Plasma Generator	Value	Status
ICP Current 0.500A = 1kW	0.546	OK
ICP Ref 5.0Vdc = 1kW	5.464	OK
ICP Current 0.00 Vdc = 0kW	0	OK
ICP Ref 0.00Vdc = 0kW	0	OK
RF Water (Hz) OFF	0	OK
RF Water (Hz) ON	23	OK
Air Knife Pres. (0.00V) OFF	0	OK
Air Knife Pres. (3.0 - 7.0 V) ON	4.054	OK
Neb 25 @ setting of 25 PSI	25	OK
Cool 18 @ setting of 18 LPM	18	OK
Aux 0.6 @ setting of 6 LPM	0.6	OK
Pump Current (0.000 A) OFF	0	OK
Pump Voltage (0.000 V) OFF	0	OK
Pump Current (0.8 to 4.0A) ON	1.04	OK
Pump Voltage (8 to 13 V) ON	12.52	OK

Set Points	Value	Status
Air In Set Point 32°C	31	OK
Cam Tee Temperature -32°C	-32	OK
Op Purge Low 0.77 LPM	0.7	OK
Op Purge High 15.50 LPM	15.5	OK
Cam Wtr T 28°C	28	OK



COPY

PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท อีทีพี เทคโนโลยี จำกัด	Date: Dec 12, 2022
Instrument: ICP-OES	Model: Prodigy 7
	S/N: P70177

7. Mn Check for performance Test

	Condition for performance Test	Condition Test	Status
Standard	1 ppm, 5 ppm, 10 ppm	10 ppm	ok
Power plasma	1.20 kw	1.2	ok
Plasma gas	16.0 LPM	16	ok
Auxiliary Gas	0.8 LPM	0.8	ok
Nebulizer	1.2 LPM	25 psi	ok
Pump Speed	25 RPM	25	ok
Integration time	15 s Axial, 5 s Radial	10 s, 5 s	ok
Nebulizer Type	Seaspray, Conical, Meinhard	Seaspray	ok
Intensity first performance	1 ppm ≥ 4,000,000 5 ppm ≥ 15,000,000 10 ppm ≥ 50,000,000	265,000,000	ok

Engineer Sign	12 Dec 2022
 Somchai Chumyaung	 TELEDYNE LEE MAN LABS Everywhere you look

COPY

MERCURY ANALYZER

Model : RA-4500

Serial No. : 21780504



บริษัท โคแอก กรุ๊ป คอร์ปอเรชั่น จำกัด
COAX GROUP CORPORATION LTD.

COAX GROUP CORPORATION LTD.

DATE : March 24, 2023

Certificate of Calibration

MERCURY ANALYZER FOR WORKING ENVIRONMENT
THERMOMETER / RA-4500

Customer name : Eastern Thai Consulting 1992 Co.,Ltd.

Certificate No : SRP001-23
Customer P/O : PO.no.PL6602053
Sale Order No : -

Model # RA-4500
Serial No. # 21780504

Results : Quality Reborn Reference Standard Laboratory, NSC-TISI-TIS 17025 Calibration No.0292

Cal. Points	TIME	PRESET TEMP	Ave.	FACTOR ±0.5
3 Point	60 Minutes	95 (°C)	90.73	0.950 - 1.050

This instrument is calibrated at factor 0.955

TEST APPARATUS

Instrument Type	Serial Number	Certificate No.
PONPE 429TP	5845166	TM23-0008
PONPE 429TP	5845167	TM23-0009
PONPE 429TP	5845168	TM23-0010

Date of Calibrate : March 24, 2023
Next due date : March 24, 2024

Calibrate by :  (Siriraj Pinsiri)
Approve by :  (Pathom Srivises)

Service Engineer

Service Manager

Environments & Petroleum Division

Environments & Petroleum Division

Eastern Thai Consulting 1992 Co., Ltd.

Automatic Mercury Analyzer

Model RA-4500

Preventive Maintenance Report

Serial No. : 21780504

Soft version : Ver 2.0.7

ROM version : Ver 2.0.1

Date : February 09, 2023

Next due date : August 09, 2023

PM by :  (P. Siriraj)

Approved by :  (Pathom S.)



Coax Group Corporation Ltd.

1131/62,64,325-331 Nakornchaisri road,
Kwang ThanonNakornchaisri, Dusit, Bangkok 10300 Thailand
Tel. 02-2435263, 02-6682436 Fax. 02-2437386

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Inspection result

ITEM	STANDARD	RESULT	JUDGE
1. Self Check			
1.1 Leak check	0.14 - 2.0L/min	0.17L/min	PASS
1.2 Sig/Ref check	Signal 3.00 - 4.00V Sig:3.97V, Ref:3.89V		PASS
1.3 Drift check	0.0000236 - 0.0000061	0.0000175	PASS
2. Analytical curve inspection(AREA)			
2.1 Calibration curve 0-100ng (Hight)	Correlation coefficient (r) ≥ 0.9999	1.0000	PASS
3. Repeatability(AREA)			
3.1 Repeat STD 50ng, n=3		1. 50.60 ng 2. 50.94 ng 3. 50.71 ng	
	C.V. ≤ 5%	0.34%	PASS
4. Blank	Below 1.0(AREA)	0.0158	PASS

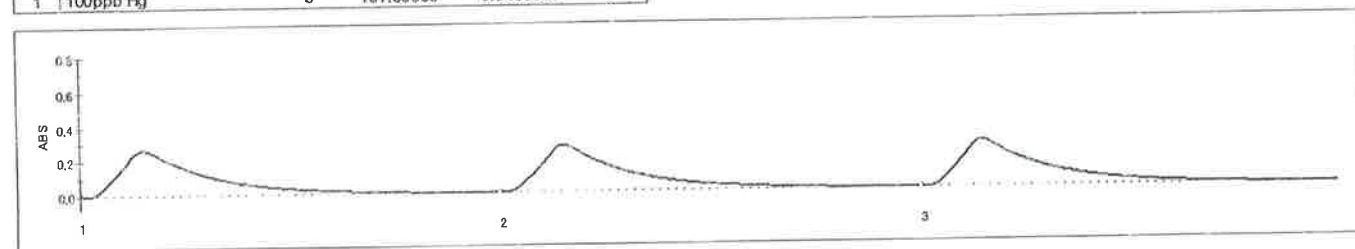
copy

SMP

No.	NAME	SVOL [mL]	CVOL [mL]	DVOL [mL]	AREA [ON]	MEAS [ng]	CONC [ug/L]	Color		Note
								[1]	[2]	
1	100ppb Hg	0.500	5.000	5.000	73.5373	50.6006	101.2012	-	-	
2	100ppb Hg	0.500	5.000	5.000	74.0347	50.9422	101.8844	-	-	
3	100ppb Hg	0.500	5.000	5.000	73.6938	50.7081	101.4162	-	-	

Statistics

No.	NAME	TRY	AV [ug/L]	SD [ug/L]	Cv [%]
1	100ppb Hg	3	101.50060	0.3493323	0.34



Self Check

Heat check: PASS!! (27.1degC[05:00] -> 31.2degC[03:03])
 Sensor check: PASS!! (3488- 133=3355)
 Leak check: PASS!! (0.17L/min)
 Sig/Ref check: PASS!! (Sig:3.97V, Ref:3.89V)
 Drift check: PASS!! (0.0000236 - 0.0000061 = 0.0000175)

COPY

-2-

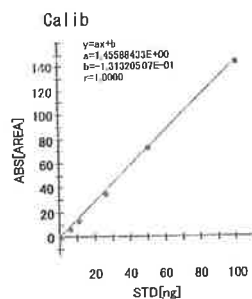
NIC NIPPON INSTRUMENTS CORPORATION

9/2/2566 16:11

Title : RA-4500 Preventive Maintenance no.2of2 in Warranty
 Date : 9/2/2566
 Name : Coax Group Corporation Ltd.
 Memo : Calibration curve, range 0-100ng

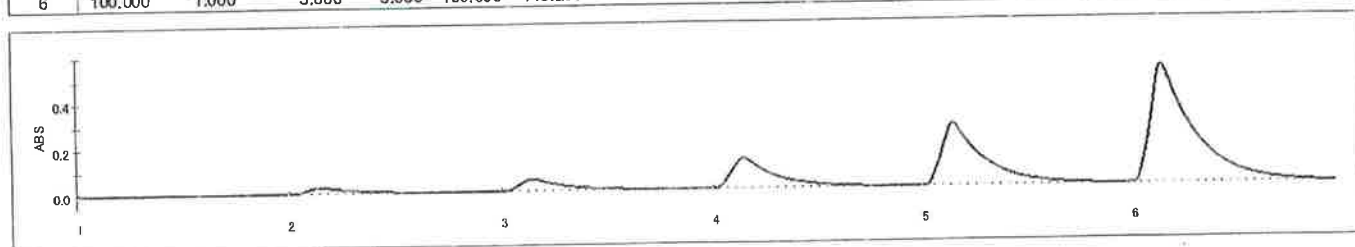
Method

Method1 (Pretreatment: without)
 (1+1)H2SO4 : 0.9mL
 10w/v% SnCl2 : 0.5mL
 Measurement Time (sec) : 120sec



STD

No.	STD [ppb]	SVOL [mL]	CVOL [mL]	DVOL [mL]	STD [ng]	AREA [ON]	MEAS [ng]	Dev [%]	Color		Note
									[1]	[2]	
1	100.000	0.000	5.000	5.000	0.000	0.0158	0.1011	-	-	-	
2	100.000	0.050	5.000	5.000	5.000	7.4089	5.1791	3.6	-	-	
3	100.000	0.100	5.000	5.000	10.000	14.1152	9.7855	2.1	-	-	
4	100.000	0.250	5.000	5.000	25.000	35.6872	24.6026	1.6	-	-	
5	100.000	0.500	5.000	5.000	50.000	73.3032	50.4398	0.9	-	-	
6	100.000	1.000	5.000	5.000	100.000	145.2998	99.8919	0.1	-	-	



COPY

STANDARD WEIGHT 50 g



Certificate No. : 22-052238
Sample Code : 22-19150-003

Page 1 of 3

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapiban 8 Rd., Nongkham,
Sriracha, Chonburi 20230

Location of Calibration : Asia Medical and Agricultural Laboratory and Research Center Public Company Limited
(Calibration Laboratory)

Equipment : Standard Weight 50 g

Manufacturer : METTLER TOLEDO

Class : F1

Serial No. : N/A

ID No. : LABE 10/1

Date of Receipt : 18 May 2022

Date of Calibration : 30 May 2022

Calibrated by : Mr. Somwang Sangdee
Scientist

Issue date : 31 May 2022

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

361 Soi Ladprao 122, Ladprao Road,
Phlabphla, Wang Thonglang, Bangkok 10310
FM-CL-007

TEL 02-516-2422

FAX 02-516-6949

Rev.05

CONTACT@AMARC.CO.TH

WWW.AMARC.CO.TH

Effective Date: 15/10/21



Certificate No. : 22-052238
Sample Code : 22-19150-003

REPORT OF CALIBRATION

Equipment : Standard Weight 50 g

Manufacturer : METTLER TOLEDO

Class : F1

Serial No. : N/A

ID No. : LABE 10/1

Result of Calibration :

☒ Without adjustment

☐ Adjustment

Conventional value of the result of weighing in air. For a weight taken at a reference temperature (t_{ref}) of 20°C, the conventional mass is the mass of a reference weight of a density (ρ_{ref}) of 8000 kg.m⁻³ which it balances in air of a reference density (ρ_0) of 1.2 kg.m⁻³

Description	Deviation	Conventional	Expanded	Maximum	ID No.
	(mg)	Mass	Uncertainty	Permissible Error	
			(mg)	± (mg)	
50 g	-0.324	49.999676 g	0.10	0.30	LABE 10/1

The result expanded uncertainty of measurement U is stated as the standard uncertainty multiplied by the coverage factor $k=2.0$, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003

[Signature]

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361 Soi Ladprao 122, Ladprao Road,

Phlabphla, Wang Thonglang, Bangkok 10310

FM-CL-084

TEL 02-516-2422

FAX 02-516-6949

Rev.03

CONTACT@AMARC.CO.TH

WWW.AMARC.CO.TH

Effective Date: 15/10/21

MSC-TS1-TS17025
CALIBRATION 0152

Page 3 of 3

Certificate No. : 22-052238

Sample Code : 22-19150-003

REPORT OF CALIBRATION

Condition of Calibration

1. Ambient Conditions : Temperature $20^{\circ}\text{C} \pm 1.5^{\circ}\text{C}$, Relative humidity $50\% \pm 10\%$ and air density 1.20 kg/m^3
2. Calibration Method : Direct comparison weighing according to OIML R111-1 : 2004(E)
3. Reference standard instrument

Instrument	Class	ID No.	Certificate No.	Due Date
1) Standard Weight 1 mg to 1 kg	E2	LB-WE-79	21-078366	22 September 2022

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

Asia Medical and Agricultural Laboratory and Research Center Public Company Limited

(Instrument number 1).

5. Condition of Calibration item: Normal

6. Description of Calibrated Item :

Type and Nominal Value :	Standard Weight 50 g
Shape :	Cylindrical weight with knob
Material :	Stainless steel
Case :	Wooden Box
Comments :	Recalibration

- End of Report -

COPY

STANDARD WEIGHT 100 g



Certificate No. : 22-052239
Sample Code : 22-19150-004

Page 1 of 3

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapiban 8 Rd., Nongkham,
Sriracha, Chonburi 20230

Location of Calibration : Asia Medical and Agricultural Laboratory and Research Center Public Company Limited
(Calibration Laboratory)

Equipment : Standard Weight 100 g

Manufacturer : N/A

Class : N/A

Serial No. : N/A

ID No. : LABE 10/2

Date of Receipt : 18 May 2022

Date of Calibration : 30 May 2022

Calibrated by : Mr. Somwang Sangdee
Scientist

Issue date : 31 May 2022

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

361 Soi Ladprao 122, Ladprao Road,
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FM-CL-017

TEL 02-516-2422
FAX 02-516-6949
Rev.05

CONTACT@AMARC.CO.TH
WWW.AMARC.CO.TH
Effective Date: 15/10/21



Certificate No. : 22-052239
Sample Code : 22-19150-004

REPORT OF CALIBRATION

Equipment : Standard Weight 100 g

Manufacturer : N/A

Class : N/A

Serial No. : N/A

ID No. : LABE 10/2

Result of Calibration : ☒ Without adjustment ☐ Adjustment

Conventional value of the result of weighing in air. For a weight taken at a reference temperature (t_{ref}) of 20°C, the conventional mass is the mass of a reference weight of a density (ρ_{ref}) of 8000 kg.m⁻³ which it balances in air of a reference density (ρ_a) of 1.2 kg.m⁻³

Description	Deviation	Conventional	Expanded	Maximum	ID No.
		Mass	Uncertainty	Permissible Error	
	(mg)		(mg)	\pm (mg)	
100 g	-0.171	99.999829 g	0.16	0.50	LABE 10/2

The result expanded uncertainty of measurement U is stated as the standard uncertainty multiplied by the coverage factor $k = 2.0$, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003

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TEL 02-516-2422
FAX 02-516-6949
Rev.03

361 Soi Ladprao 122, Ladprao Road,
Phlabphla, Wang Thonglang, Bangkok 10310
FM-CL-064

CONTACT@AMARC.CO.TH
WWW.AMARC.CO.TH
Effective Date: 15/10/21



Certificate No. : 22-052239

Sample Code : 22-19150-004

Page 3 of 3

REPORT OF CALIBRATION

Condition of Calibration

1. Ambient Conditions : Temperature 20 °C ± 1.5°C, Relative humidity 50% ± 10% and air density 1.18 kg/m³

2. Calibration Method : WI-CL-007 base on OIML R 111-1 : 2004(E)

3. Reference standard instrument

Instrument	Class	ID No.	Certificate No.	Due Date
1) Standard Weight 1 mg to 1 kg	E2	LB-WE-78	21-079366	22 September 2022

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

Asia Medical and Agricultural Laboratory and Research Center Public Company Limited

(Instrument number 1).

5. Condition of Calibration item: Normal

6. Description of Calibrated item :

Type and Nominal Value :	Standard Weight 100 g
Shape :	Cylindrical weight with knob
Material :	Stainless steel
Case :	Wooden Box
Comments :	Recalibration

- End of Report -

COPY

STANDARD WEIGHT 50 g



Certificate No. : 22-052237

Sample Code : 22-19150-002

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.

689 Moo 11, Sukhapiban 8 Rd., Nongkham,

Siracha, Chonburi 20230

Location of Calibration : Asia Medical and Agricultural Laboratory and Research Center Public Company Limited
(Calibration Laboratory)

Equipment : Standard Weight 50 g

Manufacturer : N/A

Class : N/A

Serial No. : N/A

ID No. : LABE 10/4

Date of Receipt : 18 May 2022

Date of Calibration : 30 May 2022

Calibrated by : Mr. Somwang Sangdee
Scientist

Issue date : 31 May 2022

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).



Certificate No. : 22-052237

Sample Code : 22-19150-002

REPORT OF CALIBRATION

Equipment : Standard Weight 50 g

Manufacturer : N/A

Class : N/A

Serial No. : N/A

ID No. : LABE 10/4

Result of Calibration :

☒ Without adjustment☐ Adjustment

Conventional value of the result of weighing in air. For a weight taken at a reference temperature (t_{ref}) of 20°C, the conventional mass is the mass of a reference weight of a density (ρ_{ref}) of 8000 kg.m⁻³ which it balances in air of a reference density (ρ_0) of 1.2 kg.m⁻³

Description	Deviation	Conventional		Expanded	Maximum		ID No.
		Mass			Uncertainty	Permissible Error	
				(mg)	± (mg)		
50 g	-0.111	49.999889	g	0.10	0.30		LABE 10/4

The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2.0$, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003

COPY



Certificate No. : 22-052237
Sample Code : 22-19150-002

REPORT OF CALIBRATION

Condition of Calibration

1. Ambient Conditions : Temperature $20^{\circ}\text{C} \pm 1.5^{\circ}\text{C}$, Relative humidity $50\% \pm 10\%$ and air density 1.18 kg/m^3
2. Calibration Method : WI-CL-007 base on OIML R 111-1 : 2004(E)

3. Reference standard instrument

Instrument	Class	ID No.	Certificate No.	Due Date
1) Standard Weight 1 mg to 1 kg	E2	LB-WE-79	21-079366	22 September 2022

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

Asia Medical and Agricultural Laboratory and Research Center Public Company Limited

(Instrument number 1).

5. Condition of Calibration item: Normal

6. Description of Calibrated Item :

Type and Nominal Value :	Standard Weight 50 g
Shape :	Cylindrical weight with knob
Material :	Stainless steel
Case :	Wooden Box
Comments :	Recalibration

End of Report -

COPY

THERMO-HYGROMETER

Model : 608-H1

Serial No. : 45106737



CERTIFICATE OF CALIBRATION

Page 1 of 2
Certificate No. : 23-055203
Sample Code : 23-21440-001Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapiarn 8 Rd., Nongkham,
Siiracha, Chonburi 20230Location of Calibration : Asia Medical and Agricultural Laboratory and Research Center Public Company Limited
(Calibration laboratory)Equipment : Digital thermo-hygrometer
Manufacturer : testo
Serial No. : 45106737
Model : 608-H1
ID No. : LABE 09/7
Date of Receipt : 25 May 2023
Date of Calibration : 29 May 2023

Condition of Calibration

1. Environment
- 1.1 Ambient temperature : 23.0 °C ± 3.0 °C
- 1.2 Relative humidity : 55.0 % ± 15.0 %

2. Calibration method

- 2.1 In-house method: WI-CL-045 By comparison with thermometer standard / chilled mirror hygrometer in controlled chamber.
- 2.2 The calibration by comparison unit under calibration (UUC) to the thermometer standard / chilled mirror hygrometer in a chamber at the controlled temperature / relative humidity.

3. Reference standard instrument

Instrument	Model	ID No.	Certificate No.	Due Date
3.1 Chilled Mirror	Optidew Vision	LB-OP-02 & LB-OP-02 (DP)	TH-0157-22	05 December 2023
3.2 Digital Thermometer	Optidew Vision	LB-OP-02 & LB-OP-02 (Temp.)	23-014916	12 February 2024
3.3 Digital Thermometer	34972A	LB-DA-07 with RTD-89	22-095535	06 September 2023

4. This certificate is traceable to the international system of unit (SI Unit).

- 4.1 Instrument No. 3.1 through National Institute of Metrology (Thailand).
- 4.2 Instrument No. 3.2 and 3.3 through Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.
5. This result of calibration was found accurate as shown on date and place of calibration only.

6. Condition of calibration item : Normal

Calibrated by : Miss Pornsuda Lohabai
Scientist

Approved by : (Mr. Somchai Neampunt)

Signed for Director

Issue date : 31 May 2023

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).



REPORT OF CALIBRATION

Page 2 of 2
Certificate No. : 23-055203
Sample Code : 23-21440-001

Results of Calibration

Temperature measurement

Resolution : 0.1 °C
Range : 0 °C to 50 °C

Calibration point °C	Average of standard reading		Unit under calibration		Expanded uncertainty °C
	Controlled humidity %RH	Temperature °C	Average reading °C	Correction value °C	
20	50	20.00	20.0	0.00	± 0.39
25	50	25.02	25.1	0.08	± 0.39
30	50	30.00	30.0	0.00	± 0.39

Humidity measurement

Resolution : 0.1 %RH
Range : 10 %RH to 95 %RH

Calibration point %RH	Average of standard reading		Unit under calibration		Expanded uncertainty %RH
	Air temperature °C	Calculated humidity %RH	Average reading %RH	Correction value %RH	
45	25.00	45.18	53.5	8.32	± 1.3
60	25.00	60.03	68.3	8.27	± 1.5
75	25.00	75.20	83.2	8.00	± 1.7

Notes

- * Calibration results without adjustment.

The result expanded uncertainty of measurement U is stated as the standard uncertainty multiplied by the coverage factor k , which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with GUM 1995.

- End of Report -

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UV/VIS SPECTROPHOTOMETER

Model : UV - 1800

Serial No. : A11635101643 CD



Bara Scientific Co., Ltd.
968 U Chu Liang Building Floor 7 Rama4 Road
Silom Bangkok Bangkok Thailand 10500
Tel : 02-6324300 Fax : 02-6375496-7
www.barascientific.com

Certificate of Calibration

2 of 3

Certificate No. BSCC-UV-152/23

Calibration Results:

1. Wavelength Accuracy

Certified Wavelength (nm)	UUC (nm)	Error (nm)	Uncertainty (±nm)
287.71	287.65	-0.06	0.18
445.82	445.80	-0.02	0.18
536.52	536.35	-0.17	0.18
741.02	740.99	-0.03	0.18
879.41	879.27	-0.14	0.18

2. Photometric Accuracy (UV)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (±A)
235	0.0000	0.0000	0.0000	0.0075
257	0.7311	0.7313	0.0002	0.0075
257	CNR	CNR	CNR	CNR
313	CNR	CNR	CNR	CNR
350	0.0000	0.0000	0.0000	0.0075
350	0.6306	0.6314	0.0008	0.0075

*CNR = Customer not request

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The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate. Advertising the report / Certificate and publicity of the results are prohibited and also shall not be reproduced except in full, without written approval of the Bara Scientific Co., Ltd.



Bara Scientific Co., Ltd.
968 U Chu Liang Building Floor 7 Rama4 Road
Silom Bangkok Bangkok Thailand 10500
Tel : 02-6324300 Fax : 02-6375496-7
www.barascientific.com

Certificate of Calibration

1 of 3

Number of Page(s)

BSCC-UV-152/23

UV/Vis Spectrophotometer

UV-1800

Shimadzu

A11635101643 CD

N/A

25 April 2023

25 April 2023

27 April 2023

Eastern Thai Consulting 1992 Co., Ltd

683 Moo 11, Sukkaphibarn 8 Rd., Nongkham, Sriracha, Chonburi 20230

(22.4-23.1) °C (On site)
(44.5-45.2) %RH (On site)

Good Operation

Analysis Department

In-house method WI-UV-702-01 based on ASTM E275-01

Wavelength Accuracy is traceable to certificate No. 94780 and 94775

Photometric Accuracy is traceable to certificate No. 94808 and 100147

Stray Light is traceable to certificate No. 94791

The above certificate are traceable to SI unit through Starna Scientific Ltd.

(UKAS accredited calibration laboratory NO. 0659)

Mr.Pannaphong Phannmekakul

Approved by

Signature

Mr.Kanchit Choothep
Technical Manager

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Bara Scientific
SILICON OF SUCCESS

Bara Scientific Co., Ltd.
968 U Chu Liang Building Floor 7 Rama4 Road
Silom Bangkok Bangkok Thailand 10500
Tel : 02-6324300 Fax : 02-6375496-7
www.barascientific.com



Certificate of Calibration

Certificate No. **BSCC-UV-152/23** Number of Page(s) **3 of 3**

Calibration Results:

3. Photometric Accuracy (Visible)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty ($\pm A$)
420.0	0.0000	0.0000	0.0000	0.0042
	0.5488	0.5508	0.0020	0.0042
	0.7527	0.7535	0.0008	0.0042
	1.0756	1.0758	0.0002	0.0042
440.0	0.0000	0.0000	0.0000	0.0042
	0.5391	0.5406	0.0015	0.0042
	0.7355	0.7360	0.0005	0.0042
	1.0509	1.0501	-0.0008	0.0042
465.0	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
546.1	0.0000	0.0000	0.0000	0.0042
	0.5045	0.5044	-0.0001	0.0042
	0.6884	0.6885	0.0001	0.0042
	0.9816	0.9808	-0.0008	0.0042
590.0	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
635.0	0.0000	0.0000	0.0000	0.0042
	0.5183	0.5178	-0.0005	0.0042
	0.6864	0.6868	0.0004	0.0042
	0.9747	0.9739	-0.0008	0.0042

*CNR = Customer not request

4. Stray Light*

Standard cut-off wavelength (nm)	Unit Under Calibration(UUC)	
	Wavelength (nm)	Absorbance (A)
200.75 \pm 0.1 nm	200.72	2.0164

The Stray light transmission reference is less than 1.0%T and Stray light absorbance reference is greater than 2.00A
*Stray Light not NSC-ONSC Accredited.

The measurement uncertainty is base on a standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95%
End of Certificate

The above results are valid exclusively for the calibrated item(s) as mention in this report / Certificate
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SOUND LEVEL CALIBRATOR

MODEL : NC-75

SERIAL No. : 34802645



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0021

MTC No. EEL. BP. 35/1065

CALIBRATION CERTIFICATE

Submitted by : Eastern Thai Consulting 1992 Co.,Ltd.
Address : 683 Moo 11 Sukaphitbail Rd., Nongkham, Sriracha, Chonburi 20230.
Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.
: Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Sound Calibrator
Manufacturer : Rion
Model : NC-75
Serial No. : 34802645

Ambient Environment

Temperature : (23 ± 3) °C
Relative Humidity : (50 ± 15) %
Ambient Pressure : (101.325 ± 1.500) kPa

Standards used :

1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
2. Measuring Amplifier Brüel&Kjaer 2636 S/N 1537484.
3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.
4. Digital Multimeter Agilent 34401A S/N MY44005560.
5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.
6. Audio Analyzer Panasonic VP-7722A S/N 041477D122.
7. Condenser Microphone B&K 4180 S/N 2633526.

Calibration Procedure: CP-102-04 based on IEC 60942-2003. The sound pressure level of instrument was measured by standard microphone using an insert voltage technique.

This instrument has been calibrated against standards maintained at Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

Date of Receipt : 10 Oct. 2022

Date of Calibration : 18 Oct. 2022

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0021

MTC No. EEL. BP. 35/1065

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95%.

Nominal Output of Unit Under Test = 94 dB re 20µPa at 1000 Hz

Acoustic Output in dB re 20µPa, Corrected to Reference Conditions : 101.325 kPa, 23.0°C and 50 %RH

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit
1/2 inch Brüel&Kjaer 4180	93.98	-0.02	± 0.10	±0.40 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit
1/2 inch Brüel&Kjaer 4180	1000.0	0.0	± 1.5	±1.0%

3. Total distortion

Standard Microphone Type	Measured Total distortion (%)	Uncertainty (%)	Tolerance limit
1/2 inch Brüel&Kjaer 4180	0.30	± 0.50	±3.0%

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :

Approved by :

(Mr. Weerachai Deechaiyae)



TISTR

Electrical and Electronic Standards Laboratory

Date of Calibration : 18 Oct. 2022

Industrial Metrology and Testing Service Centre

Date of Issue : 19 Oct. 2022

Ref : 2011265101004372001

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FM.BLMTC.002 Rev.

SOUND LEVEL METER

MODEL : NL-52A

SERIAL No. : 00230989



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

MTC No. EEL. BP. 152/0266

Request No. 21-66/0343

CALIBRATION CERTIFICATE

Submitted by : Eastern Thai Consulting 1992 Co., Ltd.
Address : 683 Moo 11, Sukhapibarn 8 Rd., Nongkham, Srracha, Chonburi, 20230
Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.
Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., A-Muang, Samutprakan 10280.

Instrument Calibrated :
Description : Sound Level Meter
Manufacturer : Rion
Model : NL-52A
Serial No. : 00230989
Microphone : UC-59 No.22337
Preamplifier : NH-25 No.22425

Standards used :

1. Band Pass Filter Stanford Research Systems SR 650 S/N 28712.
2. Condenser Microphone Brüel&Kjær 4180 S/N 2889871.
3. Decade Attenuator Ando AL-205 S/N 00464602.
4. Function/Arbitrary Waveform Generator Agilent 33220A S/N MY44042668.
5. Digital Function Synthesizer NF Electronic Instruments DF-193A S/N 122037.
6. Digital Multimeter Fluke 8520A S/N 4985007.
7. Pistomphone Rion NC-72 S/N 00402446.
8. Measuring Amplifier Brüel&Kjær 2636 S/N 1537484.

Date of Receipt : 27 Feb. 2023

Date of Calibration : 24 Mar. 2023

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0343

MTC No. EEL. BP. 152/0266

9. Power Amplifier Brüel&Kjær 2706 S/N 1517650.
10. Speaker Tannoy Limited, Great Britain British Patent No. 215300.
11. Digital Multimeter Agilent 34401A S/N MY44005560.
12. Programmable Attenuator Tamagawa TPA-303A S/N 2212.

Calibration Procedure :

This instrument was calibrated by using calibration procedures no CP-102-02 and CP-102-03, which were based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (2013). These calibration procedures were related to the electrical and acoustic signal tests. The electrical signal test was carried out with the direct measurement method. The acoustic signal test was performed in an anechoic room with the comparison measurement method.

This instrument has been calibrated against standards maintained at the Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95%.

Date of Calibration : 24 Mar. 2023

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1. Absolute Sensitivity

Reference Acoustic Signal (dB)	Measured value (dB)		Deviation value (dB)	Acceptance limit class 1 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	Before adjust	After adjust				
113.93	114.0	113.9	0.0	0.7	0.30	N/A

Note: The external calibration adjustment was firstly performed. The internal calibration adjustment

was then completed at the display of 113.9 dB.

2. Self-generated noise

2.1 Normal test

Measured value (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
16.2	0.10	N/A

2.2 The microphone of the sound level meter was replaced by electrical signal input device

Frequency Weighting	Measured value (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
A-Weight	10.0	0.10	N/A
C-Weight	14.5	0.10	N/A
Flat	19.7	0.10	N/A

Date of Calibration : 24 Mar. 2023

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3. Acoustical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response curve (dB)		Acceptance limit class 1 (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	A-weight	C-weight			
125	0.5	0.7	0.6	0.45	0.6
1 000	-0.4	-0.4	-0.4	0.45	0.6
8 000	0.3	0.3	0.2	0.45	0.7

4. Electrical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response curve (dB)		Acceptance limit class 1 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	A-weight	C-weight			
63	0.0	0.0	0.0	0.20	0.6
125	0.0	0.1	0.0	0.20	0.6
250	0.0	0.1	0.0	0.20	0.6
500	0.0	0.1	0.0	0.20	0.6
1 000	0.0	0.0	0.0	0.20	0.6
2 000	0.0	0.0	0.0	0.20	0.6
4 000	0.0	0.0	0.0	0.20	0.6
8 000	0.1	0.1	0.0	0.20	0.7
16 000	0.0	0.0	0.0	0.20	1.0

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5. Long-term stability

Time	Measured value (dB)	Deviated value (dB)	Acceptance limit class 1 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Begin	94.0	0.0	0.1	0.10	0.1
End	94.0				

6. Frequency and time weightings at 1 kHz

6.1 Frequency weightings at 1 kHz

Frequency	Measured value (dB)	Deviated value (dB)	Acceptance limit class 1 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Weighting	94.0	0.0	0.2	0.20	0.2
1/A-weight	94.0	0.0	0.2	0.20	0.2
C-weight	94.0	0.0	0.2	0.20	0.2
Flat					

6.2 Time weightings at 1 kHz

Frequency	Measured value (dB)	Deviated value (dB)	Acceptance limit class 1 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Weighting					
Fast	94.0	0.0	0.1	0.20	0.2
Slow	94.0	0.0	0.1	0.20	0.2
Leq	94.0	0.0	0.1	0.20	0.2

Date of Calibration : 24 Mar. 2023

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7. Level linearity on the reference level range

Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 1 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
137	137.0	0.0	0.8	0.30	0.3
136	136.0	0.0	0.8	0.30	0.3
135	135.0	0.0	0.8	0.30	0.3
134	134.0	0.0	0.8	0.30	0.3
133	133.0	0.0	0.8	0.30	0.3
132	132.0	0.0	0.8	0.30	0.3
131	131.0	0.0	0.8	0.30	0.3
130	130.0	0.0	0.8	0.30	0.3
129	129.0	0.0	0.8	0.30	0.3
124	124.0	0.0	0.8	0.30	0.3
119	119.0	0.0	0.8	0.30	0.3
114	114.0	0.0	0.8	0.30	0.3
109	109.0	0.0	0.8	0.30	0.3
104	104.0	0.0	0.8	0.30	0.3
99	99.0	0.0	0.8	0.30	0.3
94	94.0	0.0	0.8	0.30	0.3
89	89.0	0.0	0.8	0.30	0.3
84	84.0	0.0	0.8	0.30	0.3
79	79.0	0.0	0.8	0.30	0.3
74	74.0	0.0	0.8	0.30	0.3

Date of Calibration : 24 Mar. 2023

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7. Level linearity on the reference level range (cont.)

Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 1 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
69	69.0	0.0	0.8	0.30	0.3
64	63.9	-0.1	0.8	0.30	0.3
59	59.0	0.0	0.8	0.30	0.3
54	53.9	-0.1	0.8	0.30	0.3
49	49.0	0.0	0.8	0.30	0.3
44	44.1	0.1	0.8	0.30	0.3
39	39.5	0.5	0.8	0.30	0.3

8. Level linearity including the level range control

At reference sound level on the reference level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 1 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
30-130	94.0	94.0	0.0	0.8	0.30	0.3

Date of Calibration : 24 Mar. 2023

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8. Level linearity including the level range control

At reference level at 5 dB greater than the under-range on a level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 1 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
30-130	35	35.0	0.0	0.8	0.30	0.3

9. Tone burst response

Time	Toneburst Duration, Tb(ms)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 1 (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Fast	200	126.0	0.0	+0.5	0.20	0.3
	2	108.9	-0.1	+1.0; -1.5	0.20	0.3
	0.25	99.9	-0.1	+1.0; -3.0	0.20	0.3
Slow	200	119.5	-0.1	+0.5	0.20	0.3
	2	99.9	-0.1	+1.0; -3.0	0.20	0.3
	0.25	120.0	0.0	+0.5	0.20	0.3
SEL	2	100.0	0.0	+1.0; -1.5	0.20	0.3
	0.25	90.8	-0.2	+1.0; -3.0	0.20	0.3

Date of Calibration : 24 Mar. 2023

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Request No. 21-66/0343

10. Peak C sound level

Number of cycles in test signal	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class I (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Complete cycle	125.4	125.4	0.0	2.0	0.20	0.35
Positive half cycle	124.4	124.1	-0.3	1.0	0.20	0.35
Negative half cycle	124.4	124.1	-0.3	1.0	0.20	0.35

11. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limit class I (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Positive one-half cycle	Negative one-half cycle				
136.5	136.5	0.0	1.5	0.20	0.25

12. High-level stability

Time	Measured value (dB)	Deviated value (dB)	Acceptance limit class I (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Begin	129.0	0.0	0.1	0.10	0.1
End	129.0				

Calibrated by :

Wittawat Supanich

(Mr. Wittawat Supanich)

Approved by :

Prasert Kiatwong

(Mr. Prawate Kiatwong)

Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Date of Calibration : 24 Mar. 2023

Date of Issue : 24 Mar. 2023

Ref : 2014266022700825005

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Thailand
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217
Fax. (66) 0 2579 8592
E-mail : sumalee@tistr.or.th

SOUND LEVEL METER

MODEL : NL-52A

SERIAL No. : 01120945

SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY

451-451/1 Sirinthorn Rd, Bangbunru, Bangplud Bangkok 10700 THAILAND.
Tel.0-2435-8800 Fax.0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.com



NSC-TS17025
CALIBRATION 0394

Cert No. : ACL23096
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-52A / Microphone UC-59 / Preamplifier NH-25
Serial No.: 01120945 / 21951 / 22334
ID No.:

Condition As Found : GOOD
Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
SAHA GROUP INDUSTRIAL PARK, 683 MOO 11,
NONGKHAM, SIRACHA, CHONBURI 20230 THAILAND.

Location :
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 24 JANUARY 2023
Calibration Date : 26-30 JANUARY 2023
Date of Issue : 01 FEBRUARY 2023

Calibrated by : Nathakorn Pisutpaisan

Approved by :
(Thanakul Petchurai)

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

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CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL23096
Job No. : VC66AC0035
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0007-22	04-Feb-23
Waveform Generator	33511B	MY52302742	EF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL.BP. 04/0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL.BP. 03/0265	09-Feb-23
Digital Multimeter	34461A	MY60024273	EEL.BP. 05/0265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KAI	34560495	AA-3005-22	22-Feb-23

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.
3. This certificate is traceable to the international system of unit maintained at :

- 3.1 National Institute of Metrology (Thailand).
- 3.2 Thailand Institute of Scientific and Technological Research (TISTR).

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Continuation of Calibration Certificate

Cert. No. : ACL23096
Job No. : VC66AC0035
Pages : 3 of 8Cert. No. : ACL23096
Job No. : VC66AC0035
Pages : 4 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	✓	-	0.3	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long - term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.95)	94.0	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
13.8

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Measured value (dB)
A - weight	9.9
C - weight	14.9
Flat	20.5

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)		
	Flat	C-weight	A-weight
125	0.2	0.2	0.2
1000	0.1	0.1	0.1
8000	0.0	0.0	0.0
			Acceptance Limits
			±1.0
			±0.7
			+1.5, -2.5

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Continuation of Calibration Certificate

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±0.8
136.0	136.0	0.0	±0.8
135.0	135.0	0.0	±0.8
134.0	134.0	0.0	±0.8
133.0	133.0	0.0	±0.8
132.0	132.0	0.0	±0.8
131.0	131.0	0.0	±0.8
129.0	129.0	0.0	±0.8
124.0	124.0	0.0	±0.8
119.0	119.0	0.0	±0.8
114.0	114.0	0.0	±0.8
109.0	109.0	0.0	±0.8
104.0	104.0	0.0	±0.8
99.0	99.0	0.0	±0.8
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	54.0	0.0	±0.8
49.0	49.0	0.0	±0.8
44.0	44.0	0.0	±0.8
39.0	39.0	0.0	±0.8
34.0	34.0	0.0	±0.8
30.0	29.9	-0.1	±0.8
29.0	28.9	-0.1	±0.8
28.0	28.0	0.0	±0.8
27.0	26.9	-0.1	±0.8
26.0	25.9	-0.1	±0.8
25.0	24.8	-0.2	±0.8

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Continuation of Calibration Certificate

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)		
	Flat	C-weight	A-weight
63	-0.1	0.0	0.0
125	0.0	0.0	0.0
250	0.0	0.0	0.0
500	0.0	0.0	0.0
1000	0.0	0.0	0.0
2000	0.0	0.1	0.0
4000	0.0	0.0	0.0
8000	0.0	0.1	0.1
16000	0.0	-1.2	-1.2

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	0.0	-
C - weight	94.0	0.0	±0.2
Flat	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	0.0	-
Slow	94.0	0.0	±0.1
Leq	94.0	0.0	±0.1

6. Long - term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	±0.1

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Continuation of Calibration Certificate

Cert No. : ACL23096
Job No. : VC66AC0035
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±0.8

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.1	0.1	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	136.1	-0.3	±2.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
Positive half cycle	135.4	135.2	-0.2	±1.0
Negative half cycle	135.4	135.2	-0.2	±1.0

Continuation of Calibration Certificate

Cert No. : ACL23096
Job No. : VC66AC0035
Pages : 8 of 8

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle			
89.5	89.5	0.0	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	137.0	137.0	0.0	±0.1

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation, providing a level of confidence of approximately 95 %

End of Calibration Certificate

SOUND LEVEL METER

MODEL : NL-52A

SERIAL No. : 01120949



SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

451-451/1 Sindhorn Rd.,Banghumru, Bangplud Bangkok 10700 THAILAND.
Tel.0-2435-8800 Fax.0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.com

Cert. No. : ACL23100
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-52A / Microphone UC-59 / Preamplifier NH-25
Serial No.: 01120949 / 21973 / 22338
ID No.:

Condition As Found : GOOD
Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
SAHA GROUP INDUSTRIAL PARK, 683 MOO 11,
NONGKHAM, SIRACHA, CHONBURI 20230 THAILAND.

Location :
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 24 JANUARY 2023
Calibration Date : 26-30 JANUARY 2023
Date of Issue : 01 FEBRUARY 2023

Calibrated by : Nathakorn Pisutpaisan

Approved by :
(Thanakul Petchurai)

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

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Continuation of Calibration Certificate

Cert. No. : ACL23100
Job No. : VC66AC0035
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0007-22	04-Feb-23
Waveform Generator	33511B	MY52302742	EF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL.BP. 04/0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL.BP. 03/0265	09-Feb-23
Digital Multimeter	34461A	MY60024273	EEL.BP. 05/0265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KAI	34560495	AA-3005-22	22-Feb-23

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

- 3.1 National Institute of Metrology (Thailand).
- 3.2 Thailand Institute of Scientific and Technological Research (TISTR).

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Continuation of Calibration Certificate

Cert. No. : ACL23100
Job No. : VC66AC0035
Pages : 3 of 8

Continuation of Calibration Certificate

Cert. No. : ACL23100
Job No. : VC66AC0035
Pages : 4 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	✓	-	0.3	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long - term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.35
10. Peak C sound level	✓	-	0.2	0.25
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.95)	94.0	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.2

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Measured value (dB)
A - weight	10.8
C - weight	15.5
Flat	21.0

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)		
	Flat	C-weight	A-weight
125	0.2	0.2	0.2
1000	0.2	0.2	0.2
8000	-0.3	-0.2	-0.2
			Acceptance Limits
			± 1.0
			± 0.7
			+ 1.5, - 2.5

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Continuation of Calibration Certificate

Cert No. : ACL23100
Job No. : VC66AC0035
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)		
	Flat	C-weight	A-weight Acceptance Limits
63	0.0	0.0	±1.0
125	0.0	0.0	±1.0
250	0.0	0.0	±1.0
500	0.0	0.0	±1.0
1000	0.0	0.0	±1.0
2000	0.0	0.0	±1.0
4000	0.0	0.0	±1.0
8000	0.0	0.1	+1.5, -2.5
16000	0.0	-1.2	+2.5, -16.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	0.0	-
C - weight	94.0	0.0	±0.2
Flat	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	0.0	-
Slow	94.0	0.0	±0.1
Leq	94.0	0.0	±0.1

6. Long - term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	-

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±0.8
136.0	136.0	0.0	±0.8
135.0	135.0	0.0	±0.8
134.0	134.0	0.0	±0.8
133.0	133.0	0.0	±0.8
132.0	132.0	0.0	±0.8
131.0	131.0	0.0	±0.8
129.0	129.0	0.0	±0.8
124.0	124.0	0.0	±0.8
119.0	119.0	0.0	±0.8
114.0	114.0	0.0	±0.8
109.0	109.0	0.0	±0.8
104.0	104.0	0.0	±0.8
99.0	99.0	0.0	±0.8
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.1	0.1	±0.8
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	54.0	0.0	±0.8
49.0	49.0	0.0	±0.8
44.0	44.0	0.0	±0.8
39.0	39.0	0.0	±0.8
34.0	34.1	0.1	±0.8
30.0	30.0	0.0	±0.8
29.0	29.0	0.0	±0.8
28.0	28.0	0.0	±0.8
27.0	27.0	0.0	±0.8
26.0	26.0	0.0	±0.8
25.0	25.0	0.0	±0.8

Continuation of Calibration Certificate

Cert. No. : ACL23100
Job No. : VC66AC0035
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±0.8

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	135.9	-0.5	±2.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
Positive half cycle	135.4	135.2	-0.2	±1.0
Negative half cycle	135.4	135.2	-0.2	±1.0

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle	0.0	±1.5
89.6	89.6		

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	137.0	137.0	0.0	±0.1

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation, providing a level of confidence of approximately 95 %

End of Calibration Certificate

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SOUND LEVEL METER

MODEL : NL-52A

SERIAL No. : 00230985



TISTR

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0343

MTC No. EEL. BP. 148/0266

CALIBRATION CERTIFICATE

Submitted by : Eastern Thai Consulting 1992 Co., Ltd.

Address : 683 Moo 11, Sukhapiam 8 Rd., Nongkham, Sriracha, Chonburi, 20230

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., A.Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Sound Level Meter

Manufacturer : Rion

Model : NL-52A

Serial No. : 00230985

Microphone : UC-59 No.22118

Preamplifier : NH-25 No.22421

Standards used :

1. Band Pass Filter Stanford Research Systems SR 650 S/N 28712.
2. Condenser Microphone Brüel&Kjær 4180 S/N 2889871.
3. Decade Attenuator Ando AL-205 S/N 00464602.
4. Function/Arbitrary Waveform Generator Agilent 33220A S/N MY44042668.
5. Digital Function Synthesizer NF Electronic Instruments DF-193A S/N 122037.
6. Digital Multimeter Fluke 8520A S/N 4985007.
7. Pistonphone Rion NC-72 S/N 00402446.
8. Measuring Amplifier Brüel&Kjær 2636 S/N 1537484.

Date of Receipt : 27 Feb. 2023

Date of Calibration : 22 Mar. 2023

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.BL.MTC.002 Rev.4

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196 Phahonyothin Road, Chatuchak Bangkok 10900,
Thailand
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217
Fax. (66) 0 2579 8592
E-mail : sumalee@tistr.or.th



TISTR

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0343

MTC No. EEL. BP. 148/0266

9. Power Amplifier Brüel&Kjær 2706 S/N 1517650.

10. Speaker Tannoy Limited, Great Britain British Patent No. 215300.

11. Digital Multimeter Agilent 34401A S/N MY44005560.

12. Programmable Attenuator Tamagawa TPA-303A S/N 2212.

Calibration Procedure :

This instrument was calibrated by using calibration procedures no CP-102-02 and CP-102-03, which were based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (2013). These calibration procedures were related to the electrical and acoustic signal tests. The electrical signal test was carried out with the direct measurement method. The acoustic signal test was performed in an anechoic room with the comparison measurement method.

This instrument has been calibrated against standards maintained at the Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95%.

Date of Calibration : 22 Mar. 2023

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FM.BL.MTC.002 Rev.4

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1. Absolute Sensitivity

Reference Acoustic Signal (dB)	Measured value (dB)		Deviation	Acceptance limit class I (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	Before adjust	After adjust				
113.92	114.0	113.9	0.0	0.7	0.30	N/A

Note: The external calibration adjustment was firstly performed. The internal calibration adjustment was then completed at the display of 113.9 dB.

2. Self-generated noise

2.1 Normal test

Measured value (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
15.8	0.10	N/A

2.2 The microphone of the sound level meter was replaced by electrical signal input device

Frequency	Measured value (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Weighting			
A-Weight	10.5	0.10	N/A
C-Weight	14.5	0.10	N/A
Flat	20.0	0.10	N/A

Date of Calibration : 22 Mar. 2023

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3. Acoustical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response curve (dB)		Acceptance limit class I (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	A-weight	C-weight			
125	0.3	0.4	±1.0	0.45	0.6
1 000	-0.4	-0.4	+0.7	0.45	0.6
8 000	-0.8	-0.8	+1.5 ; -2.5	0.45	0.7

4. Electrical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response curve (dB)		Acceptance limit class I (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	A-weight	C-weight			
63	-0.1	0.0	±1.0	0.20	0.6
125	-0.1	0.0	±1.0	0.20	0.6
250	-0.1	0.0	±1.0	0.20	0.6
500	-0.1	0.0	±1.0	0.20	0.6
1 000	0.0	0.0	±0.7	0.20	0.6
2 000	0.0	0.0	±1.0	0.20	0.6
4 000	0.0	0.0	±1.0	0.20	0.6
8 000	0.0	0.1	+1.5 ; -2.5	0.20	0.7
16 000	0.0	0.0	+2.5 ; -16.0	0.20	1.0

Date of Calibration : 22 Mar. 2023

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5. Long-term stability

Time	Measured value (dB)	Deviated value (dB)	Acceptance limit class 1 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Begin	94.0	0.0	0.1	0.10	0.1
End	94.0				

6. Frequency and time weightings at 1 kHz

6.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limit class 1 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
A-weight	94.0	0.0	0.2	0.20	0.2
C-weight	94.0	0.0	0.2	0.20	0.2
Flat	94.0	0.0	0.2	0.20	0.2

6.2 Time weightings at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limit class 1 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Fast	94.0	0.0	0.1	0.20	0.2
Slow	94.0	0.0	0.1	0.20	0.2
Leq	94.0	0.0	0.1	0.20	0.2

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7. Level linearity on the reference level range

Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 1 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
138	138.1	0.1	0.8	0.30	0.3
137	137.1	0.1	0.8	0.30	0.3
136	136.0	0.0	0.8	0.30	0.3
135	135.0	0.0	0.8	0.30	0.3
134	134.0	0.0	0.8	0.30	0.3
133	133.0	0.0	0.8	0.30	0.3
132	132.0	0.0	0.8	0.30	0.3
131	131.0	0.0	0.8	0.30	0.3
130	130.0	0.0	0.8	0.30	0.3
129	129.0	0.0	0.8	0.30	0.3
124	124.0	0.0	0.8	0.30	0.3
119	119.0	0.0	0.8	0.30	0.3
114	114.0	0.0	0.8	0.30	0.3
109	109.0	0.0	0.8	0.30	0.3
104	104.0	0.0	0.8	0.30	0.3
99	99.0	0.0	0.8	0.30	0.3
94	94.0	0.0	0.8	0.30	0.3
89	89.0	0.0	0.8	0.30	0.3
84	84.0	0.0	0.8	0.30	0.3
79	79.1	0.1	0.8	0.30	0.3
74	74.0	0.0	0.8	0.30	0.3

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7. Level linearity on the reference level range (cont.)

Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 1 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
69	69.0	0.0	0.8	0.30	0.3
64	64.0	0.0	0.8	0.30	0.3
59	59.0	0.0	0.8	0.30	0.3
54	53.9	-0.1	0.8	0.30	0.3
49	49.0	0.0	0.8	0.30	0.3
44	43.9	-0.1	0.8	0.30	0.3
39	39.0	0.0	0.8	0.30	0.3
34	34.0	0.0	0.8	0.30	0.3
29	28.9	-0.1	0.8	0.30	0.3
28	28.0	0.0	0.8	0.30	0.3
27	26.9	-0.1	0.8	0.30	0.3
26	26.0	0.0	0.8	0.30	0.3
25	24.9	-0.1	0.8	0.30	0.3

8. Level linearity including the level range control

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 1 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
30-130	94.0	94.0	0.0	0.8	0.30	0.3

Date of Calibration : 22 Mar. 2023

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FMBLMTC.002 R

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8. Level linearity including the level range control

At reference level at 5 dB greater than the under-range on a level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 1 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
30-130	35	35.0	0.0	0.8	0.30	0.3

9. Tone burst response

Time Weighting	Toneburst Duration, Tb(ms)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 1 (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Fast	200	126.0	0.0	±0.5	0.20	0.3
	2	109.0	0.0	+1.0; -1.5	0.20	0.3
	0.25	99.9	-0.1	+1.0; -3.0	0.20	0.3
Slow	200	119.6	0.0	±0.5	0.20	0.3
	2	100.0	0.0	+1.0; -3.0	0.20	0.3
	200	120.0	0.0	±0.5	0.20	0.3
SEL	2	100.0	0.0	+1.0; -1.5	0.20	0.3
	0.25	90.9	-0.1	+1.0; -3.0	0.20	0.3

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Request No. 21-66/0343

10. Peak C sound level

Number of cycles in test signal	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class I (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Complete cycle	125.4	125.4	0.0	2.0	0.20	0.35
Positive half cycle	124.4	124.1	-0.3	1.0	0.20	0.35
Negative half cycle	124.4	124.1	-0.3	1.0	0.20	0.35

11. Overload indication

Measured value (dB)	Deviated		Acceptance limit class I (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	Positive	Negative			
136.5	one-half cycle	one-half cycle	1.5	0.20	0.25

2-74

12. High-level stability

Time	Measured value (dB)	Deviated value (dB)	Acceptance limit class I (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Begin	129.0	0.0	0.1	0.10	0.1
End	129.0				

Calibrated by :

Wittawat Supanich

(Mr. Wittawat Supanich)

Approved by :

(Mr. Prawan Kluaypa)

Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 22 Mar. 2023

Date of Issue : 23 Mar. 2023

Ref : 2011266022700825001

End of Certificate

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SOUND LEVEL METER

MODEL : NL-52A

SERIAL No. : 01120946

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY



451-451/1 Sirinthom Rd. Banghuru, Bangkok 10700 THAILAND.
Tel:0-2435-8800 Fax:0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.com

NSC-TS1-17025
CALIBRATION 0394

Cert. No. : ACL23097
Pages : 1 of 8

Calibration Certificate


Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-52A / Microphone UC-59 / Preamplifier NH-25
Serial No.: 01120946 / 21952 / 22335
ID No.:

Condition As Found : GOOD
Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
SAHA GROUP INDUSTRIAL PARK, 683 MOO 11,
NONGKHAM, SIRACHA, CHONBURI 20230 THAILAND.

Location :
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 24 JANUARY 2023
Calibration Date : 26-30 JANUARY 2023
Date of Issue : 01 FEBRUARY 2023

Calibrated by : Nathakorn Pisupaisan

Approved by : 
(Thanakul Petchurai)

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory

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Continuation of Calibration Certificate

Cert. No. : ACL23097
Job No. : VC66AC0035
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0007-22	04-Feb-23
Waveform Generator	33511B	MY52302742	EF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL.BP. 04/0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL.BP. 03/0265	09-Feb-23
Digital Multimeter	34461A	MY60024273	EEL.BP. 05/0265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KAI	34560495	AA-3005-22	22-Feb-23

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

- 3.1 National Institute of Metrology (Thailand).
- 3.2 Thailand Institute of Scientific and Technological Research (TISTR).

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Continuation of Calibration Certificate

Cert. No. : ACL23097
Job No. : VC66AC0035
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	✓	-	0.3	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long - term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

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7. Retoh.

Continuation of Calibration Certificate

Cert. No. : ACL23097
Job No. : VC66AC0035
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.95)	94.0	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.2

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Measured value (dB)
A - weight	10.8
C - weight	15.6
Flat	21.2

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)		
	Flat	C-weight	A-weight
125	0.1	0.1	0.1
1000	0.1	0.1	0.1
8000	-0.1	0.0	0.0
			Acceptance Limits
			± 1.0
			± 0.7
			+ 1.5, - 2.5

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Continuation of Calibration Certificate

Cert. No. : ACL23097
Job No. : VC66AC0035
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighing network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)		
	Flat	C-weight	A-weight
63	0.0	0.0	0.0
125	0.0	0.0	0.0
250	0.0	0.0	0.0
500	0.0	0.0	0.0
1000	0.0	0.0	0.0
2000	0.0	0.0	0.0
4000	0.0	0.0	0.0
8000	0.0	0.1	0.1
16000	0.0	-1.2	-1.2

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	0.0	-
C - weight	94.0	0.0	± 0.2
Flat	94.0	0.0	± 0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	0.0	-
Slow	94.0	0.0	± 0.1
Leq	94.0	0.0	± 0.1

6. Long - term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.1

Continuation of Calibration Certificate

Cert. No. : ACL23097
Job No. : VC66AC0035
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±0.8
136.0	136.0	0.0	±0.8
135.0	135.0	0.0	±0.8
134.0	134.0	0.0	±0.8
133.0	133.0	0.0	±0.8
132.0	132.0	0.0	±0.8
131.0	131.0	0.0	±0.8
129.0	129.0	0.0	±0.8
124.0	124.0	0.0	±0.8
119.0	119.0	0.0	±0.8
114.0	114.0	0.0	±0.8
109.0	109.0	0.0	±0.8
104.0	104.0	0.0	±0.8
99.0	99.0	0.0	±0.8
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.1	0.1	±0.8
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	54.0	0.0	±0.8
49.0	49.0	0.0	±0.8
44.0	44.0	0.0	±0.8
39.0	39.0	0.0	±0.8
34.0	34.0	0.0	±0.8
30.0	30.1	0.1	±0.8
29.0	29.0	0.0	±0.8
28.0	28.0	0.0	±0.8
27.0	27.0	0.0	±0.8
26.0	26.1	0.1	±0.8
25.0	25.0	0.0	±0.8

Continuation of Calibration Certificate

Cert No. : ACL23097
Job No. : VC66AC0035
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±0.8

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	136.1	-0.3	±2.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
Positive half cycle	135.4	135.2	-0.2	±1.0
Negative half cycle	135.4	135.2	-0.2	±1.0

Continuation of Calibration Certificate

Cert No. : ACL23097
Job No. : VC66AC0035
Pages : 8 of 8

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle	-0.2	±1.5
89.8	89.6		

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	137.0	137.0	0.0	±0.1

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation, providing a level of confidence of approximately 95 %

End of Calibration Certificate

COPY

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7. Retin

7. Retin

ANALYTICAL BALANCE (DU)

Model. : XS205DU

Serial No. : 1126323724



Certificate No. : 23-006683

Sample Code : 23-02820-006

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapiban 8 Rd., Nongkhram,
Sriracha, Chonburi 20230

Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.
(Analytical Balance Room)

Equipment : ELECTRONIC BALANCE

Manufacturer : METTLER TOLEDO

Model : XS205DU

Serial No. : 1126323724

ID No. : LABE 05/1

Date of Receipt : 20 January 2023

Date of Calibration : 20 January 2023

Calibrated by Mr. Thanadol Pholthep
Scientist

Issue date : 25 January 2023

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC)



Certificate No. : 23-006683

Sample Code : 23-02820-006

REPORT OF CALIBRATION

Equipment : ELECTRONIC BALANCE
Manufacturer : METTLER TOLEDO
Model : XS205DU
Capacity : Max 81 g / 220 g
Resolution : 0.01 mg / 0.1 mg
Serial No. : 1126323724
ID No. : LABE 05/1

Result of Calibration

1. Test weight and repeatability of reading

Repeatability is a measure of the ability of a balance to supply the same result in repetitive weighings with one and the same load under the same measurement condition. The measurement of the repeatability must include both the balance specifications and the ambient (vibration, fluctuating air current/temperature/humidity, etc.) Operator handling of the balance is also included in the standard deviation.

Unit : g	Range : 80	<input type="checkbox"/> Before adjustment	<input type="checkbox"/> After adjustment
<input checked="" type="checkbox"/> No adjustment	Nominal value	40	90
<input type="checkbox"/> Adjustment	Standard weight	40.000042	60.000045
	Average reading of indicator	40.00015	90.00019
	Standard deviation	0.000004	0.000007
Unit : g	Range : 200	<input type="checkbox"/> Before adjustment	<input type="checkbox"/> After adjustment
<input checked="" type="checkbox"/> No adjustment	Nominal value	100	200
<input type="checkbox"/> Adjustment	Standard weight	100.000022	200.000199
	Average reading of indicator	100.0001	200.0004
	Standard deviation	0.00004	0.00008

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Certificate No. : 23-006683

Sample Code : 23-02820-006

Page 3 of 4

REPORT OF CALIBRATION

Result of Calibration

2. Sensitivity or value of a scale division

Change in the output variable of a measuring instrument divided by the associated change in the input variable.

Unit : g

Range :		Range :	
Test Point	Sensitivity, S	Test Point	Sensitivity, S
0	0.99800	0	0.9980
40	0.99800	100	0.9980
80	0.99800	200	0.9980

3. Departure of indication from nominal value, Linearity

Unit : g

Nominal Value	Standard Value	Average Reading of Indicator	Correction Value	Expanded Uncertainty	Coverage Factor (k)
Unload	0.000000	0.00000	0.00000	0.0000090	2.01
0.01	0.0100036	0.01000	0.00000	0.0000093	2.01
0.1	0.1000062	0.10000	0.00001	0.000012	2.00
1	1.0000036	1.00001	-0.00001	0.000014	2.00
5	5.0000044	5.00003	-0.00003	0.000020	2.00
10	10.000000	10.00007	-0.00007	0.000032	2.00
20	20.000016	20.00011	-0.00009	0.000036	2.00
50	50.000029	50.00013	-0.00010	0.000067	2.00
100	100.000022	100.0001	-0.0001	0.00016	2.00
150	150.000051	150.0001	0.0000	0.00023	2.00
200	200.000199	200.0003	-0.0001	0.00028	2.00

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%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003.

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Certificate No. : 23-006683

Sample Code : 23-02820-006

Page 4 of 4

REPORT OF CALIBRATION

Result of Calibration :

4. Eccentric or off-centre loading

Deviation of the measurement value through off - center (eccentric) loading. The corner load increases with the weight of the load and its removal from the center of the pan support.

Weighting pan ☐ Circle ☐ Triangular ☒ Rectangular

Test weight : 50 and 100
Unit : g

Range	Position	Reading of indicator	Reading of indicator
1	50.00014	100.0001	100.0001
2	50.00014	99.9998	99.9998
3	50.00006	100.0000	100.0000
4	50.00010	100.0001	100.0001
5	50.00017	100.0001	100.0001
6	50.00014	100.0001	100.0001
Maximum difference	0.00008	0.0003	0.0003

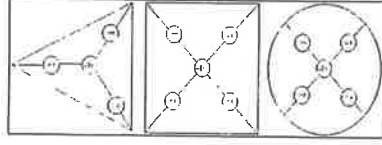
Condition of Calibration

1. Calibration Method : WI-CL-004 base on UKAS LAB 14: 2019
2. This result of calibration was found accurate as shown on date and place of calibration only.
3. Condition of Calibration item: Normal
4. This certification is traceable to the International System of Unit maintained at :-
Through the reference standard laboratory of Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (Instrument number 1).

5. Reference standard instrument :

Instrument
1) STANDARD WEIGHT 1 mg to 1 kgClass ID No.
E2 LB-WE-57Certificate No.
22-060639Due Date
27 June 2023

fmm



6. Ambient conditions	Min	Max
Temperature (°C)	21.3	22.4
Relative Humidity (%Rh)	39.2	40.4
Air pressure (hPa)	1008.4	1010.1

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End of Report -

ANALYTICAL BALANCE

Model. : SECURA224-1S

Serial No. : 0036707137

Certificate No. : 23-006682
Sample Code : 23-02820-005

REPORT OF CALIBRATION

Equipment : ELECTRONIC BALANCE
Manufacturer : SARTORIUS
Model : SECURA224-IS
Capacity : Max 220 g
Resolution : 0.0001 g
Serial No. : 0036707137
ID No. : LABE 05/2

Result of Calibration

1. Test weight and repeatability of reading

Repeatability is a measure of the ability of a balance to supply the same result in repetitive weighings with one and the same load under the same measurement condition. The measurement of the repeatability must include both the balance specifications and the ambient (vibration, fluctuating air current/temperature/humidity, etc.) Operator handling of the balance is also included in the standard deviation.

Unit : g	Range : 220	<input type="checkbox"/> Before adjustment	<input type="checkbox"/> After adjustment
<input checked="" type="checkbox"/> No adjustment	Nominal value	100	200
<input type="checkbox"/> Adjustment	Standard weight	100.000022	200.000199
	Average reading of indicator	99.9998	199.9999
	Standard deviation	0.00007	0.00007

Unit : -	Range : -	<input type="checkbox"/> Before adjustment	<input type="checkbox"/> After adjustment
<input type="checkbox"/> No adjustment	Nominal value	*	*
<input type="checkbox"/> Adjustment	Standard weight	*	*
	Average reading of indicator	*	*
	Standard deviation	*	*

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Certificate No. : 23-006682
Sample Code : 23-02820-005

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapiban 8 Rd., Nongkham,
Siriracha, Chonburi 20230

Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.
(Analytical Balance Room)

Equipment : ELECTRONIC BALANCE

Manufacturer : SARTORIUS

Model : SECURA224-IS

Serial No. : 0036707137

ID No. : LABE 05/2

Date of Receipt : 20 January 2023

Date of Calibration : 20 January 2023

Calibrated by : Mr. Thanadot Pholthep
Scientist

Issue date : 25 January 2023

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).



Certificate No. : 23-006682

Sample Code : 23-02820-005

REPORT OF CALIBRATION

Result of Calibration

2. Sensitivity or value of a scale division

Change in the output variable of a measuring instrument divided by the associated change in the input variable.

Unit : g

Test Point	Range	Sensitivity, S	Test Point	Range	Sensitivity, S
0	220	0.9980			
100		0.9980			
200		0.9980			

3. Departure of indication from nominal value, Linearity

Unit : g

Nominal Value	Standard Value	Average Reading of Indicator	Correction Value	Expanded Uncertainty	Coverage Factor (k)
Unload	0.0000000	0.0000	0.0000	0.00011	2.04
0.01	0.0100036	0.0100	0.0000	0.00011	2.04
0.1	0.1000062	0.1000	0.0000	0.00011	2.04
1	1.0000036	1.0000	0.0000	0.00011	2.04
2	2.0000128	2.0000	0.0000	0.00011	2.04
5	5.0000044	5.0000	0.0000	0.00011	2.04
10	10.0000000	10.0000	0.0000	0.00011	2.03
20	20.0000016	20.0000	0.0000	0.00012	2.03
50	50.0000029	50.0000	0.0000	0.00013	2.02
100	100.0000022	99.9998	0.0002	0.00017	2.01
200	200.0000199	200.0000	0.0002	0.00028	2.00

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%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003.

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27 June 2023



Certificate No. : 23-006682

Sample Code : 23-02820-005

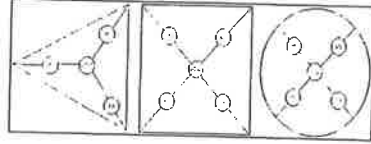
REPORT OF CALIBRATION

Result of Calibration :

4. Eccentric or off-centre loading

Deviation of the measurement value through off - center (eccentric) loading. The corner load increases with the weight of the load and its removal from the center of the pan support.

Weighting pan	Test weight : 100
<input checked="" type="radio"/> Circle	Unit : g
<input type="radio"/> Triangular	
<input type="radio"/> Rectangular	
Range	Reading of indicator
220	
Position	Reading of indicator
1	99.9998
2	100.0001
3	99.9997
4	99.9998
5	99.9998
6	99.9998
Maximum difference	0.0003
Condition of Calibration	



1. Calibration Method : WI-CL-004 base on UKAS LAB 14: 2019

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

3. Condition of Calibration item: Normal

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

- Through the reference standard laboratory of Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (Instrument number 1).

5. Reference standard instrument :

Instrument

1) STANDARD WEIGHT 1 mg to 1 kg

Class

E2

Certificate No.

22-060639

Due Date

27 June 2023

Ambient conditions	Min	Max
Temperature (°C)	21.2	22.5
Relative Humidity (%Rh)	37.1	44.3
Air pressure (hPa)	102.1	1013.0

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- End of Report -

ATOMIC ABSORPTION SPECTROPHOTOMETER

Model : PinAAcle 900F

Serial No. : PFBS22080801



PerkinElmer
For the Better

PER-INSTALLATION CHECKS:

- ☒ Verify that proper ventilation is installed and an adequate exhaust rate is accordance to PYL CFM N/A
- ☒ Verify that the gasses meet out PYL specifications---
- ☒ Verify that gas pressure regulators are installed with proper filters and pressure are set in accordance to PYL.
- ☒ Verify that the wiring in the lab meets our power and noise requirements specified in PYL.
- ☒ Verify that the lab environment conditions (room temperature, relative humidity) meet in our PYL specification
- ☒ Maintenance accessibility is adequate.
- ☒ Measured Mains Input Voltage under load is adequate per our PYL specifications (≥ 208 VAC)

PHYSICAL INSTALLATION:

- ☒ The instrument, cooling system, computer and any accessories are uncrated and installed on suitable bench
- ☒ Install all the electrical connections.
- ☒ Connect the gas hoses and tank regulators, set required pressures, and leak test as required.
- ☒ Install the burner System components. (PinAAcle Series 900T & 900F)
- ☒ Mount and connect the auto sample.
- ☒ Fill and connect the cooling system or connect external cooling according to specifications.
- ☒ Setup the computer and printer. Interconnect all cables between the computer, printer, and instrument.
- ☒ Setup and configure the computer to the instrument and install the software according to the installation chapter in the PinAAcle Service Manual.
- ☒ Record the furnace head voltage and manual temperature of 1200 Degrees Celsius.

INSTALLATION TESTING:

- ☒ Perform the following instrument performance tests according to the Installation and Test procedure.
Complete the Instrument Performance Test Data Sheet below.
 - PinAAcle900T, 900H & 900F
Flame Copper Sensitivity and Precision
 - PinAAcle900T & 900Z
Furnace Copper Characteristic Mass and Zeeman Ratio
 - PinAAcle900H
Furnace Chromium Characteristic Mass and Precision
- ☒ Make and electronic copy of the Instrument parameters file per SDB 900PIN_021 procedure on the customer computer

COPY



PerkinElmer
For the Better

PinAAcle 900 Series 900T, 900H, 900Z & 900F

Installation Checklist

Customer : EASTERN THAI CONSULTING
NONGKHAM, SIRACHA
CHONBURI 20230
Date Tested: 28-Nov-2022

CRM # _____ CSE: Pattayut Wanwongka

UPON SITE ARRIVAL:

- ☒ Verify that the instrument was not damaged during shipment
- ☒ Unpack the PC and all other accessories. Record the following:

PinAAcle Instrument Model:	PinAAcle 900F	S/N	PFBS22080801
Auto Sample Model:	N/A	S/N	-
Computer Model:	DELL	S/N	37024013667
Cooling System Model:	N/A	S/N	-
Printer Model:	N/A	S/N	-
Misc.	FIAS 100	S/N	100S22081101

- ☒ Record the software and firmware revision below:
 - Syngistix Software for AA Version: 5.0.1.2029
 - PinAAcle Spectrometer Firmware Version: 1.5.0.0126
 - PinAAcle Furnace Firmware Version: N/A
- ☒ Check the model specific Shipping Kit packed separately for completeness.
Verify the shipping Kit with each instrument order includes all items listed.

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CUSTOMER ORIENTATION:

- ☒ Refer to the Customer Orientation Script for details
- ☒ Explain the warranty and customer replaceable parts policy
- ☒ Inform the customer of relevant PerkinElmer training courses, websites, and phone number

PinAAcle 900 Series 900T, 900H, 900Z & 900F

Installation Performance Test Data Sheet

Flame Sensitivity and Precision
(PinAAcle Series 900T, 900H & 900F)

With Stainless Steel Nebulizer

Sensitivity	Mean Absorbance ≥ 0.250	N/A
Precision	%RSD ≤ 0.30 %	N/A

With High Sensitivity Nebulizer

Sensitivity	Mean Absorbance ≥ 0.250 Abs.	0.3759	Abs.
Precision	%RSD ≤ 0.40 %	0.25	%

THGA Furnace Copper Characteristic Mass and Zeeman Ratio
(PinAAcle 900T & 900Z)

Copper Characteristic Mass

Characteristic Mass	14 ± 2.5 pg	N/A	pg
Zeeman Ratio	0.52 ± 0.04	N/A	
Precision	%RSD $\leq 2.0\%$	N/A	%
A.C Voltage measurement under load (Atomization)	≥ 208 VAC	231	VAC

HGA Furnace Chromium Characteristic Mass and Precision
(PinAAcle 900H)

Chromium Characteristic Mass

Characteristic Mass	3 ± 0.8 pg	N/A
Precision	$\leq 2.0\%$	N/A
A.C Voltage measurement under load (Atomization)	≥ 207 VAC	N/A

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9. Mn Resolution Peak to Valley Ratio

HCL Sample Intensity (Valley) / HCL Sample Intensity (Peak) < 0.40 (40%) N/A
HCL Reference Intensity (Valley) / HCL Reference Intensity (Peak) < 0.40 (40%) N/A
Furnace Mode (900Z)
HCL Sample Intensity (Valley) / HCL Sample Intensity (Peak) < 0.40 (40%) N/A

10. Furnace and Baffles Alignment Check w/ Cu (900T/Z/H)

PK Area - AA < 0.005 A-s N/A
PK Area - BG < 0.005 A-s N/A

11. Furnace auto sample check valve test (900T/Z/H)

Places sample probe onto rinse alignment and for 2 minutes and watch for backwards flow of rinse solution
Does rinse solution go backward? Y/N N/A

Optional Test Check

[Flame only Verification - 900T/H/F]

12. Gas box calibration check default flow settings

Fuel flow N/A 20-22
Oxidant flow N/A around 43
Nebulizer Pressure N/A 29-29.5

[Furnace only Verification] *Note test 13&14 should be done simultaneously

13. Voltage drop*

2300C Atomization test N/A spec < 16 volts

14. Cr heating rate* : By design the ASCOM PS will output the right DC voltage regardless of the incoming voltage, so that is not the purpose of this test. We are using this to check the conductivity of the furnace head and the function of the pyrometer.

10ppb Cr standard @ 2300C Peak Height/Peak Area N/A > 1.3

COPY



PinaAcle 900 Added Installation Test Checklist:

Model: PinaAcle 900T Serial Number: PFBSZ2080801
Software Version: 5.0.1.2029 Spectrometer FW Version: 1.5.0.0126
Furnace FW Version: N/A
Instrument Control PCB revision: 3

NOTE: First 12 test checks are mandatory

1. 0.2, 0.7 & 2.0 Silitis and 8 Lamp turret position calibration.

Check ☒

2. Cu energy & Capacitance:

Cu 324.75nm Line:Energy can vary by model and configuration, but Capacitance should be > 7pF.

Capacitance= 7.0 pF

3. Wavelength Calibration Passed (As, Cu, Ba, K < 6 steps)

Yes ☒
No ☐

4. Wavelength Accuracy Check

AS 193.70 nm +/- 0.12 nm (193.58-193.82) 193.7 nm
Cu 324.75 nm +/- 0.12 nm (324.63-324.87) 324.7 nm
Ba 553.55 nm +/- 0.12 nm (553.43-553.67) 553.5 nm
K 766.49 nm +/- 0.12 nm (766.37-766.61) 766.5 nm

5. HCL Sample to HCL Reference Ratio with Cu #

30:70 N/A HCL = 0.43, spec 0.18-0.58, target 0.34-0.52
30:70 N/A D2 spec = 1.0-4.3
50:50 0.85 HCL = 1.0, spec 0.42-1.35, target 0.90-1.15
50:50 0.97 D2 spec = 0.43-1.84

6. Monochromator Bleed cover with Cu: Must be done with drak current checked (on) #

Sample beam blocked value 19 spec <60 counts, ideally <20
Reference beam blocked value (900TH) N/A spec <60 counts, ideally <20

7. Cu Flame Double-Beam Check #

Mean_15 mA - Mean_10 mA =< 0.004C 0.0024

8. Low UV Energy & Capacitance check: check on on all

Cu 216.5 nm 1.0 >= 1 pF Energy = 85 below 50 may be a problem
*Pb 217.0 nm N/A >= 1 pF Energy = N/A below 50 may be a problem
*Zn 213.0 nm N/A >= 1 pF Energy = N/A below 50 may be a problem

* Option tests

N/A for PinaAcle 900Z. Flame double-beam ode test

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Comments:

PerkinElmer Service Engineer Signature:  Date: 28-11-22
Patrayut Wanwongka

COPY

AUTOCLAVE

Model : FLS-1000

Serial No. : 55169083



CERTIFICATE OF CALIBRATION

Page 1 of 2

Certificate No. : 22-102070

Sample Code : 22-37024-003

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.

683 Moo 11, Sukhapiban 8 Rd., Nongkham,

Siracha, Chonburi 20230

Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.

(Autoclave Room)

Equipment : Autoclave

Manufacturer : TOMY

Model : FLS-1000

Serial No. : 55169083

ID No. : LABE 43/2

Date of Receipt : 19 September 2022

Date of Calibration : 19 September 2022

Condition of Calibration

1. Environment
- 1.1 Ambient temperature : Maximum 30.3 °C ; Minimum 28.8 °C
- 1.2 Relative humidity : Maximum 56.1 % ; Minimum 45.1 %
- 1.3 Line voltage supplied : Maximum 227.3 VAC ; Minimum 219.2 VAC

2. Calibration method

The calibration use in-house method; WI-CL-025 based on BS 2646 part 5: 1993 item 3.1.

3. Reference standard instrument

Instrument	Model	ID No.	Certificate No.	Due Date
3.1 Temperature Data Logger	HiTemp 140	LB-TEM-17	22-089923	31 August 2023
3.2 Temperature Data Logger	HiTemp 140	LB-TEM-16	22-023565	08 March 2023
3.3 Temperature Data Logger	TEMP 1000S	LB-TEM-14	22-089922	31 August 2023

4. This certificate is traceable to the international system of unit (SI Unit).

The measurement is traceable to Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.

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

6. Condition of calibration item : Normal

Calibrated by

Mr. Sarawoot Thammo

Approved by

(Mr. Somchai Neampunt)

Scientist

Issue date

22 September 2022

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

361 Soi Ladprao 122, Ladprao Road,

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FM-CI-114

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REPORT OF CALIBRATION

Page 2 of 2

Certificate No. : 22-102070

Sample Code : 22-37024-01

Results of Calibration

Resolution : 1 °C

1. Reporting of Temperature

Calibration point (°C)	UUC* setting (°C)	UUC* reading		Measured Temperature at each positions (°C)			Uncertainty ± (°C)	Coverage factor <i>k</i>
		Temperature (°C)	Pressure (MPa)					
				# 1	# 2 <i>Ref</i>	# 3		
121	121	121	0.11	121.81	121.80	121.83	0.64	2.00

2. Characterization results

Calibration Point (°C)	Stability ± (°C)	Uniformity (°C)	Overall Variation (°C)
121	0.08	0.12	0.17

Notes

- UUC* = Unit Under Calibration
- The quoted uncertainty includes* Stability of chamber and loading effect in chamber at 20% of uniformity*.
- 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.
- Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.
- Overall variation - the difference of the maximum and the minimum measured temperatures throughout observation time.
- UUC* reading - the average reading of indicating device that forms the integral part of the autoclave.
- Calibration results without adjustment.

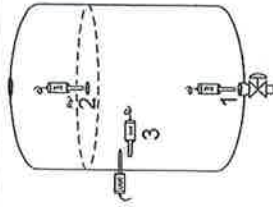


Figure: Example of sensor installation Positions

- Standard 1 = In the chamber drain, within 100 mm.
- Standard 2 = In the upper half of the chamber.
- Standard 3 = Attached to the load temperature probe, within 20 mm.

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%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003.

- End of Report -

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Phlabphla, Wang Thonglang, Bangkok 10310

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BAROMETER

Equipment : Analog Barometer

ID No. / Tag No. : BM001/41



MIRACLE INTERNATIONAL TECHNOLOGY CO., LTD.
214 Bangwaek Rd. Bangnai Bangkok 10160
Tel.: 0-2865-4647-8 Fax: 0-2865-4649 <http://www.mit.in.th>



CALIBRATION CERTIFICATE

Certificate No. : L202305085-002
Date Issued : 16-May-23

Customer : Eastern Thai Consulting 1992 Co., Ltd.
683 Moo 11 Sukhapibarn 8 Rd., Nongkham, Sriracha, Chonburi 20230

Equipment : Analog Barometer

Manufacturer : Barigo
Model : -
Serial No. : -
ID No./Tag No. : BM001/41
Date Received : 11-May-23
Date Calibrated : 15-May-23
Calibrated by : Mr. Jame Khaothong

Calibration Method or Calibration Procedure Used

In-house method : CP-21 base on DKD-R 6-1: Edition 3 2014.

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

Result of Calibration

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

This certificate may not be reproduced other than in full except with the prior written approval of the Miracle International Technology Company Limited.



Approved by: *Sarayuth T.*
(Mr. Sarayuth Tochua)

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Certificate No : L202305085-002
Environment : Ambient Temperature : $(25 \pm 2)^{\circ}\text{C}$
Relative Humidity : $(50 \pm 15)\%\text{RH}$

STD Reading mbar	UUC Reading (mbar) Before Adjusted	UUC Reading (mbar) After Adjusted	UUC Error mbar	Uncertainty \pm mbar
990.00	990.0	-	0.00	0.61
1000.00	1000.0	-	0.00	0.61
1010.00	1010.0	-	0.00	0.61
1020.00	1020.0	-	0.00	0.61
1030.00	1030.0	-	0.00	0.61

STD = Standard

UUC = Unit Under Calibration

Calibrated condition :

Pressure Medium : Air : Density = 1.19 kg/m^3 @ 20°C , 1 bar
Mounting Position : Vertical
Reference Level : at center of its dial
Conversion Factor : Multiply by $1.0 \text{ E}+02$ - Pa unit

Description of UUC :

Range : 990 - 1030 mbar Absolute
Calibration Range : 990 - 1030 mbar Absolute
Scale Interval : 1 mbar
Resolution : 0.5 mbar Absolute

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

IRPC Certificate No. CL1-P220104 for Reference Pressure Monitor Serial No. 1598, Due 11-Nov-23

End of Certificate

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BOD INCUBATOR

ID No. : LABE 19/2

NSC-TSI-TSI7025
CALIBRATION 0152

Page 1 of 3

Certificate No. : 22-136844

Sample Code : 22-51164-006

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.

683 Moo 11, Sukhapiban 8 Rd., Nongkham,

Sriracha, Cho-buri 20230

Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.

(Laboratory)

Equipment : Temperature controlled enclosures (Incubator)

Manufacturer : N/A Model : N/A

Serial No. : SS40040277 ID No. : LABE 19/2

Date of Receipt : 21 December 2022 Date of Calibration : 21 December 2022

Condition of Calibration

1. Environment
- 1.1 Ambient temperature : Maximum 25.1 °C : Minimum 24.3 °C
- 1.2 Relative humidity : Maximum 52.3 % : Minimum 48.5 %
- 1.3 Line voltage supplied : Maximum 223.6 VAC : Minimum 221.9 VAC

2. Calibration method

TLAS-G-20: Guidelines for calibration and checks of temperature controlled enclosures.

3. Reference standard instrument

Instrument	ID No.	Certificate No.	Due Date
Data Acquisition With Sensor (RTD-PT100)	LB-DA-11 (RTD-148 to RTD-155, RTD-227)	22-040308	24 April 2023

4. This certificate is traceable to the international system of unit (SI Unit).

The measurement is traceable to Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.

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

6. Condition of calibration item : Normal

Calibrated by

Mr. Nathanan Phosri

Approved by

(Mr. Somchai Neampunt)

Scientist

Signed for Director

Issue date

26 December 2022

The uncertainties are for a confidence probability of approximately 95%

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

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 unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reissued other than in full except with the prior written approval of the Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC)

361 Soi Ladprao 122, Ladprao Road,

Phlabphla, Wang Thonglang, Bangkok 10310

Rev.01

TEL 02-516-2422

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Effective Date 15/10/21

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NSC-TSI-TSI7025
CALIBRATION 0152

Page 2 of 3

Certificate No. : 22-136844

Sample Code : 22-51164-006

REPORT OF CALIBRATION

Results of Calibration

Resolution : 0.1 °C

1. Reporting of Temperature

Calibration point (°C)	UUC* setting (°C)	UUC* reading (°C)	Measured temperature at each positions (°C)								Uncertainty ± (°C)	Coverage factor k	
			# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8			# 9 ^{Ref}
20	20.0	20.0	19.65	19.56	19.47	19.29	20.96	20.47	20.23	20.58	20.29	0.35	2.00

2. Characterization results

Calibration point (°C)	Stability ± (°C)	Uniformity (°C)	Overall variation (°C)
20	0.13	1.09	1.90

Notes

* UUC* = Unit Under Calibration

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Phlabphla, Wang Thonglang, Bangkok 10310

Rev.09

TEL 02-516-2422

FAX 02-516-6949

Effective Date 15/10/21

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REPORT OF CALIBRATION

Page 3 of 3

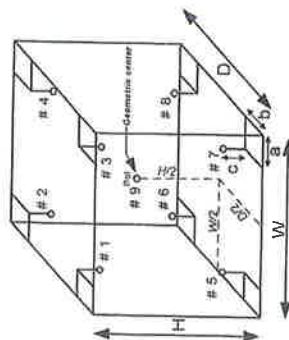
Certificate No. : 22-136844

Sample Code : 22-51164-006

Results of Calibration

Notes

1. Sensor installation locations
 - 1.1 All sensors at any corners or walls should be positioned 5 cm (a x b x c) from the wall.
 - 1.2 The reference sensor is preferably located of the geometric center of the chamber.
2. Interior dimensions approx of chamber :
W = 60 cm ; D = 70 cm ; H = 124 cm
3. Air valve or fresh air level : Off
4. Fan level : open
5. The quoted uncertainty includes "Stability of chamber and loading effect in chamber at 20% of uniformity".
6. 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.
7. Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.
8. Overall variation - the difference of the maximum and the minimum measured temperatures throughout observation time.
9. UUC^o reading - the average reading of indicating device that forms the integral part of the enclosure.
10. Calibration results without adjustment.

Figure. Example of sensor
Installation Positions

- End of Report -

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%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003.

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BOD INCUBATOR

ID No. : LABE 19/5



NSC-TSI-TIS17025
CALIBRATION0152

Page 3 of 3

REPORT OF CALIBRATION

Certificate No. : 23-040768

Sample Code : 23-16178-002

Results of Calibration

Notes

1. Sensor installation locations
 - 1.1 All sensors at any corners or walls should be positioned 5 cm (a x b x c) from the wall.
 - 1.2 The reference sensor is preferably located of the geometric center of the chamber.
2. Interior dimensions approx of chamber :
W = 60 cm ; D = 56 cm ; H = 146 cm
3. Air valve or fresh air level : Off
4. Fan level : Open
5. The quoted uncertainty includes "Stability of chamber and loading effect in chamber at 20% of uniformity".
6. 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.
7. Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.
8. Overall variation - the difference of the maximum and the minimum measured temperatures throughout observation time.
9. UUC* reading - the average reading of indicating device that forms the integral part of the enclosure.
10. Calibration results without adjustment.

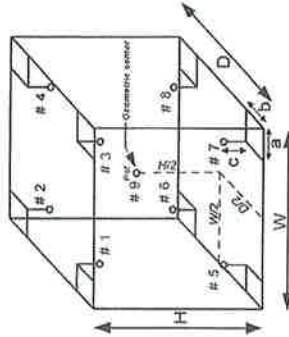


Figure:-Example of sensor
Installation Positions

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%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003

- End of Report -

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Hot Air Oven

Model. : UM 400

Serial No. : 900982

REPORT OF CALIBRATION

Results of Calibration

Resolution : 0.1 °C

1. Reporting of Temperature

Calibration point (°C)	UUC* setting (°C)	UUC* reading (°C)	Measured temperature at each positions (°C)								Uncertainty ± (°C)	Coverage factor k
			# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	# 9 ^{Ref}	
85	85.0	85.0	85.18	85.04	84.62	84.82	85.03	85.04	85.00	84.96	85.08	2.00

2. Characterization results

Calibration point (°C)	Stability ± (°C)	Uniformity (°C)	Overall variation (°C)
85	0.07	0.49	0.68

Notes

- UUC* = Unit Under Calibration

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapibon 8 Rd., Nongkham,
Siracha, Chonburi 20230

Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.
(Hot Lab)

Equipment : Temperature controlled enclosures (Hot air oven)

Manufacturer : Memmert

Model : UM 400

Serial No. : 900982

ID No. : LABE 17/1

Date of Receipt : 21 February 2023

Date of Calibration : 21 February 2023

Condition of Calibration

1. Environment	1.1 Ambient temperature	Maximum : 31.2 °C	Minimum : 28.7 °C
	1.2 Relative humidity	Maximum : 50.2 %	Minimum : 40.1 %
	1.3 Line voltage supplied	Maximum : 223.9 VAC	Minimum : 221.5 VAC

2. Calibration method

TLAS-G-20: Guidelines for calibration and checks of temperature controlled enclosures.

3. Reference standard instrument

Instrument	ID No.	Certificate No.	Due Date
Data acquisition with sensor (RTD-PT100)	LB-DA-12 (RTD-158 to RTD-166)	22-040312	02 May 2023

4. This certificate is traceable to the international system of unit (SI Unit).

The measurement is traceable to Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.

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

6. Condition of calibration item : Normal

Calibrated by : Mr. Sarawoot Thammo

Scientist

Approved by

(Mr. Somchai Neampunt)

Signed for Director

Issue date : 24 February 2023

The uncertainties are for a confidence probability of approximately 95%.
The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

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REPORT OF CALIBRATION

Page 3 of 3

Certificate No. : 23-018635

Sample Code : 23-07651-001

Results of Calibration

Notes

1. Sensor installation locations
 - 1.1 All sensors at any corners or walls should be positioned 5 cm (a x b x c) from the wall.
 - 1.2 The reference sensor is preferably located of the geometric center of the chamber.
2. Interior dimensions approx of chamber :
W = 40 cm ; D = 28 cm ; H = 39 cm
3. Air valve or fresh air level : Off
4. Fan level : Open
5. The quoted uncertainty includes " Stability of chamber and loading effect in chamber at 20% of uniformity ".
6. 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.
7. Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.
8. Overall variation - the difference of the maximum and the minimum measured temperatures throughout observation time.
9. UUC* reading - the average reading of indicating device that forms the integral part of the enclosure.
10. Calibration results without adjustment.

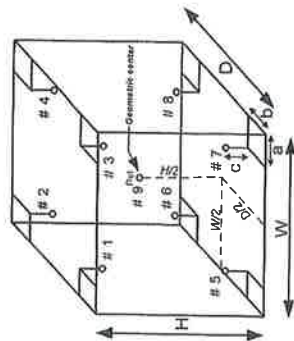


Figure: Example of sensor
installation Positions

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%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003.

- End of Report -

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INDUCTIBELY COUPLED PLASMA SPECTROMETER

Model : Prodigy 7

Serial No. : P70177



บริษัท แอปพลิเคชัน สี่พันเจ็ด จำกัด
Application Define Company Limited
133/318 ถนนพหลโยธิน แขวงสามยุค เขตเมืองใหม่ กรุงเทพมหานคร 10510
Tel: (66)8455-5191 E-mail: support@apdefine.co.th Website : http://www.apdefine.co.th
เลขประจำตัวผู้เสียภาษี 0105556032491

CERTIFICATE OF INSTRUMENT PERFORMANCE

INSTRUMENT:		INDUCTIVELY COUPLED PLASMA SPECTROMETER	STATUS
BRAND:	Teledyne Leeman Labs		
MODEL:	Prodigy 7		
SERIAL NO.	P70177		
CUSTOMER:	บริษัท อีสเทิร์นไทย คอนกรีตคัง 1992 จำกัด		
CHECKING:			
SPECTROMETER		Wavelength Accuracy check by use emission line of Hg Lamp	OK
		Mercury line 253.652 nm.	
		Plasma View (Dual View)	
		CMOS Detector check	
		Align View by Mn line 257.610 nm.	
RF GENERATOR		Incident Power 1,200 ±10 Watt Reading = 1200 Watt	OK
SAMPLE INTRODUCTION		Plasma Torch, Injector, Spray chamber, Nebulizer	OK
		Partialtic pump & Tubing	
EXHAUSTING & COOLING SYSTEM		Safety Interlock Switch (Door, Argon pressure, Water pressure)	OK
		Cooling System, water flowrate & low pressure switch	OK
		Flowrate of Air blower	OK
COMPUTER & SOFTWARE		Plasma Ignitation software & Analytical Software	OK
ANALYTICAL TEST		Full Frame Capture & Echellogram check	OK
		Calibration Cuve & QC Test	

DATE : Dec 12, 2022

Mr. Somchai Chumyung
Engineer Sign

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PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท อีสเทิร์นไทย คอนกรีต 1992 จำกัด	Date: Dec 12, 2022
Instrument: ICP-OES	Model: Prodigy 7
	S/N: P70177

1. Gas Supply /Water Re-circulator/Exhaust Hood Check:

Gas system: ตรวจสอบแรงดันแก๊สและทำการทึ่ม Argon Pressure: 5-10 psi Leak inspected (✓) No leak Nitrogen Pressure: 5-10 psi Leak inspected (✓) No leak Oxygen Pressure: 5-10 psi Leak inspected (✓) No leak	
() Change camera purge gas Dehydrator (1 times /years) Next time replacement 25/12/2562 เปลี่ยนตัวความชื้นดีไฮเดรต ทุก 1 ปี	
Water Chiller: RF generator flow rate 4.44 LPM Temperature 25.0 °C ตรวจอุณหภูมิ Leak inspected (✓) No leak ตรวจทดสอบการทึ่ม	
Water Chiller : Camera (✓) check water level and refill ตรวจระดับน้ำและเติมน้ำ (✓) change water เปลี่ยนน้ำ Temperature -31 °C ตรวจอุณหภูมิ	
Exhaust Hood Flow rate 700 CFM (system request > 150)	

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PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท อีทีพีไทย คอนสตรัคชั่น 1992 จำกัด	Date: Dec 12, 2022
Instrument: ICP-OES	Model: Prodigy 7

2. Computer & Software Check

Description	Status
Interface Cable USB (✓) No broken	OK
Software Version	OK
(✓) Operation function check :	OK
(✓) Open /Save /Edit method	OK
(✓) Instrument Control	OK
(✓) Sequence	OK
(✓) Full Frame Capture (Echelle Mode)	OK
(✓) Auto alignment /Hg alignment	OK
(✓) Calibration Curve	OK
(✓) Re-Calculation	OK
(✓) Print Report	OK

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PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท อีทีพีไทย คอนสตรัคชั่น 1992 จำกัด	Date: Dec 12, 2022
Instrument: ICP-OES	Model: Prodigy 7

3. Instrument Control

Description	Status
Optical view position: ตรวจสอบตำแหน่งพัฒนาที่ติดตั้งในเตาและมุมอง	
Hg Lamp Deltas	
X 2 Y - 9	OK
XUV 0	OK
Axial peak positions X 3325 Y 1225	OK
Radial peak positions X 4151 Y 1225	OK
Hg lamp peak positions X 2220 Y 2630	OK
Plasma Control ตรวจสอบการทำงานภาคและดับพลาสมา	
(✓) Auto Start	OK
(✓) Extinguish	OK
(✓) RF power setting	OK
(✓) Igniter	OK
(✓) Air Knife	OK
Torch Gas ตรวจสอบการทำงานระบบแก๊สที่ใช้ในเตาพลาสมา	
(✓) Coolant/Plasma Flow control	OK
(✓) Aux Flow	OK
(✓) Nebulizer Flow	OK
(✓) Optimize sample introduction function	OK
(✓) Peristaltic pump control	OK
(✓) Auto sampler Control	OK
(✓) Camera Support Module	OK
(✓) Diagnostic	OK

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PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท อีสเทิร์นไทย คอนสตรัคชั่น 1992 จำกัด	Date: Dec 12, 2022
Instrument: ICP-OES	Model: Prodigy 7

4. Cleaning & Replacement

Description	Status
(✓) O-Ring Torch replacement	OK
(✓) Pump Tubing replacement	OK
(✓) Glassware cleaning (Torch, Nebulizer, Spray chamber)	OK
(✓) Lube the roll peristaltic pump	OK
(✓) Optical windows cleaning	OK
(✓) Camera Water Re-circulator (water change/ refilled)	OK
(✓) RF Generator Water Re-circulator (water change/ refilled)	OK
(✓) Cleaning Electronics Board with spray cleaner	OK
(✓) Cleaning dust inside Unit	OK
(✓) Cleaning dust filter	OK

5. Safety Interlock

Description	Status
(✓) Door switch	OK
(✓) RF Water Re-circulator	OK
(✓) Camera Water Re-circulator	OK
(✓) Camera purge gas	OK
(✓) Argon pressure	OK
(✓) Nitrogen pressure	OK

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PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท อีสเทิร์นไทย คอนสตรัคชั่น 1992 จำกัด	Date: Dec 12, 2022
Instrument: ICP-OES	Model: Prodigy 7

6. Hardware Check with SALSA.EXE Diagnostics

Power Supply	Value	Status
-12 VDC (11 - 14.5 VDC)	-13.555	OK
+12 VDC (11 - 14.5 VDC)	+12.012	OK
+3.3VDC	3.266	OK
+5.0 VDC	4.945	OK
+13.5 VDC	13.489	OK

Plasma Generator	Value	Status
ICP Current 0.500A = 1kW	0.546	OK
ICP Ref 5.0Vdc = 1kW	5.464	OK
ICP Current 0.00 Vdc = 0kW	0	OK
ICP Ref 0.00Vdc = 0kW	0	OK
RF Water (Hz) OFF	0	OK
RF Water (Hz) ON	23	OK
Air Knife Pres. (0.00V) OFF	0	OK
Air Knife Pres. (3.0 - 7.0 V) ON	4.054	OK
Neb 25 @ setting of 25 PSI	25	OK
Cool 18 @ setting of 18 LPM	18	OK
Aux 0.6 @ setting of 6 LPM	0.6	OK
Pump Current (0.000 A) OFF	0	OK
Pump Voltage (0.000 V) OFF	0	OK
Pump Current (0.8 to 4.0A) ON	1.04	OK
Pump Voltage (8 to 13 V) ON	12.52	OK

Set Points	Value	Status
Air In Set Point 32°C	31	OK
Cam Tee Temperature -32°C	-32	OK
Op Purge Low 0.77 LPM	0.7	OK
Op Purge High 15.50 LPM	15.5	OK
Cam Wtr T 28°C	28	OK



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PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท อีทีพี เทคโนโลยี จำกัด	Date: Dec 12, 2022
Instrument: ICP-OES	Model: Prodigy 7
	S/N: P70177

7. Mn Check for performance Test

	Condition for performance Test	Condition Test	Status
Standard	1 ppm, 5 ppm, 10 ppm	10 ppm	ok
Power plasma	1.20 kw	1.2	ok
Plasma gas	16.0 LPM	16	ok
Auxiliary Gas	0.8 LPM	0.8	ok
Nebulizer	1.2 LPM	25 LPM	ok
Pump Speed	25 RPM	25	ok
Integration time	15 s Axial, 5 s Radial	10 s, 5 s	ok
Nebulizer Type	Seaspray, Conical, Meinhard	Seaspray	ok
Intensity first performance	1 ppm ≥ 4,000,000 5 ppm ≥ 15,000,000 10 ppm ≥ 50,000,000	265,000,000	ok

Engineer Sign	12 Dec 2022
	
Somchai Chumyung	TELEDYNE LEEMAN LABS Everywhere you look

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LIQUID IN GLASS THERMOMETER

Model : Total immersion

Serial No. : 43560

Calibration Certificate

Certificate No.: 2300368-001-01
Client name: EASTERN THAI CONSULTING 1992 CO., LTD.
Address: 683 Moo 11, Sukhapibam 8 Rd.,
 Nongkham, Sriracha, Chonburi 20230

Page 1 of 3

Equipment: Liquid-in-Glass Thermometer
Manufacturer: Precision
Model / Type: Total Immersion
Serial No.: 43560
ID No.: LABE 16/1
Order No.: 2300368
Operation No.: 2300368-001
Date of Receipt: 7 November 2022
Date of Calibration: 15 November 2022

Calibrated by Mr.Nuttapol Miyomchet **Approved by** (Mr.Pheraphat Tuanjit)
 Specialist Manager, Division of Calibration Laboratory
 Responsible for the Technical Management Team

Date of Issue: 18 November 2022

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.: 2300368-001-01
Equipment: Liquid-in-Glass Thermometer **Type:** Total Immersion
Range: -1.9 to 101.1 °C **Resolution:** 0.1 °C
ID No.: LABE 16/1 **Serial No.:** 43560
Manufacturer: Precision
Date of Calibration: 15 November 2022

Page 2 of 3

Location: Temperature Calibration Laboratory, National Food Institute
Environment Condition: Ambient Temperature 23 °C ± 3 °C,
 Relative Humidity 55 % ± 15 %

Condition of this results of Calibration:

- Calibration Method : - In-house method : W-TE-015 based on ASTM E77-07
 - The Calibration is determined by comparing with a known temperature from a standard resistance thermometer.
 - The temperature Scale in use at this laboratory is the International Temperature Scale of 1990 (ITS-90).

2. Reference Standard Instrument :

Instrument	Model	Serial No.	Certificate No.	Due Date	Through
BLACK STACK THERMOMETER	1560/2560	A39258/A39719	PSL-T 0674/65	7-Jun-23	TISTR
Platinum Resistance Thermometer (PRT)	5615	808926			

Support Equipment : - Ice point Unit, ID No.: ana. 614/21

- Low Temperature Bath (Deep Well Compact Bath), Model: 7381, S/N: B53496.
- Low Temperature Bath (Deep Well Compact Bath), Model: 7341, S/N: A5A084.
- High Temperature Bath (Deep Well Compact Bath), Model: 6331, S/N: A5A087.

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

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

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



Calibration Report

Certificate No.: 2300368-001-01
Equipment: Liquid-in-Glass Thermometer
Type: Total Immersion
Range: -1.9 to 101.1 °C
Resolution: 0.1 °C
ID No.: LABE 16/1
Serial No.: 43560
Manufacturer: Precision
Date of Calibration: 15 November 2022

Page 3 of 3

Calibration point: 3.0, 25.0 and 50.0 °C
Calibration result:

Reporting of ice-point or reference point

UUC* Reading (°C)	Standard Temperature/Ice Point (°C)	Correction Value (°C)	Uncertainty ± (°C)
0.0	0.0032	0.0	0.091

Reporting of temperature calibration point

UUC* Reading (°C)	Standard Temperature (°C)	Correction Value (°C)	Uncertainty ± (°C)
25.0	24.9990	0.0	0.088
50.0	49.9943	0.0	0.088

Note

* UUC* : Unit Under Calibration

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

----- End -----



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MERCURY ANALYZER

Model : RA-4500

Serial No. : 21780504

Automatic Mercury Analyzer

Model RA-4500

Preventive Maintenance Report

Serial No. : 21780504

Soft version : Ver 2.0.7

ROM version : Ver 2.0.1

Date : August 9, 2023

PM by :  (Pathom S.)

Approved by :  (Phongpan R.)



Coax Group Corporation Ltd.
1131/62,64,325-331 Nakornchaisri road,
Kwang ThanonNakornchaisri, Dusit, Bangkok 10300 Thailand
Tel. 02-2435263, 02-6682436 Fax. 02-2437386

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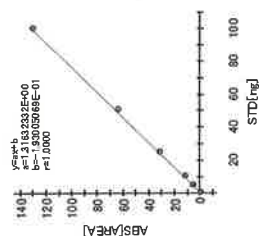
Inspection result

ITEM	STANDARD	RESULT	JUDGE
1. Self Check			
1.1 Leak check	0.14 - 2.0 L/min.	0.18 L/min	PASS
1.2 Sig/Ref check	3.0 - 4.0 volte	Sig:4.01V, Ref:4.09V.	PASS
1.3 Drift check	0.0000047 - 0.0000014	0.0000038	PASS
2. Analytical curve inspection(AREA)			
2.1 No Pretreatment	Correlation coefficient (r) ≥ 0.9990	1.0000	PASS
3. Repeatability(AREA)			
3.1 No Pretreatment 50ug/L, n=3		1. 50.353 ug/L 2. 51.477 ug/L 3. 51.306 ug/L C.V. ≤ 5%	PASS
4. Blank	Below 1.0(AREA)	0.386	OK

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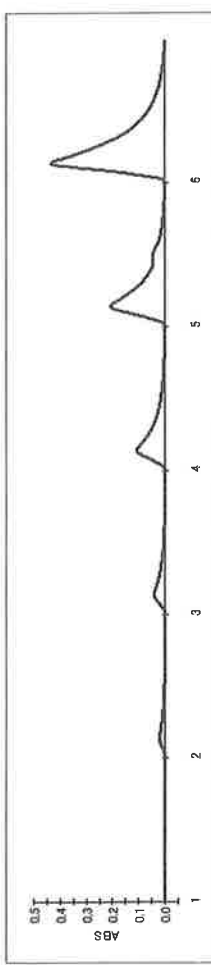
Title : RA-4500 Preventive Maintenance
 Date : 9/8/2566
 Name : Coax Group
 Memo : Calibration curve (No Pretreatment)

Calib



STD

No.	STD [ppb]	SVOL [mL]	CVOL [mL]	DVOL [mL]	STD [ng]	AREA [ON]	MEAS [ng]	Dev [%]	Note
1	0.000	5.000	5.000	5.000	0.000	0.3869	0.4405	-	
2	50.000	0.100	5.000	5.000	5.000	6.6907	5.2295	4.6	
3	50.000	0.200	5.000	5.000	10.000	12.4017	9.5681	4.3	
4	50.000	0.500	5.000	5.000	25.000	32.5205	24.8522	0.6	
5	50.000	1.000	5.000	5.000	50.000	65.2046	49.6820	0.6	
6	50.000	2.000	5.000	5.000	100.000	131.7390	100.2277	0.2	

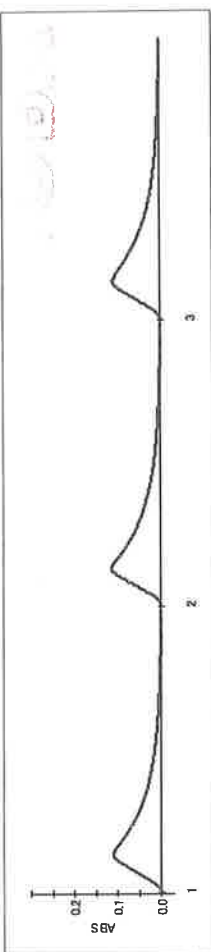


SMP

No.	NAME	SVOL [mL]	CVOL [mL]	DVOL [mL]	AREA [ON]	MEAS [ng]	CONC [ug/L]	Note
1	50ug/L	0.500	5.000	5.000	32.9478	25.1766	50.3536	
2	50ug/L	0.500	5.000	5.000	33.6875	25.7387	51.4774	
3	50ug/L	0.500	5.000	5.000	33.5749	25.6532	51.3084	

Statistics

No.	NAME	TRY	AV [ug/L]	SD [ug/L]	Cv [%]
1	50ug/L	3	51.04580	0.6055294	1.19



Self Check

Heat check: PASS!! (26.0degC[05:00] -> 30.0degC[03:06])
 Sensor check: PASS!! (1113-58=1055)
 Leak check: PASS!! (0.18L/min)
 Sig/Ref check: PASS!! (Sig: 4.01V, Ref: 4.09V)
 Drift check: PASS!! (0.0000036 - -0.0000002 = 0.0000038)

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pH Meter

Model. : SevenCompact S220

Serial No. : B448305208



REPORT OF CALIBRATION

Certificate No. : 23-011524
Sample Code : 23-04833-001

Equipment : pH Meter Resolution : 0.01 pH ; 0.1 mV ; 0.1°C
Manufacturer : METTLER TOLEDO Model : SevenCompact S220
Serial No. : B448305208 ID No. : LABE 11/4
Range : -2.000 pH to 20.000 pH ; ± 2000.0 mV ; -5.0°C to 130.0°C

Results of Calibration

Part 1. DC Voltage measurement

pH Meter Serial No. : B448305208

Nominal Value	Applied DC Voltage	Average indicator reading		Uncertainty	Coverage factor
		mV	pH		
0	414.113	414.0	0.00	± 0.083	2.00
4	177.477	177.5	4.00	± 0.083	2.00
7	0.000	0.1	7.00	± 0.083	2.00
10	-177.477	-178.3	10.00	± 0.083	2.00
14	-414.113	-413.8	14.00	± 0.083	2.00

Part 2. Performance of Electrode system

Electrode Manufacturer : METTLER TOLEDO

Model

Electrode Serial No. : 2365921

InLab Expert Pro-ISM

Three-Point Calibration at pH4 and pH7 Percent Slope : 99.6 ; at pH7 and pH10 Percent Slope : 98.4

Standard Buffer Solution	Average indicator reading		Error Value	Uncertainty	Coverage factor
	pH (@ 25 °C)	mV			
4.008	4.01	184.2	0.002	± 0.011	2.00
6.985	6.99	8.9	0.005	± 0.010	2.00
10.008	10.01	-166.8	0.002	± 0.010	2.00

The result expanded uncertainty (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%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003

D.D.

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CERTIFICATE OF CALIBRATION

Certificate No. : 23-011524
Sample Code : 23-04833-001

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapiban 8 Rd., Nongkham,
Siracha, Chonburi 20230

Location of Calibration : Asia Medical and Agricultural Laboratory and Research Center Public Company Limited
(Calibration Laboratory)

Equipment : pH Meter

Manufacturer : METTLER TOLEDO Model : SevenCompact S220

Serial No. : B448305208 ID No. : LABE 11/4

Date of Receipt : 01 February 2023 Date of Calibration : 01 February 2023

Condition of Calibration

1. Environment
1.1 Ambient temperature : 25.0 ± 2.5 °C 1.2 Relative humidity : 55.0 % ± 15.0 %

2. Calibration method
In house method WI-CL-019: based on direct measurement by using standard voltage calibrator and using certified reference material

Reference standard / Certified reference material

Instrument	ID No.	Certificate No.	Due Date
3.1 Voltage Calibrator	LB-AMC-01	22E3240	03 October 2023
3.2 Digital Thermometer	LB-TH-33	22-107027	02 October 2023
Certified Reference Material			
3.3 Buffer Solution pH 4.008	838357	PH216.L5	15 September 2024
3.4 Buffer Solution pH 6.985	838358	PH107.L5	15 September 2023
3.5 Buffer Solution pH 10.008	838359	PH220.L5	15 September 2023

4. This certificate is traceable to the international system of unit (SI Unit).

- 4.1 Instrument No. 3.1 through Technology Promotion Association (Thailand-Japan).
- 4.2 Instrument No. 3.2 through Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.
- 4.3 Buffer Solution No. 3.3 and No. 3.5 traceable to CPA chem (through primary measurement method-Harned cell using calibrated thermometer, barometer, and nanovoltmeter. Accredited laboratory ISO/IEC 17025 and ISO/IEC 17034).
- 4.4 Buffer Solution No. 3.4 traceable to CPA chem (BIM RefN HI-27 LoIN 04.06.2021 ; BIM RefN HI-28 LoIN 28.05.2021 ; BIM RefN HI-27 LoIN 04.06.2021 ; BIM RefN HI-28 LoIN 28.05.2021 Accredited laboratory ISO/IEC 17025 and ISO/IEC 17034).

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

6. Condition of calibration item : Normal

Calibrated by : Mr. Anupong Lakawin Approved by : (Ms. Pawana Pan-on)

Issue date : 03 February 2023

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC)



REPORT OF CALIBRATION

Page 3 of 3

Certificate No. : 23-011524

Sample Code : 23-04833-001

Equipment : pH Meter (Digital Thermometer with sensor)

Thermometer readout

Manufacturer : METTLER TOLEDO Model : SevenCompact S220

Serial No. : B448305208 ID No. : LABE 11/4

Resolution : 0.1 °C Range : -5.0 °C to 130.0 °C

Thermometer sensor

Manufacturer : METTLER TOLEDO Model : InLab Expert Pro-ISM

Serial No. : 2365921 ID No. : N/A

Condition of Calibration

1. Environment
 - 1.1 Ambient temperature : 23.0 °C ± 3.0 °C
 - 1.2 Relative humidity : 55.0 % ± 15.0 %

2. Calibration method

- 2.1 The calibration use in house method WI-CL-021 : by comparison with standard thermometer
- 2.2 The calibration by comparison unit under calibration (UUC) to the standard thermometer in a calibration bath at the controlled temperature.
- 2.3 The temperature scale in use of this laboratory is the international temperature scale of 1990 (ITS-90).

3. Reference standard instrument

Instrument	Model	ID No.	Certificate No.	Due date
3.1 Platinum Resistance Thermometer	PT-100	RTD-90	22-107027	02 October 2023
3.2 Thermometer Readout	GT-11	LB-TM-33	22-107027	02 October 2023

4. This certificate is traceable to the international system of unit (SI Unit).

Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (Accreditation Under TLAS Laboratory Calibration No.0152)

5. This result of calibration was found accurate as shown on date and place of calibration only.
6. Condition of Calibration item : Normal

Results of Calibration

Calibration point °C	Average of standard reading °C	Unit under calibration		Expanded uncertainty °C	Coverage factor k
		Immersion depth mm	Average reading °C		
25	25.002	120	25.0	± 0.13	2.00

Notes

- Calibration results without adjustment

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%. The standard uncertainty of measurement has been determined in accordance with JGAS M3003

- End of report -

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STANDARD WEIGHT 50 g



Certificate No. : 22-052238
Sample Code : 22-19150-003

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapiban 8 Rd., Nongkham,
Sriracha, Chonburi 20230

Location of Calibration : Asia Medical and Agricultural Laboratory and Research Center Public Company Limited
(Calibration Laboratory)

Equipment : Standard Weight 50 g

Manufacturer : METTLER TOLEDO

Class : F1

Serial No. : N/A

ID No. : LABE 10/1

Date of Receipt : 18 May 2022

Date of Calibration : 30 May 2022

Calibrated by : Mr. Somwang Sangdee
Scientist

Issue date : 31 May 2022

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).



Certificate No. : 22-052238
Sample Code : 22-19150-003

REPORT OF CALIBRATION

Equipment : Standard Weight 50 g

Manufacturer : METTLER TOLEDO

Class : F1

Serial No. : N/A

ID No. : LABE 10/1

Result of Calibration :

☒ Without adjustment

☐ Adjustment

Conventional value of the result of weighing in air. For a weight taken at a reference temperature (t_{ref}) of 20°C, the conventional mass is the mass of a reference weight of a density (ρ_{ref}) of 8000 kg.m⁻³ which it balances in air of a reference density (ρ_0) of 1.2 kg.m⁻³

Description	Deviation	Conventional	Expanded	Maximum	ID No.
	(mg)	Mass	Uncertainty	Permissible Error	
			(mg)	± (mg)	
50 g	-0.324	49.999676 g	0.10	0.30	LABE 10/1

The result expanded uncertainty of measurement U is stated as the standard uncertainty multiplied by the coverage factor $k=2.0$, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003

[Signature]

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Certificate No. : 22-052238

Sample Code : 22-19150-003

Page 3 of 3

REPORT OF CALIBRATION

Condition of Calibration

1. Ambient Conditions : Temperature $20^{\circ}\text{C} \pm 1.5^{\circ}\text{C}$, Relative humidity $50\% \pm 10\%$ and air density 1.20 kg/m^3
2. Calibration Method : Direct comparison weighing according to OIML R111-1 : 2004(E)
3. Reference standard instrument

Instrument	Class	ID No.	Certificate No.	Due Date
1) Standard Weight 1 mg to 1 kg	E2	LB-WE-79	21-078366	22 September 2022

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

Asia Medical and Agricultural Laboratory and Research Center Public Company Limited

(Instrument number 1).

5. Condition of Calibration item: Normal

6. Description of Calibrated Item :

Type and Nominal Value :	Standard Weight 50 g
Shape :	Cylindrical weight with knob
Material :	Stainless steel
Case :	Wooden Box
Comments :	Recalibration

- End of Report -

COPY

STANDARD WEIGHT 100 g



Certificate No. : 22-052239
Sample Code : 22-19150-004

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapiban 8 Rd., Nongkham,
Siriracha, Chonburi 20230

Location of Calibration : Asia Medical and Agricultural Laboratory and Research Center Public Company Limited
(Calibration Laboratory)

Equipment : Standard Weight 100 g

Manufacturer : N/A

Class : N/A

Serial No. : N/A

ID No. : LABE 10/2

Date of Receipt : 18 May 2022

Date of Calibration : 30 May 2022

Calibrated by : Mr. Somwang Sangdee
Scientist

Issue date : 31 May 2022

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).



Certificate No. : 22-052239
Sample Code : 22-19150-004

REPORT OF CALIBRATION

Equipment : Standard Weight 100 g

Manufacturer : N/A

Class : N/A

Serial No. : N/A

ID No. : LABE 10/2

Result of Calibration : ☒ Without adjustment ☐ Adjustment

Conventional value of the result of weighing in air. For a weight taken at a reference temperature (t_{ref}) of 20°C, the conventional mass is the mass of a reference weight of a density (ρ_{ref}) of 8000 kg.m⁻³ which it balances in air of a reference density (ρ_a) of 1.2 kg.m⁻³

Description	Deviation (mg)	Conventional Mass	Expanded Uncertainty (mg)	Maximum Permissible Error \pm (mg)	ID No.
100 g	-0.171	99.999829 g	0.16	0.50	LABE 10/2

The result expanded uncertainty of measurement U is stated as the standard uncertainty multiplied by the coverage factor $k = 2.0$, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003

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[Signature]
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Certificate No. : 22-052239

Sample Code : 22-19150-004

Page 3 of 3

REPORT OF CALIBRATION

Condition of Calibration

1. Ambient Conditions : Temperature 20 °C ± 1.5°C, Relative humidity 50% ± 10% and air density 1.18 kg/m³

2. Calibration Method : WI-CL-007 base on OIML R 111-1 : 2004(E)

3. Reference standard instrument

Instrument	Class	ID No.	Certificate No.	Due Date
1) Standard Weight 1 mg to 1 kg	E2	LB-WE-78	21-079366	22 September 2022

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

Asia Medical and Agricultural Laboratory and Research Center Public Company Limited

(Instrument number 1).

5. Condition of Calibration item: Normal

6. Description of Calibrated item :

Type and Nominal Value :	Standard Weight 100 g
Shape :	Cylindrical weight with knob
Material :	Stainless steel
Case :	Wooden Box
Comments :	Recalibration

- End of Report -

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STANDARD WEIGHT 50 g

MSC-TS-17517025
CALIBRATION 0152

Page 1 of 3

Certificate No. : 22-052237

Sample Code : 22-19150-002

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.

689 Moo 11, Sukhapiban 8 Rd., Nongkham,

Siracha, Chonburi 20230

Location of Calibration : Asia Medical and Agricultural Laboratory and Research Center Public Company Limited
(Calibration Laboratory)

Equipment : Standard Weight 50 g

Manufacturer : N/A

Class : N/A

Serial No. : N/A

ID No. : LABE 10/4

Date of Receipt : 18 May 2022

Date of Calibration : 30 May 2022

Calibrated by : Mr. Somwang Sangdee
Scientist

Issue date : 31 May 2022

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

MSC-TS-17517025
CALIBRATION 0152

Page 2 of 3

Certificate No. : 22-052237

Sample Code : 22-19150-002

REPORT OF CALIBRATION

Equipment : Standard Weight 50 g

Manufacturer : N/A

Class : N/A

Serial No. : N/A

ID No. : LABE 10/4

Result of Calibration :

☒ Without adjustment☐ Adjustment

Conventional value of the result of weighing in air. For a weight taken at a reference temperature (t_{ref}) of 20°C, the conventional mass is the mass of a reference weight of a density (ρ_{ref}) of 8000 kg.m⁻³ which it balances in air of a reference density (ρ_0) of 1.2 kg.m⁻³

Description	Deviation	Conventional		Expanded	Maximum		ID No.
		Mass			Uncertainty	Permissible Error	
				(mg)	± (mg)		
50 g	-0.111	49.999889	g	0.10	0.30	LABE 10/4	

The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2.0$, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003

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NSC-TIS-71517025
CALIBRATION 0152

Certificate No. : 22-052237

Sample Code : 22-19150-002

Page 3 of 3

REPORT OF CALIBRATION

Condition of Calibration

1. Ambient Conditions : Temperature 20 °C ± 1.5°C, Relative humidity 50% ± 10% and air density 1.18 kg/m³
2. Calibration Method : WI-CL-007 base on OIML R 111-1 : 2004(E)

3. Reference standard instrument

Instrument	Class	ID No.	Certificate No.	Due Date
1) Standard Weight 1 mg to 1 kg	E2	LB-WE-79	21-079366	22 September 2022

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

Asia Medical and Agricultural Laboratory and Research Center Public Company Limited

(Instrument number 1).

5. Condition of Calibration item: Normal

6. Description of Calibrated Item :

Type and Nominal Value :	Standard Weight 50 g
Shape :	Cylindrical weight with knob
Material :	Stainless steel
Case :	Wooden Box
Comments :	Recalibration

- End of Report -

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THERMO-HYGROMETER

Model : 608-H1

Serial No. : 45106737



CERTIFICATE OF CALIBRATION

Page 1 of 2
Certificate No. : 23-055203
Sample Code : 23-21440-001

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapiarn 8 Rd., Nongkham,
Siiracha, Chonburi 20230

Location of Calibration : Asia Medical and Agricultural Laboratory and Research Center Public Company Limited
(Calibration laboratory)

Equipment : Digital thermo-hygrometer

Manufacturer : testo

Model : 60B-H1

Serial No. : 45106737

ID No. : LABE 09/7

Date of Receipt : 25 May 2023

Date of Calibration : 29 May 2023

Condition of Calibration

1. Environment

1.1 Ambient temperature : 23.0 °C ± 3.0 °C

1.2 Relative humidity : 55.0 % ± 15.0 %

2. Calibration method

2.1 In-house method: WI-CL-045 By comparison with thermometer standard / chilled mirror hygrometer in controlled chamber.

2.2 The calibration by comparison unit under calibration (UUC) to the thermometer standard / chilled mirror hygrometer in a chamber at the controlled temperature / relative humidity.

3. Reference standard instrument

Instrument Model ID No. Certificate No. Due Date

3.1 Chilled Mirror Optidew Vision LB-OP-02 & LB-OP-02 (DP) TH-0157-22 05 December 2023

3.2 Digital Thermometer Optidew Vision LB-OP-02 & LB-OP-02 (Temp.) 23-014916 12 February 2024

3.3 Digital Thermometer 34972A LB-DA-07 with RTD-89 22-095535 06 September 2023

4. This certificate is traceable to the international system of unit (SI Unit).

4.1 Instrument No. 3.1 through National Institute of Metrology (Thailand).

4.2 Instrument No. 3.2 and 3.3 through Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.

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

6. Condition of calibration item : Normal

Calibrated by Miss Pornsuda Lohabal

Scientist

31 May 2023

(Mr. Somchai Neampunt)

Signed for Director

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

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TEL 02-516-2422
FAX 02-516-6949
Rev 01
CONTACT@AMARC.CO.TH
WWW.AMARC.CO.TH
Effective Date 15/10/21



REPORT OF CALIBRATION

Page 2 of 2
Certificate No. : 23-055203
Sample Code : 23-21440-001

Results of Calibration

Temperature measurement

Resolution : 0.1 °C
Range : 0 °C to 50 °C

Calibration point °C	Average of standard reading		Unit under calibration		Expanded uncertainty °C
	Controlled humidity %RH	Temperature °C	Average reading °C	Correction value °C	
20	50	20.00	20.0	0.00	± 0.39
25	50	25.02	25.1	0.08	± 0.39
30	50	30.00	30.0	0.00	± 0.39

Humidity measurement

Resolution : 0.1 %RH
Range : 10 %RH to 95 %RH

Calibration point %RH	Average of standard reading		Unit under calibration		Expanded uncertainty %RH
	Air temperature °C	Calculated humidity %RH	Average reading %RH	Correction value %RH	
45	25.00	45.18	53.5	8.32	± 1.3
60	25.00	60.03	68.3	8.27	± 1.5
75	25.00	75.20	83.2	8.00	± 1.7

Notes

* Calibration results without adjustment.

The result expanded uncertainty of measurement U is stated as the standard uncertainty multiplied by the coverage factor k , which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003

- End of Report -

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361 Soi Ladprao 122, Ladprao Road,
Phlabphla, Wang Thonglang, Bangkok 10310
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Rev 00
CONTACT@AMARC.CO.TH
WWW.AMARC.CO.TH
Effective Date 15/10/21

ANALYTICAL BALANCE (DU)

Model. : XS205DU

Serial No. : 1126323724



Certificate No. : 23-006683

Sample Code : 23-02820-006

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapiban 8 Rd., Nongkharn,
Sriacha, Chonburi 20230

Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.
(Analytical Balance Room)

Equipment : ELECTRONIC BALANCE

Manufacturer : METTLER TOLEDO

Model : XS205DU

Serial No. : 1126323724

ID No. : LABE 05/1

Date of Receipt : 20 January 2023

Date of Calibration : 20 January 2023

Calibrated by Mr. Thanadol Pholthep
Scientist

Issue date : 25 January 2023

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC)



Certificate No. : 23-006683

Sample Code : 23-02820-006

REPORT OF CALIBRATION

Equipment : ELECTRONIC BALANCE

Manufacturer : METTLER TOLEDO

Model : XS205DU

Capacity : Max 81 g / 220 g

Resolution : 0.01 mg / 0.1 mg

Serial No. : 1126323724

ID No. : LABE 05/1

Result of Calibration

1. Test weight and repeatability of reading

Repeatability is a measure of the ability of a balance to supply the same result in repetitive weighings with one and the same load under the same measurement condition. The measurement of the repeatability must include both the balance specifications and the ambient (vibration, fluctuating air current/temperature/humidity, etc.) Operator handling of the balance is also included in the standard deviation.

Unit : g Range : 80

☐ Before adjustment ☐ After adjustment

Nominal value

40 90

Standard weight

40.000042 60.000045

Average reading of indicator

40.000015 90.000019

Standard deviation

0.000004 0.000007

Unit : g Range : 200

☐ Before adjustment ☐ After adjustment

Nominal value

100 200

Standard weight

100.000022 200.000199

Average reading of indicator

100.00001 200.00004

Standard deviation

0.000004 0.000008

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Certificate No. : 23-006683

Sample Code : 23-02820-006

Page 3 of 4

REPORT OF CALIBRATION

Result of Calibration

2. Sensitivity or value of a scale division

Change in the output variable of a measuring instrument divided by the associated change in the input variable.

Unit : g

Range :		Range :	
Test Point	Sensitivity, S	Test Point	Sensitivity, S
0	0.99800	0	0.9980
40	0.99800	100	0.9980
80	0.99800	200	0.9980

3. Departure of indication from nominal value, Linearity

Unit : g

Nominal Value	Standard Value	Average Reading of Indicator	Correction Value	Expanded Uncertainty	Coverage Factor (k)
Unload	0.000000	0.00000	0.00000	0.000090	2.01
0.01	0.0100036	0.01000	0.00000	0.000093	2.01
0.1	0.1000062	0.10000	0.00001	0.000012	2.00
1	1.0000036	1.00001	-0.00001	0.000014	2.00
5	5.0000044	5.00003	-0.00003	0.000020	2.00
10	10.000000	10.00007	-0.00007	0.000032	2.00
20	20.000016	20.00011	-0.00009	0.000036	2.00
50	50.000029	50.00013	-0.00010	0.000067	2.00
100	100.000022	100.0001	-0.0001	0.00016	2.00
150	150.000051	150.0001	0.0000	0.00023	2.00
200	200.000199	200.0003	-0.0001	0.00028	2.00

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%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003.

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Certificate No. : 23-006683

Sample Code : 23-02820-006

Page 4 of 4

REPORT OF CALIBRATION

Result of Calibration :

4. Eccentric or off-centre loading

Deviation of the measurement value through off - center (eccentric) loading. The corner load increases with the weight of the load and its removal from the center of the pan support.

☐ Circle☐ Triangular☒ Rectangular

Weighing pan : 50 and 100

Unit : g

Range	Position	Reading of indicator	Reading of indicator
1	50.00014	100.0001	100.0001
2	50.00014	99.9998	99.9998
3	50.00006	100.0000	100.0000
4	50.00010	100.0001	100.0001
5	50.00017	100.0001	100.0001
6	50.00014	100.0001	100.0001
Maximum difference	0.00008	0.0003	0.0003

Condition of Calibration

1. Calibration Method : WI-CL-004 base on UKAS LAB 14: 2019

2. This result of calibration was found accurate as shown on date and

place of calibration only.

3. Condition of Calibration item: Normal

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

Through the reference standard laboratory of Asia Medical and Agricultural Laboratory and Research Center Public

Company Limited (Instrument number 1).

5. Reference standard instrument :

Instrument

1) STANDARD WEIGHT 1 mg to 1 kg

Class

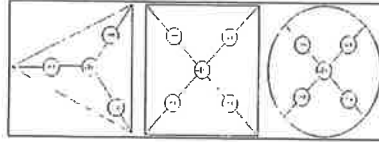
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Certificate No.

22-060639

Due Date

27 June 2023



6. Ambient conditions	Min	Max
Temperature (°C)	21.3	22.4
Relative Humidity (%Rh)	39.2	40.4
Air pressure (hPa)	1008.4	1010.1

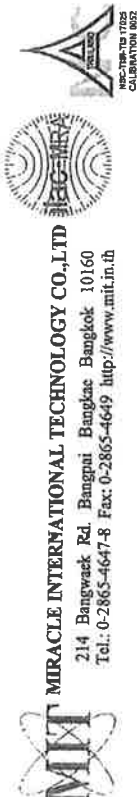
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End of Report -

BAROMETER

Equipment : Analog Barometer

ID No. / Tag No. : BM001/41



MIRACLE INTERNATIONAL TECHNOLOGY CO., LTD.
214 Bangwaek Rd. Bangnai Bangkok 10160
Tel.: 0-2865-4647-8 Fax: 0-2865-4649 <http://www.mit.in.th>



CALIBRATION CERTIFICATE

Certificate No. : L202305085-002
Date Issued : 16-May-23

Customer : Eastern Thai Consulting 1992 Co., Ltd.
683 Moo 11 Sukhapibam 8 Rd., Nongkham, Sriracha, Chonburi 20230

Equipment : Analog Barometer

Manufacturer : Barigo
Model : -
Serial No. : -
ID No./Tag No. : BM001/41
Date Received : 11-May-23
Date Calibrated : 15-May-23
Calibrated by : Mr. Jame Khaothong

Calibration Method or Calibration Procedure Used

In-house method : CP-21 base on DKD-R 6-1: Edition 3 2014.

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

Result of Calibration

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

This certificate may not be reproduced other than in full except with the prior written approval of the Miracle International Technology Company Limited.



Approved by: *Sarayuth T.*
(Mr. Sarayuth Tochua)

Page 1 of 2

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Certificate No : L202305085-002
Environment : Ambient Temperature : $(25 \pm 2)^{\circ}\text{C}$
Relative Humidity : $(50 \pm 15)\%\text{RH}$

STD Reading mbar	UUC Reading (mbar) Before Adjusted	UUC Reading (mbar) After Adjusted	UUC Error mbar	Uncertainty \pm mbar
990.00	990.0	*	0.00	0.61
1000.00	1000.0	*	0.00	0.61
1010.00	1010.0	*	0.00	0.61
1020.00	1020.0	*	0.00	0.61
1030.00	1030.0	*	0.00	0.61

STD = Standard

UUC = Unit Under Calibration

Calibrated condition :

Pressure Medium : Air : Density = 1.19 kg/m^3 @ 20°C , 1 bar
Mounting Position : Vertical
Reference Level : at center of its dial
Conversion Factor : Multiply by $1.0 \text{ E}+02$ - Pa unit

Description of UUC :

Range : 990 - 1030 mbar Absolute
Calibration Range : 990 - 1030 mbar Absolute
Scale Interval : 1 mbar
Resolution : 0.5 mbar Absolute

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

IRPC Certificate No. CL1-P220104 for Reference Pressure Monitor Serial No. 1598, Due 11-Nov-23

End of Certificate

Page 2 of 2

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Hot Air Oven

Model. : UM 400

Serial No. : 900982

REPORT OF CALIBRATION

Results of Calibration

Resolution : 0.1 °C

1. Reporting of Temperature

Calibration point (°C)	UUC* setting (°C)	UUC* reading (°C)	Measured temperature at each positions (°C)								Uncertainty ± (°C)	Coverage factor k
			# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	# 9 ^{Ref}	
85	85.0	85.0	85.18	85.04	84.62	84.82	85.03	85.04	85.00	84.96	85.08	2.00

2. Characterization results

Calibration point (°C)	Stability ± (°C)	Uniformity (°C)	Overall variation (°C)
85	0.07	0.49	0.68

Notes

- UUC* = Unit Under Calibration

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapibon 8 Rd., Nongkham,
Siracha, Chonburi 20230

Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.
(Hot Lab)

Equipment : Temperature controlled enclosures (Hot air oven)

Manufacturer : Memmert

Model : UM 400

Serial No. : 900982

ID No. : LABE 17/1

Date of Receipt : 21 February 2023

Date of Calibration : 21 February 2023

Condition of Calibration

1. Environment	1.1 Ambient temperature	Maximum : 31.2 °C	Minimum : 28.7 °C
	1.2 Relative humidity	Maximum : 50.2 %	Minimum : 40.1 %
	1.3 Line voltage supplied	Maximum : 223.9 VAC	Minimum : 221.5 VAC

2. Calibration method

TLAS-G-20: Guidelines for calibration and checks of temperature controlled enclosures.

3. Reference standard instrument

Instrument	ID No.	Certificate No.	Due Date
Data acquisition with sensor (RTD-PT100)	LB-DA-12 (RTD-158 to RTD-166)	22-040312	02 May 2023

4. This certificate is traceable to the international system of unit (SI Unit).

The measurement is traceable to Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.

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

6. Condition of calibration item : Normal

Calibrated by : Mr. Sarawoot Thammo
Approved by : (Mr. Somchai Neampunt)
Signed for Director

Issue date : 24 February 2023

The uncertainties are for a confidence probability of approximately 95%.
The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

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REPORT OF CALIBRATION

Certificate No. : 23-018635
Sample Code : 23-07651-001

Results of Calibration

Notes

1. Sensor installation locations
 - 1.1 All sensors at any corners or walls should be positioned 5 cm (a x b x c) from the wall.
 - 1.2 The reference sensor is preferably located of the geometric center of the chamber.
2. Interior dimensions approx of chamber :
W = 40 cm ; D = 28 cm ; H = 39 cm
3. Air valve or fresh air level : Off
4. Fan level : Open
5. The quoted uncertainty includes " Stability of chamber and loading effect in chamber at 20% of uniformity ".
6. 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.
7. Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.
8. Overall variation - the difference of the maximum and the minimum measured temperatures throughout observation time.
9. UUC* reading - the average reading of indicating device that forms the integral part of the enclosure.
10. Calibration results without adjustment.

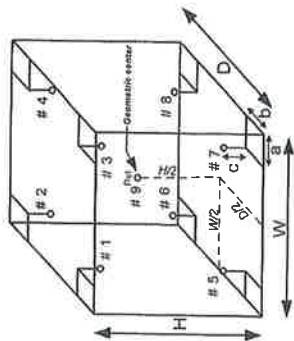


Figure: Example of sensor installation Positions

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%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003.

- End of Report -

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INDUCTIBELY COUPLED PLASMA SPECTROMETER

Model : Prodigy 7

Serial No. : P70177

CERTIFICATE OF INSTRUMENT PERFORMANCE

Engineer Sign

Devi



TELEDYNE LEEMAN LABS
High Performance Analytical Instruments






Dr. J. S. S. S. S.

PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGYTM

วันที่ ๑๖ ธันวาคม ๒๕๖๕
 ณ กรุงเทพมหานคร
 ๑๐๐๐

Instrument: ICP-OES	Model: Prodigy 7	S/N: P70177
---------------------	------------------	-------------

1. Gas Supply/Water Re-circulator/Exhaust Hood Check:

<p>Gas system: ตรวจสอบแรงดันปกติและกาหัวรั่ว</p> <p>Argon Pressure: <u>๕-๖</u> psi Nitrogen Pressure: <u>-</u> psi Oxygen Pressure: <u>-</u> psi</p> <p>(✓) No leak (-) No leak (-) No leak</p>	
<p>() Change camera purge gas Dehydrator (1 times /years) Next time replacement <u>๕/๖/๕๕</u> => ๐/๕๕ เปลี่ยนตัววัดความชื้นดีไฮเดรต ทุก 1 ปี</p>	
<p>Water Chiller: RF generator flow rate <u>4.44</u> LPM Temperature <u>2 & 0</u> °C ตรวจสอบอุณหภูมิ</p> <p>Leak inspected (✓) No leak ตรวจสอบการรั่วซึม</p>	
<p>Water Chiller : Camera</p> <p>(✓) check water level and refill ตรวจสอบระดับน้ำและเติมน้ำ (✓) change water เปลี่ยนน้ำยา Temperature <u>-3.1</u> °C ตรวจสอบอุณหภูมิ</p>	
<p>Exhaust Hood Flow rate <u>๖๐๐</u> CFM (system request > 150)</p>	

PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท อีทีพีไทย คอนสตรัคชั่น 1992 จำกัด	Date: Dec 12, 2022
Instrument: ICP-OES	Model: Prodigy 7

2. Computer & Software Check

Description	Status
Interface Cable USB (✓) No broken	OK
Software Version	OK
(✓) Operation function check:	OK
(✓) Open /Save /Edit method	OK
(✓) Instrument Control	OK
(✓) Sequence	OK
(✓) Full Frame Capture (Echelle Mode)	OK
(✓) Auto alignment /Hg alignment	OK
(✓) Calibration Curve	OK
(✓) Re-Calculation	OK
(✓) Print Report	OK

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PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท อีทีพีไทย คอนสตรัคชั่น 1992 จำกัด	Date: Dec 12, 2022
Instrument: ICP-OES	Model: Prodigy 7

3. Instrument Control

Description	Status
Optical view position: ตรวจสอบตำแหน่งพัฒนาที่ติดตั้งในเตาและมุมอง	
Hg Lamp Deltas	
X 2 Y - 9	OK
XUV 0	OK
Axial peak positions X 3325 Y 1225	OK
Radial peak positions X 4151 Y 1225	OK
Hg lamp peak positions X 2220 Y 2630	OK
Plasma Control ตรวจสอบการทำงานภาคและดับพลาสมา	
(✓) Auto Start	OK
(✓) Extinguish	OK
(✓) RF power setting	OK
(✓) Igniter	OK
(✓) Air Knife	OK
Torch Gas ตรวจสอบการทำงานระบบแก๊สที่ใช้ในเตาพลาสมา	
(✓) Coolant/Plasma Flow control	OK
(✓) Aux Flow	OK
(✓) Nebulizer Flow	OK
(✓) Optimize sample introduction function	OK
(✓) Peristaltic pump control	OK
(✓) Auto sampler Control	OK
(✓) Camera Support Module	OK
(✓) Diagnostic	OK

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PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท อีสเทิร์นไทย คอนสตรัคชั่น 1992 จำกัด	Date: Dec 12, 2022
Instrument: ICP-OES	Model: Prodigy 7

4. Cleaning & Replacement

Description	Status
(✓) O-Ring Torch replacement	OK
(✓) Pump Tubing replacement	OK
(✓) Glassware cleaning (Torch, Nebulizer, Spray chamber)	OK
(✓) Lube the roll peristaltic pump	OK
(✓) Optical windows cleaning	OK
(✓) Camera Water Re-circulator (water change/ refilled)	OK
(✓) RF Generator Water Re-circulator (water change/ refilled)	OK
(✓) Cleaning Electronics Board with spray cleaner	OK
(✓) Cleaning dust inside Unit	OK
(✓) Cleaning dust filter	OK

5. Safety Interlock

Description	Status
(✓) Door switch	OK
(✓) RF Water Re-circulator	OK
(✓) Camera Water Re-circulator	OK
(✓) Camera purge gas	OK
(✓) Argon pressure	OK
(✓) Nitrogen pressure	OK

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PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท อีสเทิร์นไทย คอนสตรัคชั่น 1992 จำกัด	Date: Dec 12, 2022
Instrument: ICP-OES	Model: Prodigy 7

6. Hardware Check with SALSA.EXE Diagnostics

Power Supply	Value	Status
-12 VDC (11 - 14.5 VDC)	-13.555	OK
+12 VDC (11 - 14.5 VDC)	+12.012	OK
+3.3VDC	3.266	OK
+5.0 VDC	4.945	OK
+13.5 VDC	13.489	OK

Plasma Generator	Value	Status
ICP Current 0.500A = 1kW	0.546	OK
ICP Ref 5.0Vdc = 1kW	5.464	OK
ICP Current 0.00 Vdc = 0kW	0	OK
ICP Ref 0.00Vdc = 0kW	0	OK
RF Water (Hz) OFF	0	OK
RF Water (Hz) ON	23	OK
Air Knife Pres. (0.00V) OFF	0	OK
Air Knife Pres. (3.0 - 7.0 V) ON	4.054	OK
Neb 25 @ setting of 25 PSI	25	OK
Cool 18 @ setting of 18 LPM	18	OK
Aux 0.6 @ setting of 6 LPM	0.6	OK
Pump Current (0.000 A) OFF	0	OK
Pump Voltage (0.000 V) OFF	0	OK
Pump Current (0.8 to 4.0A) ON	1.04	OK
Pump Voltage (8 to 13 V) ON	12.52	OK

Set Points	Value	Status
Air In Set Point 32°C	31	OK
Cam Tee Temperature -32°C	-32	OK
Op Purge Low 0.77 LPM	0.7	OK
Op Purge High 15.50 LPM	15.5	OK
Cam Wtr T 28°C	28	OK



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PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท อีทีพี เทคโนโลยี จำกัด	Date: Dec 12, 2022
Instrument: ICP-OES	Model: Prodigy 7
	S/N: P70177

7. Mn Check for performance Test

	Condition for performance Test	Condition Test	Status
Standard	1 ppm, 5 ppm, 10 ppm	10 ppm	ok
Power plasma	1.20 kw	1.2	ok
Plasma gas	16.0 LPM	16	ok
Auxiliary Gas	0.8 LPM	0.8	ok
Nebulizer	1.2 LPM	25 psi	ok
Pump Speed	25 RPM	25	ok
Integration time	15 s Axial, 5 s Radial	10 s, 5 s	ok
Nebulizer Type	Seaspray, Conical, Meinhard	Seaspray	ok
Intensity first performance	1 ppm ≥ 4,000,000 5 ppm ≥ 15,000,000 10 ppm ≥ 50,000,000	265,000,000	ok

Engineer Sign	12 Dec 2022
	
Somchai Chumyaung	TELEDYNE LEMMAN LABS Everywhere you look

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MERCURY ANALYZER

Model : RA-4500

Serial No. : 21780504



บริษัท โคแอก กรุ๊ป คอร์ปอเรชั่น จำกัด
COAX GROUP CORPORATION LTD.

COAX GROUP CORPORATION LTD.

DATE : March 24, 2023

Certificate of Calibration

MERCURY ANALYZER FOR WORKING ENVIRONMENT
THERMOMETER / RA-4500

Customer name : Eastern Thai Consulting 1992 Co.,Ltd.

Certificate No : SRP001-23
Customer P/O : PO.no.PL6602053
Sale Order No : -

Model # RA-4500
Serial No. # 21780504

Results : Quality Reborn Reference Standard Laboratory, NSC-TISI-TIS 17025 Calibration No.0292

Cal. Points	TIME	PRESET TEMP	Ave.	FACTOR ±0.5
3 Point	60 Minutes	95 (°C)	90.73	0.950 - 1.050

This instrument is calibrated at factor 0.955

TEST APPARATUS

Instrument Type	Serial Number	Certificate No.
PONPE 429TP	5845166	TM23-0008
PONPE 429TP	5845167	TM23-0009
PONPE 429TP	5845168	TM23-0010

Date of Calibrate : March 24, 2023
Next due date : March 24, 2024

Calibrate by :  (Siriraj Pinsiri)
Approve by :  (Pathom Srivises)

Service Engineer

Service Manager

Environments & Petroleum Division

Environments & Petroleum Division

Eastern Thai Consulting 1992 Co., Ltd.

Automatic Mercury Analyzer

Model RA-4500

Preventive Maintenance Report

Serial No. : 21780504

Soft version : Ver 2.0.7

ROM version : Ver 2.0.1

Date : February 09, 2023

Next due date : August 09, 2023

PM by :  (P. Siriraj)

Approved by :  (Pathom S.)



Coax Group Corporation Ltd.

1131/62,64,325-331 Nakornchaisri road,
Kwang ThanonNakornchaisri, Dusit, Bangkok 10300 Thailand
Tel. 02-2435263, 02-6682436 Fax. 02-2437386

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Inspection result

ITEM	STANDARD	RESULT	JUDGE
1. Self Check			
1.1 Leak check	0.14 - 2.0L/min	0.17L/min	PASS
1.2 Sig/Ref check	Signal 3.00 - 4.00V Sig:3.97V, Ref:3.89V		PASS
1.3 Drift check	0.0000236 - 0.0000061	0.0000175	PASS
2. Analytical curve inspection(AREA)			
2.1 Calibration curve 0-100ng (Hight)	Correlation coefficient (r) ≥ 0.9999	1.0000	PASS
3. Repeatability(AREA)			
3.1 Repeat STD 50ng, n=3		1. 50.60 ng 2. 50.94 ng 3. 50.71 ng	
	C.V. ≤ 5%	0.34%	PASS
4. Blank	Below 1.0(AREA)	0.0158	PASS

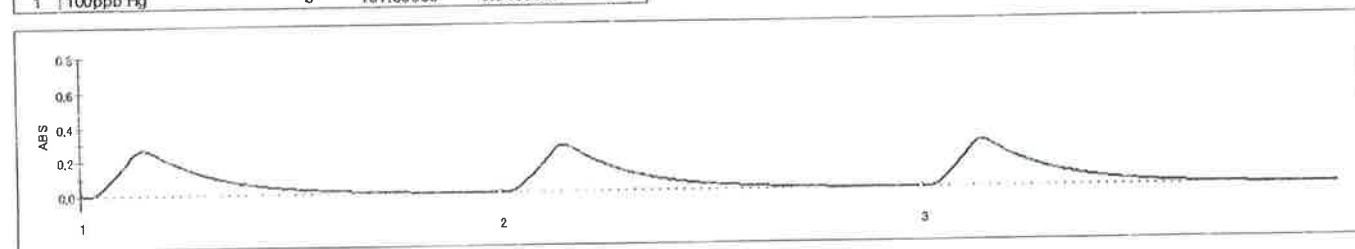
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SMP

No.	NAME	SVOL [mL]	CVOL [mL]	DVOL [mL]	AREA [ON]	MEAS [ng]	CONC [ug/L]	Color		Note
								[1]	[2]	
1	100ppb Hg	0.500	5.000	5.000	73.5373	50.6006	101.2012	-	-	
2	100ppb Hg	0.500	5.000	5.000	74.0347	50.9422	101.8844	-	-	
3	100ppb Hg	0.500	5.000	5.000	73.6938	50.7081	101.4162	-	-	

Statistics

No.	NAME	TRY	AV [ug/L]	SD [ug/L]	Cv [%]
1	100ppb Hg	3	101.50060	0.3493323	0.34



Self Check

Heat check: PASS!! (27.1degC[05:00] -> 31.2degC[03:03])
 Sensor check: PASS!! (3488- 133=3355)
 Leak check: PASS!! (0.17L/min)
 Sig/Ref check: PASS!! (Sig:3.97V, Ref:3.89V)
 Drift check: PASS!! (0.0000236 - 0.0000061 = 0.0000175)

COPY

-2-

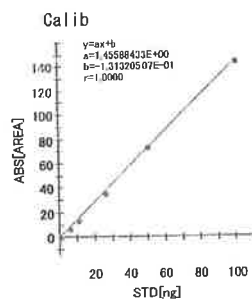
NIC NIPPON INSTRUMENTS CORPORATION

9/2/2566 16:11

Title : RA-4500 Preventive Maintenance no.2of2 in Warranty
 Date : 9/2/2566
 Name : Coax Group Corporation Ltd.
 Memo : Calibration curve, range 0-100ng

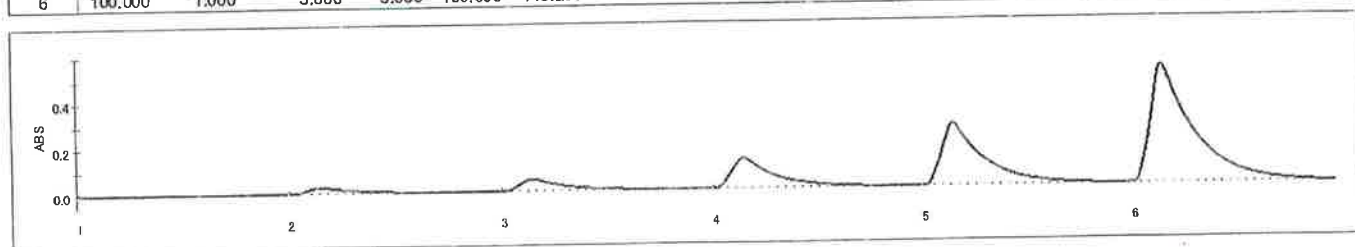
Method

Method1 (Pretreatment: without)
 (1+1)H2SO4 : 0.9mL
 10w/v% SnCl2 : 0.5mL
 Measurement Time (sec) : 120sec



STD

No.	STD [ppb]	SVOL [mL]	CVOL [mL]	DVOL [mL]	STD [ng]	AREA [ON]	MEAS [ng]	Dev [%]	Color		Note
									[1]	[2]	
1	100.000	0.000	5.000	5.000	0.000	0.0158	0.1011	-	-	-	
2	100.000	0.050	5.000	5.000	5.000	7.4089	5.1791	3.6	-	-	
3	100.000	0.100	5.000	5.000	10.000	14.1152	9.7855	2.1	-	-	
4	100.000	0.250	5.000	5.000	25.000	35.6872	24.6026	1.6	-	-	
5	100.000	0.500	5.000	5.000	50.000	73.3032	50.4398	0.9	-	-	
6	100.000	1.000	5.000	5.000	100.000	145.2998	99.8919	0.1	-	-	



COPY

STANDARD WEIGHT 50 g



Certificate No. : 22-052238
Sample Code : 22-19150-003

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapiban 8 Rd., Nongkham,
Sriracha, Chonburi 20230

Location of Calibration : Asia Medical and Agricultural Laboratory and Research Center Public Company Limited
(Calibration Laboratory)

Equipment : Standard Weight 50 g

Manufacturer : METTLER TOLEDO

Class : F1

Serial No. : N/A

ID No. : LABE 10/1

Date of Receipt : 18 May 2022

Date of Calibration : 30 May 2022

Calibrated by : Mr. Somwang Sangdee
Scientist

Issue date : 31 May 2022

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).



Certificate No. : 22-052238
Sample Code : 22-19150-003

REPORT OF CALIBRATION

Equipment : Standard Weight 50 g

Manufacturer : METTLER TOLEDO

Class : F1

Serial No. : N/A

ID No. : LABE 10/1

Result of Calibration :

☒ Without adjustment

☐ Adjustment

Conventional value of the result of weighing in air. For a weight taken at a reference temperature (t_{ref}) of 20°C, the conventional mass is the mass of a reference weight of a density (ρ_{ref}) of 8000 kg.m⁻³ which it balances in air of a reference density (ρ_0) of 1.2 kg.m⁻³

Description	Deviation	Conventional	Expanded	Maximum	ID No.
		Mass	Uncertainty	Permissible Error	
	(mg)		(mg)	± (mg)	
50 g	-0.324	49.999676 g	0.10	0.30	LABE 10/1

The result expanded uncertainty of measurement U is stated as the standard uncertainty multiplied by the coverage factor $k=2.0$, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003

[Signature]

COPY



Certificate No. : 22-052238

Sample Code : 22-19150-003

Page 3 of 3

REPORT OF CALIBRATION

Condition of Calibration

1. Ambient Conditions : Temperature $20^{\circ}\text{C} \pm 1.5^{\circ}\text{C}$, Relative humidity $50\% \pm 10\%$ and air density 1.20 kg/m^3
2. Calibration Method : Direct comparison weighing according to OIML R111-1 : 2004(E)
3. Reference standard instrument

Instrument	Class	ID No.	Certificate No.	Due Date
1) Standard Weight 1 mg to 1 kg	E2	LB-WE-79	21-078366	22 September 2022

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

Asia Medical and Agricultural Laboratory and Research Center Public Company Limited

(Instrument number 1).

5. Condition of Calibration item: Normal

6. Description of Calibrated Item :

Type and Nominal Value :	Standard Weight 50 g
Shape :	Cylindrical weight with knob
Material :	Stainless steel
Case :	Wooden Box
Comments :	Recalibration

- End of Report -

COPY

STANDARD WEIGHT 100 g



Certificate No. : 22-052239
Sample Code : 22-19150-004

Page 1 of 3

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapiban 8 Rd., Nongkham,
Sriracha, Chonburi 20230

Location of Calibration : Asia Medical and Agricultural Laboratory and Research Center Public Company Limited
(Calibration Laboratory)

Equipment : Standard Weight 100 g

Manufacturer : N/A

Class : N/A

Serial No. : N/A

ID No. : LABE 10/2

Date of Receipt : 18 May 2022

Date of Calibration : 30 May 2022

Calibrated by : Mr. Somwang Sangdee
Scientist

Issue date : 31 May 2022

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).



Certificate No. : 22-052239
Sample Code : 22-19150-004

Page 2 of 3

REPORT OF CALIBRATION

Equipment : Standard Weight 100 g

Manufacturer : N/A

Class : N/A

Serial No. : N/A

ID No. : LABE 10/2

Result of Calibration : ☒ Without adjustment ☐ Adjustment

Conventional value of the result of weighing in air. For a weight taken at a reference temperature (t_{ref}) of 20°C, the conventional mass is the mass of a reference weight of a density (ρ_{ref}) of 8000 kg.m⁻³ which it balances in air of a reference density (ρ_a) of 1.2 kg.m⁻³

Description	Deviation (mg)	Conventional Mass	Expanded Uncertainty (mg)	Maximum Permissible Error \pm (mg)	ID No.
100 g	-0.171	99.999829 g	0.16	0.50	LABE 10/2

The result expanded uncertainty of measurement U is stated as the standard uncertainty multiplied by the coverage factor $k = 2.0$, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003

[Signature]

COPY



Certificate No. : 22-052239

Sample Code : 22-19150-004

Page 3 of 3

REPORT OF CALIBRATION

Condition of Calibration

1. Ambient Conditions : Temperature 20 °C ± 1.5°C, Relative humidity 50% ± 10% and air density 1.18 kg/m³

2. Calibration Method : WI-CL-007 base on OIML R 111-1 : 2004(E)

3. Reference standard instrument

Instrument	Class	ID No.	Certificate No.	Due Date
1) Standard Weight 1 mg to 1 kg	E2	LB-WE-78	21-079366	22 September 2022

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

Asia Medical and Agricultural Laboratory and Research Center Public Company Limited

(Instrument number 1).

5. Condition of Calibration item: Normal

6. Description of Calibrated item :

Type and Nominal Value :	Standard Weight 100 g
Shape :	Cylindrical weight with knob
Material :	Stainless steel
Case :	Wooden Box
Comments :	Recalibration

- End of Report -

COPY

STANDARD WEIGHT 50 g



Certificate No. : 22-052237

Sample Code : 22-19150-002

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.

689 Moo 11, Sukhapiban 8 Rd., Nongkham,

Siracha, Chonburi 20230

Location of Calibration : Asia Medical and Agricultural Laboratory and Research Center Public Company Limited
(Calibration Laboratory)

Equipment : Standard Weight 50 g

Manufacturer : N/A

Class : N/A

Serial No. : N/A

ID No. : LABE 10/4

Date of Receipt : 18 May 2022

Date of Calibration : 30 May 2022

Calibrated by : Mr. Somwang Sangdee
Scientist

Issue date : 31 May 2022

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).



Certificate No. : 22-052237

Sample Code : 22-19150-002

REPORT OF CALIBRATION

Equipment : Standard Weight 50 g

Manufacturer : N/A

Class : N/A

Serial No. : N/A

ID No. : LABE 10/4

Result of Calibration :

☒ Without adjustment☐ Adjustment

Conventional value of the result of weighing in air. For a weight taken at a reference temperature (t_{ref}) of 20°C, the conventional mass is the mass of a reference weight of a density (ρ_{ref}) of 8000 kg.m⁻³ which it balances in air of a reference density (ρ_0) of 1.2 kg.m⁻³

Description	Deviation (mg)	Conventional		Expanded Uncertainty (mg)	Maximum Permissible Error ± (mg)	ID No.
		Mass				
50 g	-0.111	49.999889 g		0.10	0.30	LABE 10/4

The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2.0$, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003

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NSC-TIS-71517025
CALIBRATION 0152

Certificate No. : 22-052237

Sample Code : 22-19150-002

Page 3 of 3

REPORT OF CALIBRATION

Condition of Calibration

1. Ambient Conditions : Temperature 20 °C ± 1.5°C, Relative humidity 50% ± 10% and air density 1.18 kg/m³
2. Calibration Method : WI-CL-007 base on OIML R 111-1 : 2004(E)

3. Reference standard instrument

Instrument	Class	ID No.	Certificate No.	Due Date
1) Standard Weight 1 mg to 1 kg	E2	LB-WE-79	21-079366	22 September 2022

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

Asia Medical and Agricultural Laboratory and Research Center Public Company Limited

(Instrument number 1).

5. Condition of Calibration item: Normal

6. Description of Calibrated Item :

Type and Nominal Value :	Standard Weight 50 g
Shape :	Cylindrical weight with knob
Material :	Stainless steel
Case :	Wooden Box
Comments :	Recalibration

- End of Report -

COPY

THERMO-HYGROMETER

Model : 608-H1

Serial No. : 45106737



CERTIFICATE OF CALIBRATION

Page 1 of 2
Certificate No. : 23-055203
Sample Code : 23-21440-001

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapiarn 8 Rd., Nongkham,
Siiracha, Chonburi 20230

Location of Calibration : Asia Medical and Agricultural Laboratory and Research Center Public Company Limited
(Calibration laboratory)

Equipment : Digital thermo-hygrometer

Manufacturer : testo Model : 60B-H1

Serial No. : 45106737 ID No. : LABE 09/7

Date of Receipt : 25 May 2023 Date of Calibration : 29 May 2023

Condition of Calibration

1. Environment 1.1 Ambient temperature : 23.0 °C ± 3.0 °C
1.2 Relative humidity : 55.0 % ± 15.0 %

2. Calibration method

- 2.1 In-house method: WI-CL-045 By comparison with thermometer standard / chilled mirror hygrometer in controlled chamber.
2.2 The calibration by comparison unit under calibration (UUC) to the thermometer standard / chilled mirror hygrometer in a chamber at the controlled temperature / relative humidity.

3. Reference standard instrument

Instrument	Model	ID No.	Certificate No.	Due Date
3.1 Chilled Mirror	Optidew Vision	LB-OP-02 & LB-OP-02 (DP)	TH-0157-22	05 December 2023
3.2 Digital Thermometer	Optidew Vision	LB-OP-02 & LB-OP-02 (Temp.)	23-014916	12 February 2024
3.3 Digital Thermometer	34972A	LB-DA-07 with RTD-89	22-095535	06 September 2023

4. This certificate is traceable to the international system of unit (SI Unit).

4.1 Instrument No. 3.1 through National Institute of Metrology (Thailand).

4.2 Instrument No. 3.2 and 3.3 through Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.

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

6. Condition of calibration item : Normal

Calibrated by Miss Pornsuda Lohabal

Scientist

Issue date 31 May 2023

(Mr. Somchai Neampunt)

Signed for Director

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).



REPORT OF CALIBRATION

Page 2 of 2
Certificate No. : 23-055203
Sample Code : 23-21440-001

Results of Calibration

Temperature measurement

Resolution : 0.1 °C
Range : 0 °C to 50 °C

Calibration point °C	Average of standard reading		Unit under calibration		Expanded uncertainty °C
	Controlled humidity %RH	Temperature °C	Average reading °C	Correction value °C	
20	50	20.00	20.0	0.00	± 0.39
25	50	25.02	25.1	0.08	± 0.39
30	50	30.00	30.0	0.00	± 0.39

Humidity measurement

Resolution : 0.1 %RH
Range : 10 %RH to 95 %RH

Calibration point %RH	Average of standard reading		Unit under calibration		Expanded uncertainty %RH
	Air temperature °C	Calculated humidity %RH	Average reading %RH	Correction value %RH	
45	25.00	45.18	53.5	8.32	± 1.3
60	25.00	60.03	68.3	8.27	± 1.5
75	25.00	75.20	83.2	8.00	± 1.7

Notes

- * Calibration results without adjustment.

The result expanded uncertainty of measurement U is stated as the standard uncertainty multiplied by the coverage factor k , which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with GUM 1995.

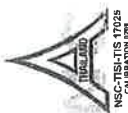
- End of Report -

COPY

UV/VIS SPECTROPHOTOMETER

Model : UV - 1800

Serial No. : A11635101643 CD



Bara Scientific Co., Ltd.
968 U Chu Liang Building Floor 7 Rama4 Road
Silom Bangkok Bangkok Thailand 10500
Tel : 02-6324300 Fax : 02-6375496-7
www.barascientific.com



Certificate of Calibration

2 of 3

Certificate No. BSCC-UV-152/23 Number of Page(s)

Calibration Results:

1. Wavelength Accuracy

Certified Wavelength (nm)	UUC (nm)	Error (nm)	Uncertainty (±nm)
287.71	287.65	-0.06	0.18
445.82	445.80	-0.02	0.18
536.52	536.35	-0.17	0.18
741.02	740.99	-0.03	0.18
879.41	879.27	-0.14	0.18

2. Photometric Accuracy (UV)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (±A)
235	0.0000	0.0000	0.0000	0.0075
257	0.7311	0.7313	0.0002	0.0075
257	CNR	CNR	CNR	CNR
313	CNR	CNR	CNR	CNR
350	0.0000	0.0000	0.0000	0.0075
350	0.6306	0.6314	0.0008	0.0075

*CNR = Customer not request

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The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate. Advertising the report / Certificate and publicity of the results are prohibited and also shall not be reproduced except in full, without written approval of the Bara Scientific Co., Ltd.



Bara Scientific Co., Ltd.
968 U Chu Liang Building Floor 7 Rama4 Road
Silom Bangkok Bangkok Thailand 10500
Tel : 02-6324300 Fax : 02-6375496-7
www.barascientific.com



Certificate of Calibration

1 of 3

Certificate No. BSCC-UV-152/23 Number of Page(s)

Equipment UV/Vis Spectrophotometer
Model UV-1800
Manufacturer Shimadzu
Serial No. A11635101643 CD
ID No. N/A
Date of receipt 25 April 2023
Date of calibration 25 April 2023
Date of issue 27 April 2023

Customer name Eastern Thai Consulting 1992 Co., Ltd

Address 683 Moo 11, Sukkaphibarn 8 Rd., Nongkham, Sriracha, Chonburi 20230

Temperature (22.4-23.1) °C (On site)
Humidity (44.5-45.2) %RH (On site)

Equipment condition Good Operation

Calibration Location Analysis Department

Calibration Procedure In-house method WI-UV-702-01 based on ASTM E275-01

Traceability
Wavelength Accuracy is traceable to certificate No. 94780 and 94775
Photometric Accuracy is traceable to certificate No. 94808 and 100147
Stray Light is traceable to certificate No. 94791
The above certificate are traceable to SI unit through Starna Scientific Ltd.
(UKAS accredited calibration laboratory NO. 0659)

Calibrated by Mr. Pannaphong Phannmekakul

Approved by

Signature

Mr. Kanchit Choothep
Technical Manager

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Bara Scientific
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Bara Scientific Co., Ltd.
968 U Chu Liang Building Floor 7 Rama4 Road
Silom Bangkok Bangkok Thailand 10500
Tel : 02-6324300 Fax : 02-6375496-7
www.barascientific.com



Certificate of Calibration

Certificate No. **BSCC-UV-152/23** Number of Page(s) **3 of 3**

Calibration Results:

3. Photometric Accuracy (Visible)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty ($\pm A$)
420.0	0.0000	0.0000	0.0000	0.0042
	0.5488	0.5508	0.0020	0.0042
	0.7527	0.7535	0.0008	0.0042
	1.0756	1.0758	0.0002	0.0042
440.0	0.0000	0.0000	0.0000	0.0042
	0.5391	0.5406	0.0015	0.0042
	0.7355	0.7360	0.0005	0.0042
	1.0509	1.0501	-0.0008	0.0042
465.0	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
546.1	0.0000	0.0000	0.0000	0.0042
	0.5045	0.5044	-0.0001	0.0042
	0.6884	0.6885	0.0001	0.0042
	0.9816	0.9808	-0.0008	0.0042
590.0	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
635.0	0.0000	0.0000	0.0000	0.0042
	0.5183	0.5178	-0.0005	0.0042
	0.6864	0.6868	0.0004	0.0042
	0.9747	0.9739	-0.0008	0.0042

*CNR = Customer not request

4. Stray Light*

Standard cut-off wavelength (nm)	Unit Under Calibration(UUC)	
	Wavelength (nm)	Absorbance (A)
200.75 \pm 0.1 nm	200.72	2.0164

The Stray light transmission reference is less than 1.0%T and Stray light absorbance reference is greater than 2.00A

The measurement uncertainty is base on a standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95%

End of Certificate

The above results are valid exclusively for the calibrated item(s) as mention in this report / Certificate. Adversing the report / Certificate and publicity of the results are prohibited and also shall not be reproduced except in full, without written approval of the Bara Scientific Co., Ltd.

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ANALYTICAL BALANCE (DU)

Model. : XS205DU

Serial No. : 1126323724



Certificate No. : 23-006683

Sample Code : 23-02820-006

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapiban 8 Rd., Nongkhram,
Sriracha, Chonburi 20230

Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.
(Analytical Balance Room)

Equipment : ELECTRONIC BALANCE

Manufacturer : METTLER TOLEDO

Model : XS205DU

Serial No. : 1126323724

ID No. : LABE 05/1

Date of Receipt : 20 January 2023

Date of Calibration : 20 January 2023

Calibrated by Mr. Thanadol Pholthep
Scientist

Issue date : 25 January 2023

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC)



Certificate No. : 23-006683

Sample Code : 23-02820-006

REPORT OF CALIBRATION

Equipment : ELECTRONIC BALANCE

Manufacturer : METTLER TOLEDO

Model : XS205DU

Capacity : Max 81 g / 220 g

Resolution : 0.01 mg / 0.1 mg

Serial No. : 1126323724

ID No. : LABE 05/1

Result of Calibration

1. Test weight and repeatability of reading

Repeatability is a measure of the ability of a balance to supply the same result in repetitive weighings with one and the same load under the same measurement condition. The measurement of the repeatability must include both the balance specifications and the ambient (vibration, fluctuating air current/temperature/humidity, etc.) Operator handling of the balance is also included in the standard deviation.

Unit : g Range : 80

☐ Before adjustment ☐ After adjustment

Nominal value

40 90

Standard weight

40.000042 60.000045

☒ No adjustment☐ Adjustment

Average reading of indicator

40.00015 90.00019

Standard deviation

0.000004 0.000007

Unit : g Range : 200

☐ Before adjustment ☐ After adjustment

Nominal value

100 200

Standard weight

100.000022 200.000199

☒ No adjustment☐ Adjustment

Average reading of indicator

100.0001 200.0004

Standard deviation

0.00004 0.00008

COPY



Certificate No. : 23-006683

Sample Code : 23-02820-006

Page 3 of 4

REPORT OF CALIBRATION

Result of Calibration

2. Sensitivity or value of a scale division

Change in the output variable of a measuring instrument divided by the associated change in the input variable.

Unit : g

Range :		Range :	
Test Point	Sensitivity, S	Test Point	Sensitivity, S
0	0.99800	0	0.9980
40	0.99800	100	0.9980
80	0.99800	200	0.9980

3. Departure of indication from nominal value, Linearity

Unit : g

Nominal Value	Standard Value	Average Reading of Indicator	Correction Value	Expanded Uncertainty	Coverage Factor (k)
Unload	0.000000	0.00000	0.00000	0.000090	2.01
0.01	0.0100036	0.01000	0.00000	0.000093	2.01
0.1	0.1000062	0.10000	0.00001	0.000012	2.00
1	1.0000036	1.00001	-0.00001	0.000014	2.00
5	5.0000044	5.00003	-0.00003	0.000020	2.00
10	10.000000	10.00007	-0.00007	0.000032	2.00
20	20.000016	20.00011	-0.00009	0.000036	2.00
50	50.000029	50.00013	-0.00010	0.000067	2.00
100	100.000022	100.0001	-0.0001	0.00016	2.00
150	150.000051	150.0001	0.0000	0.00023	2.00
200	200.000199	200.0003	-0.0001	0.00028	2.00

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%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003.

COPY



Certificate No. : 23-006683

Sample Code : 23-02820-006

Page 4 of 4

REPORT OF CALIBRATION

Result of Calibration :

4. Eccentric or off-centre loading

Deviation of the measurement value through off - center (eccentric) loading. The corner load increases with the weight of the load and its removal from the center of the pan support.

☐ Circle☐ Triangular☒ Rectangular

Weighing pan : 50 and 100

Unit : g

Range	Position	Reading of indicator	Reading of indicator
1	50.00014	100.0001	100.0001
2	50.00014	99.9998	99.9998
3	50.00006	100.0000	100.0000
4	50.00010	100.0001	100.0001
5	50.00017	100.0001	100.0001
6	50.00014	100.0001	100.0001
Maximum difference	0.00008	0.0003	0.0003

Condition of Calibration

1. Calibration Method : WI-CL-004 base on UKAS LAB 14: 2019

2. This result of calibration was found accurate as shown on date and

place of calibration only.

3. Condition of Calibration item: Normal

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

- Through the reference standard laboratory of Asia Medical and Agricultural Laboratory and Research Center Public

Company Limited (Instrument number 1).

5. Reference standard instrument :

Instrument

1) STANDARD WEIGHT 1 mg to 1 kg

Class

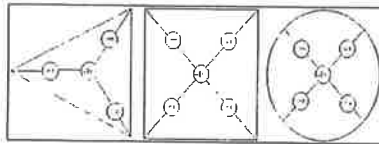
E2

Certificate No.

22-060639

Due Date

27 June 2023



6. Ambient conditions	Min	Max
Temperature (°C)	21.3	22.4
Relative Humidity (%Rh)	39.2	40.4
Air pressure (hPa)	1008.4	1010.1

CONTACT@AMARC.CO.TH
WWW.AMARC.CO.TH
Effective Date: 15/10/21

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End of Report -

ATOMIC ABSORPTION SPECTROPHOTOMETER

Model : PinAAcle 900F

Serial No. : PFBS22080801



PerkinElmer
For the Better

PER-INSTALLATION CHECKS:

- ☒ Verify that proper ventilation is installed and an adequate exhaust rate is accordance to PYL CFM N/A
- ☒ Verify that the gasses meet out PYL specifications---
- ☒ Verify that gas pressure regulators are installed with proper filters and pressure are set in accordance to PYL.
- ☒ Verify that the wiring in the lab meets our power and noise requirements specified in PYL.
- ☒ Verify that the lab environment conditions (room temperature, relative humidity) meet in our PYL specification
- ☒ Maintenance accessibility is adequate.
- ☒ Measured Mains Input Voltage under load is adequate per our PYL specifications (≥ 208 VAC)

PHYSICAL INSTALLATION:

- ☒ The instrument, cooling system, computer and any accessories are uncrated and installed on suitable bench
- ☒ Install all the electrical connections.
- ☒ Connect the gas hoses and tank regulators, set required pressures, and leak test as required.
- ☒ Install the burner System components. (PinAAcle Series 900T & 900F)
- ☒ Mount and connect the auto sample.
- ☒ Fill and connect the cooling system or connect external cooling according to specifications.
- ☒ Setup the computer and printer. Interconnect all cables between the computer, printer, and instrument.
- ☒ Setup and configure the computer to the instrument and install the software according to the installation chapter in the PinAAcle Service Manual.
- ☒ Record the furnace head voltage and manual temperature of 1200 Degrees Celsius.

INSTALLATION TESTING:

- ☒ Perform the following instrument performance tests according to the Installation and Test procedure.
Complete the Instrument Performance Test Data Sheet below.
 - PinAAcle900T, 900H & 900F
Flame Copper Sensitivity and Precision
 - PinAAcle900T & 900Z
Furnace Copper Characteristic Mass and Zeeman Ratio
 - PinAAcle900H
Furnace Chromium Characteristic Mass and Precision
- ☒ Make and electronic copy of the Instrument parameters file per SDB 900PIN_021 procedure on the customer computer

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PinAAcle 900 Series 900T, 900H, 900Z & 900F

Installation Checklist

Customer : EASTERN THAI CONSULTING Date Tested: 28-Nov-2022
NONGKHAM, SIRACHA
CHONBURI 20230

CRM # - CSE: Pattayut Wanwongka

UPON SITE ARRIVAL:

- ☒ Verify that the instrument was not damaged during shipment
- ☒ Unpack the PC and all other accessories. Record the following:

PinAAcle Instrument Model:	PinAAcle 900F	S/N	PFBS22080801
Auto Sample Model:	N/A	S/N	-
Computer Model:	DELL	S/N	37024013667
Cooling System Model:	N/A	S/N	-
Printer Model:	N/A	S/N	-
Misc.	FIAS 100	S/N	100S22081101

- ☒ Record the software and firmware revision below:
 - Syngistix Software for AA Version: 5.0.1.2029
 - PinAAcle Spectrometer Firmware Version: 1.5.0.0126
 - PinAAcle Furnace Firmware Version: N/A
- ☒ Check the model specific Shipping Kit packed separately for completeness. Verify the shipping Kit with each instrument order includes all items listed.

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CUSTOMER ORIENTATION:

- ☒ Refer to the Customer Orientation Script for details
- ☒ Explain the warranty and customer replaceable parts policy
- ☒ Inform the customer of relevant PerkinElmer training courses, websites, and phone number

PinAAcle 900 Series 900T, 900H, 900Z & 900F

Installation Performance Test Data Sheet

Flame Sensitivity and Precision
(PinAAcle Series 900T, 900H & 900F)

With Stainless Steel Nebulizer

Sensitivity	Mean Absorbance ≥ 0.250	N/A
Precision	%RSD ≤ 0.30 %	N/A

With High Sensitivity Nebulizer

Sensitivity	Mean Absorbance ≥ 0.250 Abs.	0.3759	Abs.
Precision	%RSD ≤ 0.40 %	0.25	%

THGA Furnace Copper Characteristic Mass and Zeeman Ratio
(PinAAcle 900T & 900Z)

Copper Characteristic Mass

Characteristic Mass	14 ± 2.5 pg	N/A	pg
Zeeman Ratio	0.52 ± 0.04	N/A	
Precision	%RSD ≤ 2.0 %	N/A	%
A.C Voltage measurement under load (Atomization)	≥ 208 VAC	231	VAC

HGA Furnace Chromium Characteristic Mass and Precision
(PinAAcle 900H)

Chromium Characteristic Mass

Characteristic Mass	3 ± 0.8 pg	N/A
Precision	≤ 2.0 %	N/A
A.C Voltage measurement under load (Atomization)	≥ 207 VAC	N/A

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PinaAcle 900 Added Installation Test Checklist:

Model: PinaAcle 900T Serial Number: PFB522080801
 Software Version: 5.0.1.2029 Spectrometer FW Version: 1.5.0.0126
 Furnace FW Version: N/A
 Instrument Control PCB revision: 3

NOTE: First 12 test checks are mandatory

1. 0.2, 0.7 & 2.0 Sifts and 8 Lamp turret position calibration.

Check ☒

2. Cu energy & Capacitance:

Cu 324.75nm Line:Energy can vary by model and configuration, but Capacitance should be > 7pF.

Capacitance= 7.0 pF

3. Wavelength Calibration Passed (As, Cu, Ba, K & 6 steps)

Yes ☒
 No ☐

4. Wavelength Accuracy Check

AS 193.70 nm +/- 0.12 nm	(193.58-193.82)	193.7 nm
Cu 324.75 nm +/- 0.12 nm	(324.63-324.87)	324.7 nm
Ba 553.55 nm +/- 0.12 nm	(553.43-553.67)	553.5 nm
K 766.49 nm +/- 0.12 nm	(766.37-766.61)	766.5 nm

5. HCL Sample to HCL Reference Ratio with Cu #

30:70	N/A	HCL = 0.43, spec 0.18-0.58, target 0.34-0.52
30:70	N/A	D2 spec = 1.0-4.3
50:50	0.85	HCL = 1.0, spec 0.42-1.35, target 0.90-1.15
50:50	0.97	D2 spec = 0.43-1.84

6. Monochromator Bleed cover with Cu: Must be done with drak current checked (on) #

Sample beam blocked value 19 spec <60 counts, ideally <20
 Reference beam blocked value (900TH) N/A spec <60 counts, ideally <20

7. Cu Flame Double-Beam Check #

Mean_15 mA - Mean_10 mA =< 0.004f 0.0024

8. Low UV Energy & Capacitance check: check on on all

Cu 216.5 nm	1.0	> 1 pF Energy = 85	below 50 may be a problem
*Pb 217.0 nm	N/A	> 1 pF Energy = N/A	below 50 may be a problem
*Zn 213.0 nm	N/A	> 1 pF Energy = N/A	below 50 may be a problem

* Option tests

N/A for PinaAcle 9002. Flame double-beam ode test



PinaAcle 900 Added Installation Test Checklist:

Model: PinaAcle 900T Serial Number: PFB522080801
 Software Version: 5.0.1.2029 Spectrometer FW Version: 1.5.0.0126
 Furnace FW Version: N/A
 Instrument Control PCB revision: 3

NOTE: First 12 test checks are mandatory

1. 0.2, 0.7 & 2.0 Sifts and 8 Lamp turret position calibration.

Check ☒

2. Cu energy & Capacitance:

Cu 324.75nm Line:Energy can vary by model and configuration, but Capacitance should be > 7pF.

Capacitance= 7.0 pF

3. Wavelength Calibration Passed (As, Cu, Ba, K & 6 steps)

Yes ☒
 No ☐

4. Wavelength Accuracy Check

AS 193.70 nm +/- 0.12 nm	(193.58-193.82)	193.7 nm
Cu 324.75 nm +/- 0.12 nm	(324.63-324.87)	324.7 nm
Ba 553.55 nm +/- 0.12 nm	(553.43-553.67)	553.5 nm
K 766.49 nm +/- 0.12 nm	(766.37-766.61)	766.5 nm

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30:70	N/A	HCL = 0.43, spec 0.18-0.58, target 0.34-0.52
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50:50	0.85	HCL = 1.0, spec 0.42-1.35, target 0.90-1.15
50:50	0.97	D2 spec = 0.43-1.84

6. Monochromator Bleed cover with Cu: Must be done with drak current checked (on) #

Sample beam blocked value 19 spec <60 counts, ideally <20
 Reference beam blocked value (900TH) N/A spec <60 counts, ideally <20

7. Cu Flame Double-Beam Check #

Mean_15 mA - Mean_10 mA =< 0.004f 0.0024

8. Low UV Energy & Capacitance check: check on on all

Cu 216.5 nm	1.0	> 1 pF Energy = 85	below 50 may be a problem
*Pb 217.0 nm	N/A	> 1 pF Energy = N/A	below 50 may be a problem
*Zn 213.0 nm	N/A	> 1 pF Energy = N/A	below 50 may be a problem

* Option tests

N/A for PinaAcle 9002. Flame double-beam ode test

9. Mn Resolution Peak to Valley Ratio

HCL Sample Intensity (Valley) / HCL Sample Intensity (Peak) < 0.40 (40%) N/A

HCL Reference Intensity (Valley) / HCL Reference Intensity (Peak) < 0.40 (40%) N/A

Furnace Mode (900Z)

HCL Sample Intensity (Valley) / HCL Sample Intensity (Peak) < 0.40 (40%) N/A

10. Furnace and Baffles Alignment Check w/ Cu (900T/Z/H)

PK Area - AA < 0.005 A-s N/A

PK Area - BG < 0.005 A-s N/A

11. Furnace auto sample check valve test (900T/Z/H)

Places sample probe onto rinse alignment and for 2 minutes and watch for backwards flow of rinse solution

Does rinse solution go backward? Y/N N/A

Optional Test Check

[Flame only Verification - 900T/H/F]

12. Gas box calibration check default flow settings

Fuel flow N/A 20-22

Oxidant flow N/A around 43

Nebulizer Pressure N/A 29-29.5

[Furnace only Verification] *Note test 13&14 should be done simultaneously

13. Voltage drop*

2300C Atomization test N/A spec < 16 volts

14. Cr heating rate* : By design the ASCOM PS will output the right DC voltage regardless of the incoming voltage, so that is not the purpose of this test. We are using this to check the conductivity of the furnace head and the function of the pyrometer.

10ppb Cr standard @ 2300C Peak Height/Peak Area N/A > 1.3

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Comments:

PerkinElmer Service Engineer Signature:  Date: 28-11-22

Patrayut Wanwongka

~~COPY~~

BAROMETER

Equipment : Analog Barometer

ID No. / Tag No. : BM001/41



MIRACLE INTERNATIONAL TECHNOLOGY CO., LTD.
214 Bangwaek Rd. Bangnai Bangkok 10160
Tel.: 0-2865-4647-8 Fax: 0-2865-4649 <http://www.mit.in.th>



CALIBRATION CERTIFICATE

Certificate No. : L202305085-002
Date Issued : 16-May-23

Customer : Eastern Thai Consulting 1992 Co., Ltd.
683 Moo 11 Sukhapibarn 8 Rd., Nongkham, Sriracha, Chonburi 20230

Equipment : Analog Barometer

Manufacturer : Barigo
Model : -
Serial No. : -
ID No./Tag No. : BM001/41
Date Received : 11-May-23
Date Calibrated : 15-May-23
Calibrated by : Mr. Jame Khaothong

Calibration Method or Calibration Procedure Used

In-house method : CP-21 base on DKD-R 6-1: Edition 3 2014.

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

Result of Calibration

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

This certificate may not be reproduced other than in full except with the prior written approval of the Miracle International Technology Company Limited.



Approved by: *Sarayuth T.*
(Mr. Sarayuth Tothua)

Page 1 of 2

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Certificate No : L202305085-002
Environment : Ambient Temperature : $(25 \pm 2)^{\circ}\text{C}$
Relative Humidity : $(50 \pm 15)\%\text{RH}$

STD Reading mbar	UUC Reading (mbar) Before Adjusted	UUC Reading (mbar) After Adjusted	UUC Error mbar	Uncertainty \pm mbar
990.00	990.0	-	0.00	0.61
1000.00	1000.0	-	0.00	0.61
1010.00	1010.0	-	0.00	0.61
1020.00	1020.0	-	0.00	0.61
1030.00	1030.0	-	0.00	0.61

STD = Standard

UUC = Unit Under Calibration

Calibrated condition :

Pressure Medium : Air : Density = 1.19 kg/m^3 @ 20°C , 1 bar
Mounting Position : Vertical
Reference Level : at center of its dial
Conversion Factor : Multiply by $1.0 \text{ E}+02$ - Pa unit

Description of UUC :

Range : 990 - 1030 mbar Absolute
Calibration Range : 990 - 1030 mbar Absolute
Scale Interval : 1 mbar
Resolution : 0.5 mbar Absolute

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

IRPC Certificate No. CL1-P220104 for Reference Pressure Monitor Serial No. 1598, Due 11-Nov-23

End of Certificate

Page 2 of 2

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Hot Air Oven

Model. : UM 400

Serial No. : 900982

REPORT OF CALIBRATION

Results of Calibration

Resolution : 0.1 °C

1. Reporting of Temperature

Calibration point (°C)	UUC* setting (°C)	UUC* reading (°C)	Measured temperature at each positions (°C)								Uncertainty ± (°C)	Coverage factor k
			# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	# 9 ^{Ref}	
85	85.0	85.0	85.18	85.04	84.62	84.82	85.03	85.04	85.00	84.96	85.08	2.00

2. Characterization results

Calibration point (°C)	Stability ± (°C)	Uniformity (°C)	Overall variation (°C)
85	0.07	0.49	0.68

Notes

UUC* = Unit Under Calibration

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapibon 8 Rd., Nongkham,
Siracha, Chonburi 20230

Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.
(Hot Lab)

Equipment : Temperature controlled enclosures (Hot air oven)

Manufacturer : Memmert

Model : UM 400

ID No. : LABE 17/1

Date of Receipt : 21 February 2023

Date of Calibration : 21 February 2023

Condition of Calibration

1. Environment	1.1 Ambient temperature	Maximum : 31.2 °C	Minimum : 28.7 °C
	1.2 Relative humidity	Maximum : 50.2 %	Minimum : 40.1 %
	1.3 Line voltage supplied	Maximum : 223.9 VAC	Minimum : 221.5 VAC

2. Calibration method

TLAS-G-20: Guidelines for calibration and checks of temperature controlled enclosures.

3. Reference standard instrument

Instrument	ID No.	Certificate No.	Due Date
Data acquisition with sensor (RTD-PT100)	LB-DA-12 (RTD-158 to RTD-166)	22-040312	02 May 2023

4. This certificate is traceable to the international system of unit (SI Unit).

The measurement is traceable to Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.

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

6. Condition of calibration item : Normal

Calibrated by : Mr. Sarawoot Thammo
Scientist

Approved by : (Mr. Somchai Neampunt)
Signed for Director

Issue date : 24 February 2023

The uncertainties are for a confidence probability of approximately 95%.
The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

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REPORT OF CALIBRATION

Page 3 of 3

Certificate No. : 23-018635

Sample Code : 23-07651-001

Results of Calibration

Notes

1. Sensor installation locations
 - 1.1 All sensors at any corners or walls should be positioned 5 cm (a x b x c) from the wall.
 - 1.2 The reference sensor is preferably located of the geometric center of the chamber.
2. Interior dimensions approx of chamber :
W = 40 cm ; D = 28 cm ; H = 39 cm
3. Air valve or fresh air level : Off
4. Fan level : Open
5. The quoted uncertainty includes " Stability of chamber and loading effect in chamber at 20% of uniformity ".
6. 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.
7. Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.
8. Overall variation - the difference of the maximum and the minimum measured temperatures throughout observation time.
9. UUC* reading - the average reading of indicating device that forms the integral part of the enclosure.
10. Calibration results without adjustment.

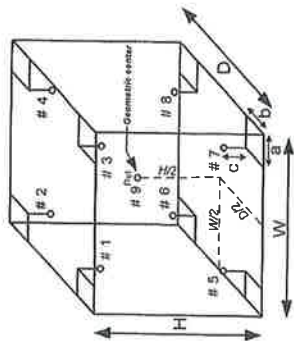


Figure: Example of sensor
installation Positions

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%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003.

- End of Report -

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INDUCTIBELY COUPLED PLASMA SPECTROMETER

Model : Prodigy 7

Serial No. : P70177



บริษัท แอปพลิเคชัน ดีฟายน์ จำกัด
Application Define Company Limited
133/318 ถนนพหลโยธิน แขวงสามยุค เขตเมืองใหม่ กรุงเทพมหานคร 10510
133/318 Hatairath Road, Minburi Sub-district Minburi District, Bangkok 10510
Tel: (66)8455-5191 E-mail: support@apdefine.co.th Website: http://www.apdefine.co.th
เลขประจำตัวผู้เสียภาษี 0105556032491

CERTIFICATE OF INSTRUMENT PERFORMANCE

INSTRUMENT:

INDUCTIVELY COUPLED PLASMA SPECTROMETER

BRAND:

Teledyne Leeman Labs

MODEL:

Prodigy 7

SERIAL NO.

P70177

CUSTOMER:

บริษัท อีทีพี เทคโนโลยี จำกัด

CHECKING:

SPECTROMETER

Wavelength Accuracy check by use emission line of Hg Lamp

Mercury line 253.652 nm.

Plasma View (Dual View)

CMOS Detector check

Align View by Mn line 257.610 nm.

RF GENERATOR

Incident Power 1,200 ±10 Watt Reading = 1200 Watt

SAMPLE INTRODUCTION

Plasma Torch, Injector, Spray chamber, Nebulizer

Partialtic pump & Tubing

EXHAUSTING & COOLING SYSTEM

Safety Interlock Switch (Door, Argon pressure, Water pressure)

Cooling System, water flowrate & low pressure switch

Flowrate of Air blower

COMPUTER & SOFTWARE

Plasma Ignition software & Analytical Software

ANALYTICAL TEST

Full Frame Capture & Echellogram check

Calibration Cuve & QC Test

DATE : Dec 12, 2022

Mr. Somchai Chumyung

Engineer Sign

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PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท อีทีพี เทคโนโลยี จำกัด 1992 จำกัด






Date: Dec 12, 2022

Instrument: ICP-OES

Model: Prodigy 7

S/N: P70177

1. Gas Supply /Water Re-circulator/Exhaust Hood Check:

Gas system: ตรวจสอบแรงดันแก๊สและแก๊สที่เต็ม Argon Pressure: 5.5 psi Leak inspected (✓) No leak Nitrogen Pressure: 5.5 psi Leak inspected (✓) No leak Oxygen Pressure: 5.5 psi Leak inspected (✓) No leak	
() Change camera purge gas Dehydrator (1 times /years) Next time replacement 25/12/2564 เปลี่ยนตัวความชื้นดีไฮเดรต ทุก 1 ปี	
Water Chiller: RF generator flow rate 4.44 LPM Temperature 25.0 C ตรวจอุณหภูมิ Leak inspected (✓) No leak ตรวจท่อทุกตัว	
Water Chiller: Camera (✓) check water level and refill ตรวจระดับน้ำและเติมน้ำ (✓) change water เปลี่ยนน้ำ Temperature 25.1 °C ตรวจอุณหภูมิ	
Exhaust Hood Flow rate 270 CFM (system request > 150)	

TELEDYNE LEEEMAN LABS
PURITY. PRECISION. PERFORMANCE.

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PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท อีทีพีไทย คอนสตรัคชั่น 1992 จำกัด	Date: Dec 12, 2022
Instrument: ICP-OES	Model: Prodigy 7
	S/N: P70177

2. Computer & Software Check

Description	Status
Interface Cable USB (✓) No broken	OK
Software Version	OK
(✓) Operation function check:	OK
(✓) Open /Save /Edit method	OK
(✓) Instrument Control	OK
(✓) Sequence	OK
(✓) Full Frame Capture (Echelle Mode)	OK
(✓) Auto alignment /Hg alignment	OK
(✓) Calibration Curve	OK
(✓) Re-Calculation	OK
(✓) Print Report	OK

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PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท อีทีพีไทย คอนสตรัคชั่น 1992 จำกัด	Date: Dec 12, 2022
Instrument: ICP-OES	Model: Prodigy 7
	S/N: P70177

3. Instrument Control

Description	Status
Optical view position: ตรวจสอบตำแหน่งพัฒนาที่ติดตั้งในเตาและมุมอง	
Hg Lamp Deltas	
X 2 Y - 9	OK
XUV 0	OK
Axial peak positions X 3325 Y 1225	OK
Radial peak positions X 4151 Y 1225	OK
Hg lamp peak positions X 2220 Y 2630	OK
Plasma Control ตรวจสอบการทำงานภาคและดับพลาสมา	
(✓) Auto Start	OK
(✓) Extinguish	OK
(✓) RF power setting	OK
(✓) Igniter	OK
(✓) Air Knife	OK
Torch Gas ตรวจสอบการทำงานระบบแก๊สที่ใช้ในเตาพลาสมา	
(✓) Coolant /Plasma Flow control	OK
(✓) Aux Flow	OK
(✓) Nebulizer Flow	OK
(✓) Optimize sample introduction function	OK
(✓) Peristaltic pump control	OK
(✓) Auto sampler Control	OK
(✓) Camera Support Module	OK
(✓) Diagnostic	OK

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PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท อีสเทิร์นไทย คอนสตรัคชั่น 1992 จำกัด	Date: Dec 12, 2022
Instrument: ICP-OES	Model: Prodigy 7

4. Cleaning & Replacement

Description	Status
(✓) O-Ring Torch replacement	OK
(✓) Pump Tubing replacement	OK
(✓) Glassware cleaning (Torch, Nebulizer, Spray chamber)	OK
(✓) Lube the roll peristaltic pump	OK
(✓) Optical windows cleaning	OK
(✓) Camera Water Re-circulator (water change/ refilled)	OK
(✓) RF Generator Water Re-circulator (water change/ refilled)	OK
(✓) Cleaning Electronics Board with spray cleaner	OK
(✓) Cleaning dust inside Unit	OK
(✓) Cleaning dust filter	OK

5. Safety Interlock

Description	Status
(✓) Door switch	OK
(✓) RF Water Re-circulator	OK
(✓) Camera Water Re-circulator	OK
(✓) Camera purge gas	OK
(✓) Argon pressure	OK
(✓) Nitrogen pressure	OK

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PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท อีสเทิร์นไทย คอนสตรัคชั่น 1992 จำกัด	Date: Dec 12, 2022
Instrument: ICP-OES	Model: Prodigy 7

6. Hardware Check with SALSA.EXE Diagnostics

Power Supply	Value	Status
-12 VDC (11 - 14.5 VDC)	-13.55V	OK
+12 VDC (11 - 14.5 VDC)	+12.01V	OK
+3.3VDC	3.26V	OK
+5.0VDC	4.94V	OK
+13.5 VDC	13.48V	OK

Plasma Generator	Value	Status
ICP Current 0.500A = 1kW	0.54A	OK
ICP Ref 5.0Vdc = 1kW	5.46V	OK
ICP Current 0.00 Vdc = 0kW	0	OK
ICP Ref 0.00Vdc = 0kW	0	OK
RF Water (Hz) OFF	0	OK
RF Water (Hz) ON	23	OK
Air Knife Pres. (0.00V) OFF	0	OK
Air Knife Pres. (3.0 - 7.0 V) ON	4.05V	OK
Neb 25 @ setting of 25 PSI	25	OK
Cool 18 @ setting of 18 LPM	18	OK
Aux 0.6 @ setting of 6 LPM	0.6	OK
Pump Current (0.000 A) OFF	0	OK
Pump Voltage (0.000 V) OFF	0	OK
Pump Current (0.8 to 4.0A) ON	1.0A	OK
Pump Voltage (8 to 13 V) ON	12.52	OK

Set Points	Value	Status
Air In Set Point 32°C	31	OK
Cam Tee Temperature -32°C	-32	OK
Op Purge Low 0.77 LPM	0.7	OK
Op Purge High 15.50 LPM	15.5	OK
Cam Wtr T 28°C	28	OK



COPY

PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท อีทีพีไทย คอนสตรัคชั่น 1992 จำกัด	Date: Dec 12, 2022
Instrument: ICP-OES	Model: Prodigy 7
	S/N: P70177

7. Mn Check for performance Test

	Condition for performance Test	Condition Test	Status
Standard	1 ppm, 5 ppm, 10 ppm	10 ppm	ok
Power plasma	1.20 kw	1.2	ok
Plasma gas	16.0 LPM	16	ok
Auxiliary Gas	0.8 LPM	0.8	ok
Nebulizer	1.2 LPM	25 psi	ok
Pump Speed	25 RPM	25	ok
Integration time	15 s Axial, 5 s Radial	10 s, 5 s	ok
Nebulizer Type	Seaspray, Conical, Meinhard	Seaspray	ok
Intensity first performance	1 ppm ≥ 4,000,000 5 ppm ≥ 15,000,000 10 ppm ≥ 50,000,000	265,000,000	ok

Engineer Sign	12 Dec 2022
	
Somchai Chumyaung	TELEDYNE LEEMAN LABS Everywhere you look

COPY

MERCURY ANALYZER

Model : RA-4500

Serial No. : 21780504



บริษัท โคกซ์ กรุ๊ป คอร์ปอเรชั่น จำกัด
COAX GROUP CORPORATION LTD.

COAX GROUP CORPORATION LTD.

DATE : March 24, 2023

Certificate of Calibration

MERCURY ANALYZER FOR WORKING ENVIRONMENT
THERMOMETER / RA-4500

Customer name : Eastern Thai Consulting 1992 Co.,Ltd.

Certificate No : SRP001-23
Customer P/O : PO.no.PL6602053
Sale Order No : -

Model # RA-4500
Serial No. # 21780504

Results : Quality Reborn Reference Standard Laboratory, NSC-TISI-TIS 17025 Calibration No.0292

Cal. Points	TIME	PRESET TEMP	Ave.	FACTOR ±0.5
3 Point	60 Minutes	95 (°C)	90.73	0.950 - 1.050

This instrument is calibrated at factor 0.955

TEST APPARATUS

Instrument Type	Serial Number	Certificate No.
PONPE 429TP	5845166	TM23-0008
PONPE 429TP	5845167	TM23-0009
PONPE 429TP	5845168	TM23-0010

Date of Calibrate : March 24, 2023

Next due date : March 24, 2024

Calibrate by

Approve by :

(Siriraj Pinsiri)
Service Engineer

(Pathom Srivises)
Service Manager
Environments & Petroleum Division

Environments & Petroleum Division

Eastern Thai Consulting 1992 Co., Ltd.

Automatic Mercury Analyzer

Model RA-4500

Preventive Maintenance Report

Serial No. : 21780504

Soft version : Ver 2.0.7

ROM version : Ver 2.0.1

Date : February 09, 2023

Next due date : August 09, 2023

PM by : 
(P. Siriraj)

Approved by : 
(Pathom S.)



Coax Group Corporation Ltd.

1131/62,64,325-331 Nakornchaisri road,
Kwang ThanonNakornchaisri, Dusit, Bangkok 10300 Thailand
Tel. 02-2435263, 02-6682436 Fax. 02-2437386

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Inspection result

ITEM	STANDARD	RESULT	JUDGE
1. Self Check			
1.1 Leak check	0.14 - 2.0L/min	0.17L/min	PASS
1.2 Sig/Ref check	Signal 3.00 - 4.00V Sig:3.97V, Ref:3.89V		PASS
1.3 Drift check	0.0000236 - 0.0000061	0.0000175	PASS
2. Analytical curve inspection(AREA)			
2.1 Calibration curve 0-100ng (Hight)	Correlation coefficient (r) ≥ 0.9999	1.0000	PASS
3. Repeatability(AREA)			
3.1 Repeat STD 50ng, n=3		1. 50.60 ng 2. 50.94 ng 3. 50.71 ng	
	C.V. ≤ 5%	0.34%	PASS
4. Blank	Below 1.0(AREA)	0.0158	PASS

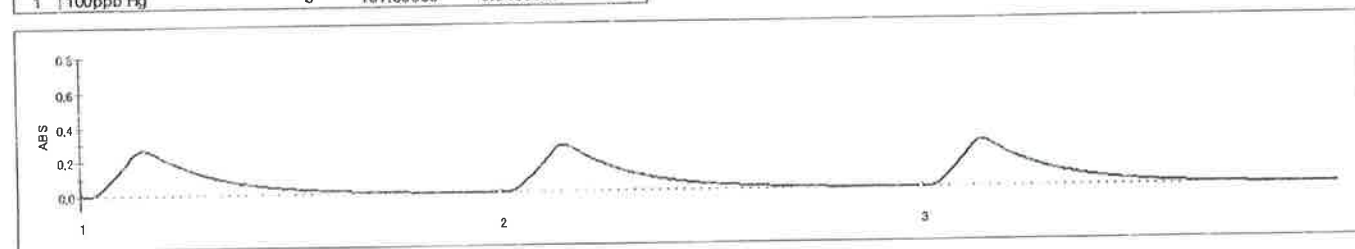
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SMP

No.	NAME	SVOL [mL]	CVOL [mL]	DVOL [mL]	AREA [ON]	MEAS [ng]	CONC [ug/L]	Color		Note
								[1]	[2]	
1	100ppb Hg	0.500	5.000	5.000	73.5373	50.6006	101.2012	-	-	
2	100ppb Hg	0.500	5.000	5.000	74.0347	50.9422	101.8844	-	-	
3	100ppb Hg	0.500	5.000	5.000	73.6938	50.7081	101.4162	-	-	

Statistics

No.	NAME	TRY	AV [ug/L]	SD [ug/L]	Cv [%]
1	100ppb Hg	3	101.50060	0.3493323	0.34



Self Check

Heat check: PASS!! (27.1degC[05:00] -> 31.2degC[03:03])
 Sensor check: PASS!! (3488- 133=3355)
 Leak check: PASS!! (0.17L/min)
 Sig/Ref check: PASS!! (Sig:3.97V, Ref:3.89V)
 Drift check: PASS!! (0.0000236 - 0.0000061 = 0.0000175)

COPY

-2-

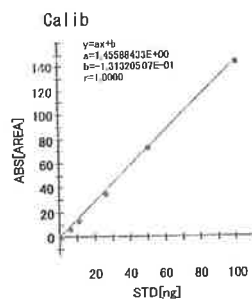
NIC NIPPON INSTRUMENTS CORPORATION

9/2/2566 16:11

Title : RA-4500 Preventive Maintenance no.2of2 in Warranty
 Date : 9/2/2566
 Name : Coax Group Corporation Ltd.
 Memo : Calibration curve, range 0-100ng

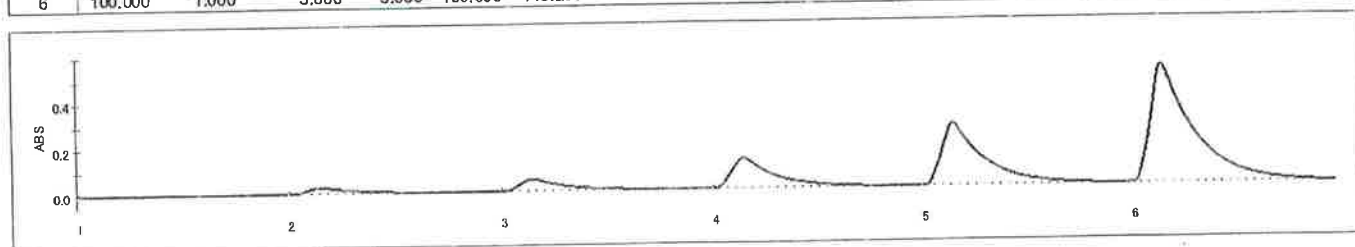
Method

Method1 (Pretreatment: without)
 (1+1)H2SO4 : 0.9mL
 10w/v% SnCl2 : 0.5mL
 Measurement Time (sec) : 120sec



STD

No.	STD [ppb]	SVOL [mL]	CVOL [mL]	DVOL [mL]	STD [ng]	AREA [ON]	MEAS [ng]	Dev [%]	Color		Note
									[1]	[2]	
1	100.000	0.000	5.000	5.000	0.000	0.0158	0.1011	-	-	-	
2	100.000	0.050	5.000	5.000	5.000	7.4089	5.1791	3.6	-	-	
3	100.000	0.100	5.000	5.000	10.000	14.1152	9.7855	2.1	-	-	
4	100.000	0.250	5.000	5.000	25.000	35.6872	24.6026	1.6	-	-	
5	100.000	0.500	5.000	5.000	50.000	73.3032	50.4398	0.9	-	-	
6	100.000	1.000	5.000	5.000	100.000	145.2998	99.8919	0.1	-	-	



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STANDARD WEIGHT 50 g



Certificate No. : 22-052238
Sample Code : 22-19150-003

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapiban 8 Rd., Nongkham,
Sriracha, Chonburi 20230

Location of Calibration : Asia Medical and Agricultural Laboratory and Research Center Public Company Limited
(Calibration Laboratory)

Equipment : Standard Weight 50 g

Manufacturer : METTLER TOLEDO

Class : F1

Serial No. : N/A

ID No. : LABE 10/1

Date of Receipt : 18 May 2022

Date of Calibration : 30 May 2022

Calibrated by : Mr. Somwang Sangdee
Scientist

Issue date : 31 May 2022

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).



Certificate No. : 22-052238
Sample Code : 22-19150-003

REPORT OF CALIBRATION

Equipment : Standard Weight 50 g

Manufacturer : METTLER TOLEDO

Class : F1

Serial No. : N/A

ID No. : LABE 10/1

Result of Calibration :

☒ Without adjustment

☐ Adjustment

Conventional value of the result of weighing in air. For a weight taken at a reference temperature (t_{ref}) of 20°C, the conventional mass is the mass of a reference weight of a density (ρ_{ref}) of 8000 kg.m⁻³ which it balances in air of a reference density (ρ_0) of 1.2 kg.m⁻³

Description	Deviation	Conventional	Expanded	Maximum	ID No.
		Mass	Uncertainty	Permissible Error	
	(mg)		(mg)	± (mg)	
50 g	-0.324	49.999676 g	0.10	0.30	LABE 10/1

The result expanded uncertainty of measurement U is stated as the standard uncertainty multiplied by the coverage factor $k=2.0$, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003

[Signature]

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Certificate No. : 22-052238

Sample Code : 22-19150-003

Page 3 of 3

REPORT OF CALIBRATION

Condition of Calibration

1. Ambient Conditions : Temperature $20^{\circ}\text{C} \pm 1.5^{\circ}\text{C}$, Relative humidity $50\% \pm 10\%$ and air density 1.20 kg/m^3
2. Calibration Method : Direct comparison weighing according to OIML R111-1 : 2004(E)
3. Reference standard instrument

Instrument	Class	ID No.	Certificate No.	Due Date
1) Standard Weight 1 mg to 1 kg	E2	LB-WE-79	21-078366	22 September 2022

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

Asia Medical and Agricultural Laboratory and Research Center Public Company Limited

(Instrument number 1).

5. Condition of Calibration item: Normal

6. Description of Calibrated Item :

Type and Nominal Value :	Standard Weight 50 g
Shape :	Cylindrical weight with knob
Material :	Stainless steel
Case :	Wooden Box
Comments :	Recalibration

- End of Report -

COPY

STANDARD WEIGHT 100 g



Certificate No. : 22-052239
Sample Code : 22-19150-004

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapiban 8 Rd., Nongkham,
Siriracha, Chonburi 20230

Location of Calibration : Asia Medical and Agricultural Laboratory and Research Center Public Company Limited
(Calibration Laboratory)

Equipment : Standard Weight 100 g

Manufacturer : N/A

Class : N/A

Serial No. : N/A

ID No. : LABE 10/2

Date of Receipt : 18 May 2022

Date of Calibration : 30 May 2022

Calibrated by : Mr. Somwang Sangdee
Scientist

Issue date : 31 May 2022

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).



Certificate No. : 22-052239
Sample Code : 22-19150-004

REPORT OF CALIBRATION

Equipment : Standard Weight 100 g

Manufacturer : N/A

Class : N/A

Serial No. : N/A

ID No. : LABE 10/2

Result of Calibration : ☒ Without adjustment ☐ Adjustment

Conventional value of the result of weighing in air. For a weight taken at a reference temperature (t_{ref}) of 20°C, the conventional mass is the mass of a reference weight of a density (ρ_{ref}) of 8000 kg.m⁻³ which it balances in air of a reference density (ρ_a) of 1.2 kg.m⁻³

Description	Deviation (mg)	Conventional Mass	Expanded Uncertainty (mg)	Maximum Permissible Error \pm (mg)	ID No.
100 g	-0.171	99.999829 g	0.16	0.50	LABE 10/2

The result expanded uncertainty of measurement U is stated as the standard uncertainty multiplied by the coverage factor $k = 2.0$, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003

[Signature]

[Signature]
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Certificate No. : 22-052239

Sample Code : 22-19150-004

Page 3 of 3

REPORT OF CALIBRATION

Condition of Calibration

1. Ambient Conditions : Temperature 20 °C ± 1.5°C, Relative humidity 50% ± 10% and air density 1.18 kg/m³

2. Calibration Method : WI-CL-007 base on OIML R 111-1 : 2004(E)

3. Reference standard instrument

Instrument	Class	ID No.	Certificate No.	Due Date
1) Standard Weight 1 mg to 1 kg	E2	LB-WE-78	21-079366	22 September 2022

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

Asia Medical and Agricultural Laboratory and Research Center Public Company Limited

(Instrument number 1).

5. Condition of Calibration item: Normal

6. Description of Calibrated item :

Type and Nominal Value :	Standard Weight 100 g
Shape :	Cylindrical weight with knob
Material :	Stainless steel
Case :	Wooden Box
Comments :	Recalibration

- End of Report -

COPY

STANDARD WEIGHT 50 g



Certificate No. : 22-052237

Sample Code : 22-19150-002

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.

689 Moo 11, Sukhapiban 8 Rd., Nongkham,

Siracha, Chonburi 20230

Location of Calibration : Asia Medical and Agricultural Laboratory and Research Center Public Company Limited
(Calibration Laboratory)

Equipment : Standard Weight 50 g

Manufacturer : N/A

Class : N/A

Serial No. : N/A

ID No. : LABE 10/4

Date of Receipt : 18 May 2022

Date of Calibration : 30 May 2022

Calibrated by : Mr. Somwang Sangdee
Scientist

Issue date : 31 May 2022

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).



Certificate No. : 22-052237

Sample Code : 22-19150-002

REPORT OF CALIBRATION

Equipment : Standard Weight 50 g

Manufacturer : N/A

Class : N/A

Serial No. : N/A

ID No. : LABE 10/4

Result of Calibration :

☒ Without adjustment☐ Adjustment

Conventional value of the result of weighing in air. For a weight taken at a reference temperature (t_{ref}) of 20°C, the conventional mass is the mass of a reference weight of a density (ρ_{ref}) of 8000 kg.m⁻³ which it balances in air of a reference density (ρ_0) of 1.2 kg.m⁻³

Description	Deviation	Conventional	Expanded	Maximum	ID No.
		Mass	Uncertainty	Permissible Error	
	(mg)		(mg)	± (mg)	
50 g	-0.111	49.999889 g	0.10	0.30	LABE 10/4

The result expanded uncertainty of measurement U is stated as the standard uncertainty multiplied by the coverage factor $k=2.0$, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003

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NSC-TIS-71517025
CALIBRATION 0152

Certificate No. : 22-052237

Sample Code : 22-19150-002

Page 3 of 3

REPORT OF CALIBRATION

Condition of Calibration

1. Ambient Conditions : Temperature 20 °C ± 1.5°C, Relative humidity 50% ± 10% and air density 1.18 kg/m³
2. Calibration Method : WI-CL-007 base on OIML R 111-1 : 2004(E)

3. Reference standard instrument

Instrument	Class	ID No.	Certificate No.	Due Date
1) Standard Weight 1 mg to 1 kg	E2	LB-WE-79	21-079366	22 September 2022

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

Asia Medical and Agricultural Laboratory and Research Center Public Company Limited

(Instrument number 1).

5. Condition of Calibration item: Normal

6. Description of Calibrated Item :

Type and Nominal Value :	Standard Weight 50 g
Shape :	Cylindrical weight with knob
Material :	Stainless steel
Case :	Wooden Box
Comments :	Recalibration

End of Report -

Signature

COPY

THERMO-HYGROMETER

Model : 608-H1

Serial No. : 45106737



CERTIFICATE OF CALIBRATION

Page 1 of 2
Certificate No. : 23-055203
Sample Code : 23-21440-001

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapibarn 8 Rd., Nongkham,
Siiracha, Chonburi 20230

Location of Calibration : Asia Medical and Agricultural Laboratory and Research Center Public Company Limited
(Calibration laboratory)

Equipment : Digital thermo-hygrometer

Manufacturer : testo

Model : 60B-H1

Serial No. : 45106737

ID No. : LABE 09/7

Date of Receipt : 25 May 2023

Date of Calibration : 29 May 2023

Condition of Calibration

1. Environment

1.1 Ambient temperature : 23.0 °C ± 3.0 °C

1.2 Relative humidity : 55.0 % ± 15.0 %

2. Calibration method

2.1 In-house method: WI-CL-045 By comparison with thermometer standard / chilled mirror hygrometer in controlled chamber.

2.2 The calibration by comparison unit under calibration (UUC) to the thermometer standard / chilled mirror hygrometer in a chamber at the controlled temperature / relative humidity.

3. Reference standard instrument

Instrument Model ID No. Certificate No. Due Date

3.1 Chilled Mirror Optidew Vision LB-OP-02 & LB-OP-02 (DP) TH-0157-22 05 December 2023

3.2 Digital Thermometer Optidew Vision LB-OP-02 & LB-OP-02 (Temp.) 23-014916 12 February 2024

3.3 Digital Thermometer 34972A LB-DA-07 with RTD-89 22-095535 06 September 2023

4. This certificate is traceable to the international system of unit (SI Unit).

4.1 Instrument No. 3.1 through National Institute of Metrology (Thailand).

4.2 Instrument No. 3.2 and 3.3 through Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.

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

6. Condition of calibration item : Normal

Calibrated by Miss Pornsuda Lohabai

Scientist

31 May 2023

Approved by

(Mr. Somchai Neampunt)

Signed for Director

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

361 Soi Ladprao 122, Ladprao Road,
Phlabphla, Wang Thonglang, Bangkok 10310
FM-CL-114
TEL 02-516-2422
FAX 02-516-6949
Rev 01
CONTACT@AMARC.CO.TH
WWW.AMARC.CO.TH
Effective Date 15/10/21



REPORT OF CALIBRATION

Page 2 of 2
Certificate No. : 23-055203
Sample Code : 23-21440-001

Results of Calibration

Temperature measurement

Resolution : 0.1 °C
Range : 0 °C to 50 °C

Calibration point °C	Average of standard reading		Unit under calibration		Expanded uncertainty °C
	Controlled humidity %RH	Temperature °C	Average reading °C	Correction value °C	
20	50	20.00	20.0	0.00	± 0.39
25	50	25.02	25.1	0.08	± 0.39
30	50	30.00	30.0	0.00	± 0.39

Humidity measurement

Resolution : 0.1 %RH
Range : 10 %RH to 95 %RH

Calibration point %RH	Average of standard reading		Unit under calibration		Expanded uncertainty %RH
	Air temperature °C	Calculated humidity %RH	Average reading %RH	Correction value %RH	
45	25.00	45.18	53.5	8.32	± 1.3
60	25.00	60.03	68.3	8.27	± 1.5
75	25.00	75.20	83.2	8.00	± 1.7

Notes

* Calibration results without adjustment.

The result expanded uncertainty of measurement U is stated as the standard uncertainty multiplied by the coverage factor k , which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003

- End of Report -

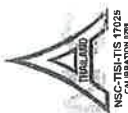
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Phlabphla, Wang Thonglang, Bangkok 10310
FM-CL-018
TEL 02-516-2422
FAX 02-516-6949
Rev 09
CONTACT@AMARC.CO.TH
WWW.AMARC.CO.TH
Effective Date 15/10/21

UV/VIS SPECTROPHOTOMETER

Model : UV - 1800

Serial No. : A11635101643 CD



Bara Scientific Co., Ltd.
968 U Chu Liang Building Floor 7 Rama4 Road
Silom Bangkok Bangkok Thailand 10500
Tel : 02-6324300 Fax : 02-6375496-7
www.barascientific.com



Certificate of Calibration

2 of 3

Certificate No. BSCC-UV-152/23

Calibration Results:

1. Wavelength Accuracy

Certified Wavelength (nm)	UUC (nm)	Error (nm)	Uncertainty (±nm)
287.71	287.65	-0.06	0.18
445.82	445.80	-0.02	0.18
536.52	536.35	-0.17	0.18
741.02	740.99	-0.03	0.18
879.41	879.27	-0.14	0.18

2. Photometric Accuracy (UV)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (±A)
235	0.0000	0.0000	0.0000	0.0075
257	0.7311	0.7313	0.0002	0.0075
257	CNR	CNR	CNR	CNR
313	CNR	CNR	CNR	CNR
350	0.0000	0.0000	0.0000	0.0075
350	0.6306	0.6314	0.0008	0.0075

*CNR = Customer not request

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The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate. Advertising the report / Certificate and publicity of the results are prohibited and also shall not be reproduced except in full, without written approval of the Bara Scientific Co., Ltd.



Bara Scientific Co., Ltd.
968 U Chu Liang Building Floor 7 Rama4 Road
Silom Bangkok Bangkok Thailand 10500
Tel : 02-6324300 Fax : 02-6375496-7
www.barascientific.com



Certificate of Calibration

1 of 3

Number of Page(s)

Certificate No. BSCC-UV-152/23

Equipment UV/Vis Spectrophotometer

Model UV-1800

Manufacturer Shimadzu

Serial No. A11635101643 CD

ID No. N/A

Date of receipt 25 April 2023

Date of calibration 25 April 2023

Date of issue 27 April 2023

Customer name Eastern Thai Consulting 1992 Co., Ltd

Address 683 Moo 11, Sukkaphibarn 8 Rd., Nongkham, Sriracha, Chonburi 20230

Temperature (22.4-23.1) °C (On site)

Humidity (44.5-45.2) %RH (On site)

Equipment condition Good Operation

Calibration Location Analysis Department

Calibration Procedure In-house method WI-UV-702-01 based on ASTM E275-01

Traceability Wavelength Accuracy is traceable to certificate No. 94780 and 94775

Photometric Accuracy is traceable to certificate No. 94808 and 100147

Stray Light is traceable to certificate No. 94791

The above certificate are traceable to SI unit through Starna Scientific Ltd.

(UKAS accredited calibration laboratory NO. 0659)

Calibrated by Mr. Pannaphong Phannmekakul

Approved by

Signature

Mr. Kanchit Choothep
Technical Manager

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968 U Chu Liang Building Floor 7 Rama4 Road
Silom Bangkok Bangkok Thailand 10500
Tel : 02-6324300 Fax : 02-6375496-7
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Bara Scientific
SILICON OF SUCCESS

Certificate of Calibration

Certificate No. **BSCC-UV-152/23** Number of Page(s) **3 of 3**

Calibration Results:

3. Photometric Accuracy (Visible)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty ($\pm A$)
420.0	0.0000	0.0000	0.0000	0.0042
	0.5488	0.5508	0.0020	0.0042
	0.7527	0.7535	0.0008	0.0042
	1.0756	1.0758	0.0002	0.0042
440.0	0.0000	0.0000	0.0000	0.0042
	0.5391	0.5406	0.0015	0.0042
	0.7355	0.7360	0.0005	0.0042
	1.0509	1.0501	-0.0008	0.0042
465.0	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
546.1	0.0000	0.0000	0.0000	0.0042
	0.5045	0.5044	-0.0001	0.0042
	0.6884	0.6885	0.0001	0.0042
	0.9816	0.9808	-0.0008	0.0042
590.0	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
635.0	0.0000	0.0000	0.0000	0.0042
	0.5183	0.5178	-0.0005	0.0042
	0.6864	0.6868	0.0004	0.0042
	0.9747	0.9739	-0.0008	0.0042

*CNR = Customer not request

4. Stray Light*

Standard cut-off wavelength (nm)	Unit Under Calibration(UUC)	
	Wavelength (nm)	Absorbance (A)
200.75±0.1nm	200.72	2.0164

The Stray light transmission reference is less than 1.0%T and Stray light absorbance reference is greater than 2.00A
*Stray Light not NSC-ONSC Accredited.

The measurement uncertainty is base on a standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95%
End of Certificate

The above results are valid exclusively for the calibrated item(s) as mention in this report / Certificate
Advertising the report / Certificate and publicity of the results are prohibited and also shall not be reproduced
except in full, without written approval of the Bara Scientific Co., Ltd.

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ANALYTICAL BALANCE (DU)

Model. : XS205DU

Serial No. : 1126323724



Certificate No. : 23-006683

Sample Code : 23-02820-006

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapiban 8 Rd., Nongkhram,
Sriracha, Chonburi 20230

Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.
(Analytical Balance Room)

Equipment : ELECTRONIC BALANCE

Manufacturer : METTLER TOLEDO

Model : XS205DU

Serial No. : 1126323724

ID No. : LABE 05/1

Date of Receipt : 20 January 2023

Date of Calibration : 20 January 2023

Calibrated by Mr. Thanadol Pholthep
Scientist

Issue date : 25 January 2023

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC)



Certificate No. : 23-006683

Sample Code : 23-02820-006

REPORT OF CALIBRATION

Equipment : ELECTRONIC BALANCE
Manufacturer : METTLER TOLEDO
Model : XS205DU
Capacity : Max 81 g / 220 g
Resolution : 0.01 mg / 0.1 mg
Serial No. : 1126323724
ID No. : LABE 05/1

Result of Calibration

1. Test weight and repeatability of reading

Repeatability is a measure of the ability of a balance to supply the same result in repetitive weighings with one and the same load under the same measurement condition. The measurement of the repeatability must include both the balance specifications and the ambient (vibration, fluctuating air current/temperature/humidity, etc.) Operator handling of the balance is also included in the standard deviation.

Unit : g	Range : 80	<input type="checkbox"/> Before adjustment	<input type="checkbox"/> After adjustment
<input checked="" type="checkbox"/> No adjustment	Nominal value	40	90
<input type="checkbox"/> Adjustment	Standard weight	40.000042	60.000045
	Average reading of indicator	40.00015	90.00019
	Standard deviation	0.000004	0.000007
Unit : g	Range : 200	<input type="checkbox"/> Before adjustment	<input type="checkbox"/> After adjustment
<input checked="" type="checkbox"/> No adjustment	Nominal value	100	200
<input type="checkbox"/> Adjustment	Standard weight	100.000022	200.000199
	Average reading of indicator	100.0001	200.0004
	Standard deviation	0.00004	0.00008

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Certificate No. : 23-006683

Sample Code : 23-02820-006

Page 3 of 4

REPORT OF CALIBRATION

Result of Calibration

2. Sensitivity or value of a scale division

Change in the output variable of a measuring instrument divided by the associated change in the input variable.

Unit : g

Range :		Range :	
Test Point		Test Point	
Sensitivity, S		Sensitivity, S	
0	0.99800	0	0.9980
40	0.99800	100	0.9980
80	0.99800	200	0.9980

3. Departure of indication from nominal value, Linearity

Unit : g

Nominal Value		Standard Value		Average Reading of Indicator		Expanded Uncertainty		Coverage Factor (k)	
Unload		0.000000		0.00000		0.0000090		2.01	
0.01		0.0100036		0.01000		0.0000093		2.01	
0.1		0.1000062		0.10000		0.000012		2.00	
1		1.0000036		1.00001		0.000014		2.00	
5		5.0000044		5.00003		0.000020		2.00	
10		10.000000		10.00007		0.000032		2.00	
20		20.000016		20.00011		0.000036		2.00	
50		50.000029		50.00013		0.000067		2.00	
100		100.000022		100.0001		0.00016		2.00	
150		150.000051		150.0001		0.00023		2.00	
200		200.000199		200.0003		0.00028		2.00	

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%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003.

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Certificate No. : 23-006683

Sample Code : 23-02820-006

Page 4 of 4

REPORT OF CALIBRATION

Result of Calibration :

4. Eccentric or off-centre loading

Deviation of the measurement value through off - center (eccentric) loading. The corner load increases with the weight of the load and its removal from the center of the pan support.

Weighting pan ☐ Circle ☐ Triangular ☒ Rectangular

Test weight : 50 and 100
Unit : g

Range	Position	Reading of indicator	Reading of indicator
1	50.00014	100.0001	100.0001
2	50.00014	99.9998	100.0000
3	50.00006	100.0000	100.0001
4	50.00010	100.0001	100.0001
5	50.00017	100.0001	100.0001
6	50.00014	100.0001	100.0001
Maximum difference	0.00008	0.0003	

Condition of Calibration

1. Calibration Method : WI-CL-004 base on UKAS LAB 14: 2019

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

3. Condition of Calibration item: Normal

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

Through the reference standard laboratory of Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (Instrument number 1).

5. Reference standard instrument :

Instrument

1) STANDARD WEIGHT 1 mg to 1 kg

Class E2

ID No. LB-WE-57

Certificate No. 22-060639

Due Date

27 June 2023

6. Ambient conditions	Min	Max
Temperature (°C)	21.3	22.4
Relative Humidity (%Rh)	39.2	40.4
Air pressure (hPa)	1008.4	1010.1

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End of Report -

ATOMIC ABSORPTION SPECTROPHOTOMETER

Model : PinAAcle 900F

Serial No. : PFBS22080801



PerkinElmer
For the Better

PER-INSTALLATION CHECKS:

- ☒ Verify that proper ventilation is installed and an adequate exhaust rate is accordance to PYL CFM N/A
- ☒ Verify that the gasses meet out PYL specifications---
- ☒ Verify that gas pressure regulators are installed with proper filters and pressure are set in accordance to PYL.
- ☒ Verify that the wiring in the lab meets our power and noise requirements specified in PYL.
- ☒ Verify that the lab environment conditions (room temperature, relative humidity) meet in our PYL specification
- ☒ Maintenance accessibility is adequate.
- ☒ Measured Mains Input Voltage under load is adequate per our PYL specifications (≥ 208 VAC)

PHYSICAL INSTALLATION:

- ☒ The instrument, cooling system, computer and any accessories are uncrated and installed on suitable bench
- ☒ Install all the electrical connections.
- ☒ Connect the gas hoses and tank regulators, set required pressures, and leak test as required.
- ☒ Install the burner System components. (PinAAcle Series 900T & 900F)
- ☒ Mount and connect the auto sample.
- ☒ Fill and connect the cooling system or connect external cooling according to specifications.
- ☒ Setup the computer and printer. Interconnect all cables between the computer, printer, and instrument.
- ☒ Setup and configure the computer to the instrument and install the software according to the installation chapter in the PinAAcle Service Manual.
- ☒ Record the furnace head voltage and manual temperature of 1200 Degrees Celsius.

INSTALLATION TESTING:

- ☒ Perform the following instrument performance tests according to the Installation and Test procedure.
Complete the Instrument Performance Test Data Sheet below.
 - PinAAcle900T, 900H & 900F
Flame Copper Sensitivity and Precision
 - PinAAcle900T & 900Z
Furnace Copper Characteristic Mass and Zeeman Ratio
 - PinAAcle900H
Furnace Chromium Characteristic Mass and Precision
- ☒ Make and electronic copy of the Instrument parameters file per SDB 900PIN_021 procedure on the customer computer

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PerkinElmer
For the Better

PinAAcle 900 Series 900T, 900H, 900Z & 900F

Installation Checklist

Customer : EASTERN THAI CONSULTING Date Tested: 28-Nov-2022
NONGKHAM, SIRACHA
CHONBURI 20230

CRM # - CSE: Pattayut Wanwongka

UPON SITE ARRIVAL:

- ☒ Verify that the instrument was not damaged during shipment
- ☒ Unpack the PC and all other accessories. Record the following:

PinAAcle Instrument Model:	PinAAcle 900F	S/N	PFBS22080801
Auto Sample Model:	N/A	S/N	-
Computer Model:	DELL	S/N	37024013667
Cooling System Model:	N/A	S/N	-
Printer Model:	N/A	S/N	-
Misc.	FIAS 100	S/N	100S22081101

- ☒ Record the software and firmware revision below:
 - Syngistix Software for AA Version: 5.0.1.2029
 - PinAAcle Spectrometer Firmware Version: 1.5.0.0126
 - PinAAcle Furnace Firmware Version: N/A
- ☒ Check the model specific Shipping Kit packed separately for completeness. Verify the shipping Kit with each instrument order includes all items listed.

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CUSTOMER ORIENTATION:

- ☒ Refer to the Customer Orientation Script for details
- ☒ Explain the warranty and customer replaceable parts policy
- ☒ Inform the customer of relevant PerkinElmer training courses, websites, and phone number

PinAAcle 900 Series 900T, 900H, 900Z & 900F

Installation Performance Test Data Sheet

Flame Sensitivity and Precision
(PinAAcle Series 900T, 900H & 900F)

With Stainless Steel Nebulizer

Sensitivity	Mean Absorbance ≥ 0.250	N/A
Precision	%RSD ≤ 0.30 %	N/A

With High Sensitivity Nebulizer

Sensitivity	Mean Absorbance ≥ 0.250 Abs.	0.3759
Precision	%RSD ≤ 0.40 %	0.25 %

THGA Furnace Copper Characteristic Mass and Zeeman Ratio
(PinAAcle 900T & 900Z)

Copper Characteristic Mass

Characteristic Mass	14 ± 2.5 pg	N/A
Zeeman Ratio	0.52 ± 0.04	N/A
Precision	%RSD $\leq 2.0\%$	N/A %
A.C Voltage measurement under load (Atomization)	≥ 208 VAC	231 VAC

HGA Furnace Chromium Characteristic Mass and Precision
(PinAAcle 900H)

Chromium Characteristic Mass

Characteristic Mass	3 ± 0.8 pg	N/A
Precision	$\leq 2.0\%$	N/A
A.C Voltage measurement under load (Atomization)	≥ 207 VAC	N/A

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PinaAcle 900 Added Installation Test Checklist:

Model: PinaAcle 900T Serial Number: PFBS22080801
 Software Version: 5.0.1.2029 Spectrometer FW Version: 1.5.0.0126
 Furnace FW Version: N/A
 Instrument Control PCB revision: 3

NOTE: First 12 test checks are mandatory

1. 0.2, 0.7 & 2.0 Silitis and 8 Lamp turret position calibration.

Check ☒

2. Cu energy & Capacitance:

Cu 324.75nm Line:Energy can vary by model and configuration, but Capacitance should be > 7pF.

Capacitance= 7.0 pF

3. Wavelength Calibration Passed (As, Cu, Ba, K < 6 steps)

Yes ☒

No ☐

4. Wavelength Accuracy Check

AS 193.70 nm +/- 0.12 nm	(193.58-193.82)	193.7 nm
Cu 324.75 nm +/- 0.12 nm	(324.63-324.87)	324.7 nm
Ba 553.55 nm +/- 0.12 nm	(553.43-553.67)	553.5 nm
K 766.49 nm +/- 0.12 nm	(766.37-766.61)	766.5 nm

5. HCL Sample to HCL Reference Ratio with Cu #

30:70	N/A	HCL = 0.43, spec 0.18-0.58, target 0.34-0.52
30:70	N/A	D2 spec = 1.0-4.3
50:50	0.85	HCL = 1.0, spec 0.42-1.35, target 0.90-1.15
50:50	0.97	D2 spec = 0.43-1.84

6. Monochromator Bleed cover with Cu: Must be done with drak current checked (on) #

Sample beam blocked value 19 spec <60 counts, ideally <20
 Reference beam blocked value (900TH) N/A spec <60 counts, ideally <20

7. Cu Flame Double-Beam Check #

Mean_15 mA - Mean_10 mA =< 0.004f 0.0024

8. Low UV Energy & Capacitance check: check on on all

Cu 216.5 nm	1.0	≥ 1 pF Energy = <u>85</u>	below 50 may be a problem
*Pb 217.0 nm	N/A	≥ 1 pF Energy = <u>N/A</u>	below 50 may be a problem
*Zn 213.0 nm	N/A	≥ 1 pF Energy = <u>N/A</u>	below 50 may be a problem

* Option tests

N/A for PinaAcle 900Z. Flame double-beam ode test



PinaAcle 900 Added Installation Test Checklist:

Model: PinaAcle 900T Serial Number: PFBS22080801
 Software Version: 5.0.1.2029 Spectrometer FW Version: 1.5.0.0126
 Furnace FW Version: N/A
 Instrument Control PCB revision: 3

NOTE: First 12 test checks are mandatory

1. 0.2, 0.7 & 2.0 Silitis and 8 Lamp turret position calibration.

Check ☒

2. Cu energy & Capacitance:

Cu 324.75nm Line:Energy can vary by model and configuration, but Capacitance should be > 7pF.

Capacitance= 7.0 pF

3. Wavelength Calibration Passed (As, Cu, Ba, K < 6 steps)

Yes ☒

No ☐

4. Wavelength Accuracy Check

AS 193.70 nm +/- 0.12 nm	(193.58-193.82)	193.7 nm
Cu 324.75 nm +/- 0.12 nm	(324.63-324.87)	324.7 nm
Ba 553.55 nm +/- 0.12 nm	(553.43-553.67)	553.5 nm
K 766.49 nm +/- 0.12 nm	(766.37-766.61)	766.5 nm

5. HCL Sample to HCL Reference Ratio with Cu #

30:70	N/A	HCL = 0.43, spec 0.18-0.58, target 0.34-0.52
30:70	N/A	D2 spec = 1.0-4.3
50:50	0.85	HCL = 1.0, spec 0.42-1.35, target 0.90-1.15
50:50	0.97	D2 spec = 0.43-1.84

6. Monochromator Bleed cover with Cu: Must be done with drak current checked (on) #

Sample beam blocked value 19 spec <60 counts, ideally <20
 Reference beam blocked value (900TH) N/A spec <60 counts, ideally <20

7. Cu Flame Double-Beam Check #

Mean_15 mA - Mean_10 mA =< 0.004f 0.0024

8. Low UV Energy & Capacitance check: check on on all

Cu 216.5 nm	1.0	≥ 1 pF Energy = <u>85</u>	below 50 may be a problem
*Pb 217.0 nm	N/A	≥ 1 pF Energy = <u>N/A</u>	below 50 may be a problem
*Zn 213.0 nm	N/A	≥ 1 pF Energy = <u>N/A</u>	below 50 may be a problem

* Option tests

N/A for PinaAcle 900Z. Flame double-beam ode test

9. Mn Resolution Peak to Valley Ratio

HCL Sample Intensity (Valley) / HCL Sample Intensity (Peak) < 0.40 (40%) N/A

HCL Reference Intensity (Valley) / HCL Reference Intensity (Peak) < 0.40 (40%) N/A

Furnace Mode (900Z)

HCL Sample Intensity (Valley) / HCL Sample Intensity (Peak) < 0.40 (40%) N/A

10. Furnace and Baffles Alignment Check w/ Cu (900T/Z/H)

PK Area - AA < 0.005 A-s N/A

PK Area - BG < 0.005 A-s N/A

11. Furnace auto sample check valve test (900T/Z/H)

Places sample probe onto rinse alignment and for 2 minutes and watch for backwards flow of rinse solution

Does rinse solution go backward? Y/N N/A

Optional Test Check

[Flame only Verification - 900T/H/F]

12. Gas box calibration check default flow settings

Fuel flow N/A 20-22

Oxidant flow N/A around 43

Nebulizer Pressure N/A 29-29.5

[Furnace only Verification] *Note test 13&14 should be done simultaneously

13. Voltage drop*

2300C Atomization test N/A spec < 16 volts

14. Cr heating rate* : By design the ASCOM PS will output the right DC voltage regardless of the incoming voltage, so that is not the purpose of this test. We are using this to check the conductivity of the furnace head and the function of the pyrometer.

10ppb Cr standard @ 2300C Peak Height/Peak Area N/A > 1.3

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Comments:

PerkinElmer Service Engineer Signature:  Date: 28-11-22

Patrayut Wanwongka

~~COPY~~

ANALYTICAL BALANCE

Model. : SECURA224-1S

Serial No. : 0036707137

Certificate No. : 23-006682
Sample Code : 23-02820-005

REPORT OF CALIBRATION

Equipment : ELECTRONIC BALANCE
Manufacturer : SARTORIUS
Model : SECURA224-IS
Capacity : Max 220 g
Resolution : 0.0001 g
Serial No. : 0036707137
ID No. : LABE 05/2

Result of Calibration

1. Test weight and repeatability of reading

Repeatability is a measure of the ability of a balance to supply the same result in repetitive weighings with one and the same load under the same measurement condition. The measurement of the repeatability must include both the balance specifications and the ambient (vibration, fluctuating air current/temperature/humidity, etc.) Operator handling of the balance is also included in the standard deviation.

Unit : g	Range : 220	<input type="checkbox"/> Before adjustment	<input type="checkbox"/> After adjustment
<input checked="" type="checkbox"/> No adjustment	Nominal value	100	200
<input type="checkbox"/> Adjustment	Standard weight	100.000022	200.000199
	Average reading of indicator	99.9998	199.9999
	Standard deviation	0.00007	0.00007

Unit : .	Range : .	<input type="checkbox"/> Before adjustment	<input type="checkbox"/> After adjustment
<input type="checkbox"/> No adjustment	Nominal value	.	.
<input type="checkbox"/> Adjustment	Standard weight	.	.
	Average reading of indicator	.	.
	Standard deviation	.	.

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Certificate No. : 23-006682
Sample Code : 23-02820-005

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapiban 8 Rd., Nongkham,
Siriracha, Chonburi 20230

Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.
(Analytical Balance Room)

Equipment : ELECTRONIC BALANCE

Manufacturer : SARTORIUS

Model : SECURA224-IS

Serial No. : 0036707137

ID No. : LABE 05/2

Date of Receipt : 20 January 2023

Date of Calibration : 20 January 2023

Calibrated by : Mr. Thanadol Pholthep
Scientist

Issue date : 25 January 2023

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).



Certificate No. : 23-006682

Sample Code : 23-02820-005

REPORT OF CALIBRATION

Result of Calibration

2. Sensitivity or value of a scale division

Change in the output variable of a measuring instrument divided by the associated change in the input variable.

Unit : g

Test Point	Range	Sensitivity, S	Test Point	Range	Sensitivity, S
0	220	0.9980			
100		0.9980			
200		0.9980			

3. Departure of indication from nominal value, Linearity

Unit : g

Nominal Value	Standard Value	Average Reading of Indicator	Correction Value	Expanded Uncertainty	Coverage Factor (k)
Unload	0.0000000	0.0000	0.0000	0.00011	2.04
0.01	0.0100036	0.0100	0.0000	0.00011	2.04
0.1	0.1000062	0.1000	0.0000	0.00011	2.04
1	1.0000036	1.0000	0.0000	0.00011	2.04
2	2.0000128	2.0000	0.0000	0.00011	2.04
5	5.0000044	5.0000	0.0000	0.00011	2.04
10	10.0000000	10.0000	0.0000	0.00011	2.03
20	20.0000016	20.0000	0.0000	0.00012	2.03
50	50.0000029	50.0000	0.0000	0.00013	2.02
100	100.0000022	99.9998	0.0002	0.00017	2.01
200	200.0000199	200.0000	0.0002	0.00028	2.00

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%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003.

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Certificate No. : 23-006682

Sample Code : 23-02820-005

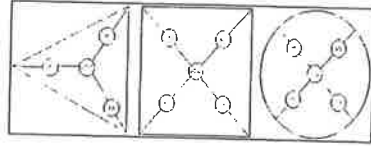
REPORT OF CALIBRATION

Result of Calibration :

4. Eccentric or off-centre loading

Deviation of the measurement value through off - center (eccentric) loading. The corner load increases with the weight of the load and its removal from the center of the pan support.

Weighting pan	Test weight : 100
<input checked="" type="radio"/> Circle	Unit : g
<input type="radio"/> Triangular	
<input type="radio"/> Rectangular	
Range	Reading of indicator
220	
Position	Reading of indicator
1	99.9998
2	100.0001
3	99.9997
4	99.9998
5	99.9998
6	99.9998
Maximum difference	0.0003
Condition of Calibration	



1. Calibration Method : WI-CL-004 base on UKAS LAB 14: 2019

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

3. Condition of Calibration item: Normal

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

- Through the reference standard laboratory of Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (Instrument number 1).

5. Reference standard instrument :

Instrument

1) STANDARD WEIGHT 1 mg to 1 kg

Class

E2

Certificate No.

22-060639

Due Date

27 June 2023

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- End of Report -

AUTOCLAVE

Model : FLS-1000

Serial No. : 55169083



CERTIFICATE OF CALIBRATION

Page 1 of 2

Certificate No. : 23-082126
Sample Code : 23-30826-004

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapibam 8 Rd., Nongkham,
Siracha, Chonburi 20230

Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.
(Autoclave Room)

Equipment : Autoclave
Manufacturer : TOMY
Model : FLS-1000
Serial No. : 55165083
ID No. : LABE 43/2
Date of Receipt : 24 July 2023
Date of Calibration : 24 July 2023

Condition of Calibration

1. Environment
- 1.1 Ambient temperature : Maximum 32.3 °C , Minimum 30.6 °C
 - 1.2 Relative humidity : Maximum 58.9 % ; Minimum 56.3 %
 - 1.3 Line voltage supplied : Maximum 226.5 VAC ; Minimum 221.6 VAC

2. Calibration method

The calibration use in-house method: WI-CL-025 based on BS 2646 part 5:1993 item 3.1.

3. Reference standard instrument

Instrument	Model	ID No.	Certificate No.	Due Date
3.1 Temperature Data Logger	HiTemp 140	LB-TEM-25	23-030851	23 March 2024
3.2 Temperature Data Logger	HiTemp 140	LB-TEM-25	23-030852	23 March 2024
3.3 Temperature Data Logger	HiTemp 140	LB-TEM-27	23-030853	23 March 2024

4. This certificate is traceable to the international system of unit (SI Unit).

The measurement is traceable to Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.

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

6. Condition of calibration item : Normal

Calibrated by : Mr. Serawoot Thammo
Scientist
25 July 2023

Approved by : (Mr. Somchai Neempunt)
Signed for Director

Issue date : 25 July 2023

The uncertainty was for a confidence probability of approximately 95%.
The calibration result is applied only to the above calibrated item and was used accurate as shown on date and place of calibration only.

This Certificate is issued in accordance with the traditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has reduced 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 increased after that in full except with the prior written approval of the Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

361 Soi Ladproo 122, Ladproo Road,
Phlabphla, Wang Thonglang, Bangkok 10310

CONTACT@AMARC.CO.TH
WWW.AMARC.CO.TH
TEL. 02-516-2422
FAX 02-516-6949
Rev 01
Effective Date 15/10/21



Page 2 of 2

Certificate No. : 23-082126
Sample Code : 23-30826-004

REPORT OF CALIBRATION

Results of Calibration

Resolution : 1 °C

1. Reporting of Temperature

Calibration point (°C)	UUC* setting (°C)	UUC* reading		Measured Temperature at each positions (°C)		Uncertainty ± (°C)	Coverage factor k
		Temperature (°C)	Pressure (MPa)				
121	121	122	0.11	# 1 121.78	# 2 121.78	# 3 121.76	2.00

2. Characterization results

Calibration Point (°C)	Stability ± (°C)	Uniformity (°C)	Overall Variation (°C)
121	0.05	0.04	0.12

Notes

- UUC* = Unit Under Calibration
- The quoted uncertainty includes "Stability of chamber and leading effect in chamber at 20% of uniformity".
- 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.
- Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.
- Overall variation - the difference of the maximum and the minimum measured temperatures throughout observation time.
- UUC* reading - the average reading of indicating device that forms the integral part of the autoclave.
- Calibration results without adjustment.

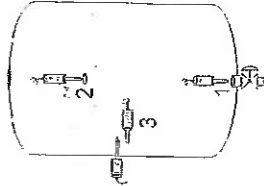


Figure: Example of sensor installation Positions

- Location 1 : 1/3 the chamber diam. within 100 mm
- Location 2 : 1/3 the upper half of the U.C. region
- Location 3 : Attached to the load temperature probe, within 20 mm

The above expressed reliability of measurement is based on the assumption that the measuring instrument is used in accordance with the manufacturer's instructions. The stated uncertainty of measurement has been determined in accordance with ISO 9001:2015.

- End of Report -

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FAX 02-516-6949
Rev 01
Effective Date 15/10/21

BAROMETER

Equipment : Analog Barometer

ID No. / Tag No. : BM001/41



CALIBRATION CERTIFICATE

Certificate No. : L202305085-002
 Date Issued : 16-May-23

Customer : Eastern Thai Consulting 1992 Co., Ltd.
 683 Moo 11 Sukhapibarn 8 Rd., Nongkham, Sriracha, Chonburi 20230

Equipment : Analog Barometer

Manufacturer : Barigo
Model : -
Serial No. : -
ID No./Tag No. : BM001/41
Date Received : 11-May-23
Date Calibrated : 15-May-23
Calibrated by : Mr. Jame Khaothong

Calibration Method or Calibration Procedure Used

In-house method : CP-21 base on DKD-R 6-1: Edition 3 2014.

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

Result of Calibration

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

This certificate may not be reproduced other than in full except with the prior written approval of the Miracle International Technology Company Limited.



Approved by: *Sarayuth T.*
 (Mr. Sarayuth Tochua)

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Certificate No : L202305085-002
 Environment : Ambient Temperature : $(25 \pm 2)^{\circ}\text{C}$
 Relative Humidity : $(50 \pm 15)\%\text{RH}$

STD Reading mbar	UUC Reading (mbar) Before Adjusted	UUC Reading (mbar) After Adjusted	UUC Error mbar	Uncertainty \pm mbar
990.00	990.0	-	0.00	0.61
1000.00	1000.0	-	0.00	0.61
1010.00	1010.0	-	0.00	0.61
1020.00	1020.0	-	0.00	0.61
1030.00	1030.0	-	0.00	0.61

STD = Standard

UUC = Unit Under Calibration

Calibrated condition :

Pressure Medium : Air : Density = 1.19 kg/m^3 @ 20°C , 1 bar
 Mounting Position : Vertical
 Reference Level : at center of its dial
 Conversion Factor : Multiply by $1.0 \text{ E}+02$ - Pa unit

Description of UUC :

Range : 990 - 1030 mbar Absolute
 Calibration Range : 990 - 1030 mbar Absolute
 Scale Interval : 1 mbar
 Resolution : 0.5 mbar Absolute

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

IRPC Certificate No. CL1-P220104 for Reference Pressure Monitor Serial No. 1598, Due 11-Nov-23

End of Certificate

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BOD INCUBATOR

ID No. : LABE 19/2

NSC-TSI-TSI17025
CALIBRATION 0152

Page 1 of 3

Certificate No. : 22-136844

Sample Code : 22-51164-006

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.

683 Moo 11, Sukhapiban 8 Rd., Nongkham,

Sriracha, Cho-buri 20230

Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.

(Laboratory)

Equipment : Temperature controlled enclosures (Incubator)

Manufacturer : N/A Model : N/A

Serial No. : SS40040277 ID No. : LABE 19/2

Date of Receipt : 21 December 2022 Date of Calibration : 21 December 2022

Condition of Calibration

1. Environment
- 1.1 Ambient temperature : Maximum 25.1 °C : Minimum 24.3 °C
- 1.2 Relative humidity : Maximum 52.3 % : Minimum 48.5 %
- 1.3 Line voltage supplied : Maximum 223.6 VAC : Minimum 221.9 VAC

2. Calibration method

TLAS-G-20: Guidelines for calibration and checks of temperature controlled enclosures.

3. Reference standard instrument

Instrument	ID No.	Certificate No.	Due Date
Data Acquisition With Sensor (RTD-PT100)	LB-DA-11 (RTD-148 to RTD-155, RTD-227)	22-040308	24 April 2023

4. This certificate is traceable to the international system of unit (SI Unit).

The measurement is traceable to Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.

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

6. Condition of calibration item : Normal

Calibrated by

Mr. Nathanan Phosri

Approved by

(Mr. Somchai Neampunt)

Scientist

Signed for Director

Issue date

26 December 2022

The uncertainties are for a confidence probability of approximately 95%

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

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 unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reissued or other than in full except with the prior written approval of the Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC)

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Effective Date 15/10/21

NSC-TSI-TSI17025
CALIBRATION 0152

Page 2 of 3

Certificate No. : 22-136844

Sample Code : 22-51164-006

REPORT OF CALIBRATION

Results of Calibration

Resolution : 0.1 °C

1. Reporting of Temperature

Calibration point (°C)	UUC* setting (°C)	UUC* reading (°C)	Measured temperature at each positions (°C)								Uncertainty ± (°C)	Coverage factor k	
			#1	#2	#3	#4	#5	#6	#7	#8			#9 ^{Ref}
20	20.0	20.0	19.65	19.56	19.47	19.29	20.96	20.47	20.23	20.58	20.29	0.35	2.00

2. Characterization results

Calibration point (°C)	Stability ± (°C)	Uniformity (°C)	Overall variation (°C)
20	0.13	1.09	1.90

Notes

* UUC* = Unit Under Calibration

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WWW.AMARC.CO.TH

Effective Date 15/10/21



REPORT OF CALIBRATION

NSC-TIS-16517025
CALIBRATION 0152

Page 3 of 3

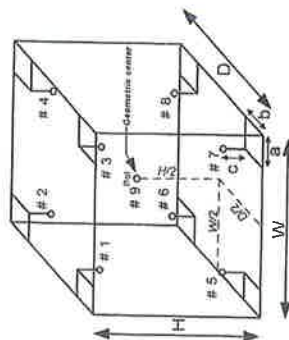
Certificate No. : 22-136844

Sample Code : 22-51164-006

Results of Calibration

Notes

1. Sensor installation locations
 - 1.1 All sensors at any corners or walls should be positioned 5 cm (a x b x c) from the wall.
 - 1.2 The reference sensor is preferably located of the geometric center of the chamber.
2. Interior dimensions approx of chamber :
W = 60 cm ; D = 70 cm ; H = 124 cm
3. Air valve or fresh air level : Off
4. Fan level : open
5. The quoted uncertainty includes "Stability of chamber and loading effect in chamber at 20% of uniformity".
6. 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.
7. Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.
8. Overall variation - the difference of the maximum and the minimum measured temperatures throughout observation time.
9. UUC^o reading - the average reading of indicating device that forms the integral part of the enclosure.
10. Calibration results without adjustment.

Figure. Example of sensor
Installation Positions

- End of Report -

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%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003.

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BOD INCUBATOR

ID No. : LABE 19/5



REPORT OF CALIBRATION

Results of Calibration

Resolution : 0.1 °C

1. Reporting of Temperature

Calibration point (°C)	UUC* setting (°C)	UUC* reading (°C)	Measured temperature at each positions (°C)								Uncertainty ± (°C)	Coverage factor k	
			# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8			# 9 nd
20	20.0	20.0	20.06	19.92	19.96	19.89	19.93	20.08	19.97	19.79	19.86	0.42	2.00

2. Characterization results

Calibration point (°C)	Stability ± (°C)	Uniformity (°C)	Overall variation (°C)
20	0.32	0.37	0.85

Notes

UUC* = Unit Under Calibration

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapiban 8 Rd., Nongkham,
Siracha, Chonburi 20230

Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.
(Laboratory)

Equipment : Temperature controlled enclosures (Incubator)
Manufacturer : Lovibond
Model : Tc44SS
Serial No. : 0520/005227
ID No. : LABE 19/5
Date of Receipt : 21 April 2023
Date of Calibration : 21 April 2023

Condition of Calibration

1. Environment	1.1 Ambient temperature	: Maximum 36.1 °C	: Minimum 34.5 °C
	1.2 Relative humidity	: Maximum 51.8 %	: Minimum 49.3 %
	1.3 Line voltage supplied	: Maximum 224.7 VAC	: Minimum 221.9 VAC

2. Calibration method

TLAS-G-20: Guidelines for calibration and checks of temperature controlled enclosures.

3. Reference standard instrument

Instrument	ID No.	Certificate No.	Due Date
Data Acquisition With Sensor (RTD-P100)	LB-DA-08 (RTD-239 to RTD-247)	22-077888	09 August 2023

4. This certificate is traceable to the international system of unit (SI Unit).

The measurement is traceable to Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.

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

6. Condition of calibration item : Normal

Calibrated by : Mr. Sarawoot Thamno
Scientist
Issue date : 24 April 2023
Approved by : (Mr. Somchai Neampunt)
Signed for Director

The uncertainties are for a confidence probability of approximately 95%.
The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.
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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).
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Effective Date 15/11/21





NSC-TSI-TIS17025
CALIBRATION0152

Page 3 of 3

REPORT OF CALIBRATION

Certificate No. : 23-040768

Sample Code : 23-16178-002

Results of Calibration

Notes

1. Sensor installation locations
 - 1.1 All sensors at any corners or walls should be positioned 5 cm (a x b x c) from the wall.
 - 1.2 The reference sensor is preferably located of the geometric center of the chamber.
2. Interior dimensions approx of chamber :
W = 60 cm ; D = 56 cm ; H = 146 cm
3. Air valve or fresh air level : Off
4. Fan level : Open
5. The quoted uncertainty includes "Stability of chamber and loading effect in chamber at 20% of uniformity".
6. 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.
7. Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.
8. Overall variation - the difference of the maximum and the minimum measured temperatures throughout observation time.
9. UUC* reading - the average reading of indicating device that forms the integral part of the enclosure.
10. Calibration results without adjustment.

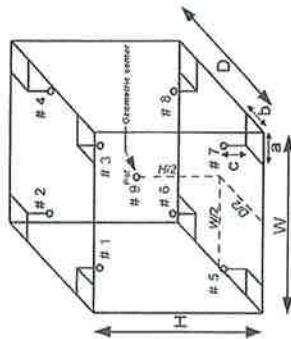


Figure:-Example of sensor
Installation Positions

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%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003

- End of Report -

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Hot Air Oven

Model. : UM 400

Serial No. : 900982

REPORT OF CALIBRATION

Results of Calibration

Resolution : 0.1 °C

1. Reporting of Temperature

Calibration point (°C)	UUC* setting (°C)	UUC* reading (°C)	Measured temperature at each positions (°C)								Uncertainty ± (°C)	Coverage factor k
			# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	# 9 ^{Ref}	
85	85.0	85.0	85.18	85.04	84.62	84.82	85.03	85.04	85.00	84.96	85.08	2.00

2. Characterization results

Calibration point (°C)	Stability ± (°C)	Uniformity (°C)	Overall variation (°C)
85	0.07	0.49	0.68

Notes

- UUC* = Unit Under Calibration

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapibon 8 Rd., Nongkham,
Siracha, Chonburi 20230

Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.
(Hot Lab)

Equipment : Temperature controlled enclosures (Hot air oven)

Manufacturer : Memmert

Model : UM 400

Serial No. : 900982

ID No. : LABE 17/1

Date of Receipt : 21 February 2023

Date of Calibration : 21 February 2023

Condition of Calibration

1. Environment	1.1 Ambient temperature	Maximum : 31.2 °C	Minimum : 28.7 °C
	1.2 Relative humidity	Maximum : 50.2 %	Minimum : 40.1 %
	1.3 Line voltage supplied	Maximum : 223.9 VAC	Minimum : 221.5 VAC

2. Calibration method

TLAS-G-20: Guidelines for calibration and checks of temperature controlled enclosures.

3. Reference standard instrument

Instrument	ID No.	Certificate No.	Due Date
Data acquisition with sensor (RTD-PT100)	LB-DA-12 (RTD-158 to RTD-166)	22-040312	02 May 2023

4. This certificate is traceable to the international system of unit (SI Unit).

The measurement is traceable to Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.

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

6. Condition of calibration item : Normal

Calibrated by : Mr. Sarawoot Thammo
Scientist

Approved by : (Mr. Somchai Neampunt)
Signed for Director

Issue date : 24 February 2023

The uncertainties are for a confidence probability of approximately 95%.
The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

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REPORT OF CALIBRATION

Page 3 of 3

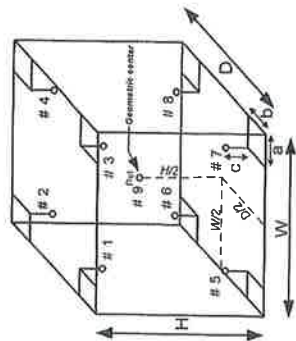
Certificate No. : 23-018635

Sample Code : 23-07651-001

Results of Calibration

Notes

1. Sensor installation locations
 - 1.1 All sensors at any corners or walls should be positioned 5 cm (a x b x c) from the wall.
 - 1.2 The reference sensor is preferably located of the geometric center of the chamber.
2. Interior dimensions approx of chamber :
W = 40 cm ; D = 28 cm ; H = 39 cm
3. Air valve or fresh air level : Off
4. Fan level : Open
5. The quoted uncertainty includes " Stability of chamber and loading effect in chamber at 20% of uniformity ".
6. 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.
7. Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.
8. Overall variation - the difference of the maximum and the minimum measured temperatures throughout observation time.
9. UUC* reading - the average reading of indicating device that forms the integral part of the enclosure.
10. Calibration results without adjustment.

Figure: Example of sensor
installation Positions

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%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003.

- End of Report -

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INDUCTIBELY COUPLED PLASMA SPECTROMETER

Model : Prodigy 7

Serial No. : P70177



บริษัท แอปพลิเคชัน สี่พันเจ็ด จำกัด
Application Define Company Limited
133/318 ถนนพหลโยธิน แขวงสามยุค เขตเมืองใหม่ กรุงเทพมหานคร 10510
Tel: (66)8455-5191 E-mail: support@apdefine.co.th Website : http://www.apdefine.co.th
เลขประจำตัวผู้เสียภาษี 0105556032491

CERTIFICATE OF INSTRUMENT PERFORMANCE

INSTRUMENT:		INDUCTIVELY COUPLED PLASMA SPECTROMETER	STATUS
BRAND:		Teledyne Leeman Labs	
MODEL:		Prodigy 7	
SERIAL NO.		P70177	
CUSTOMER:		บริษัท อีสเทิร์นไทย คอนกรีตส์ 1992 จำกัด	
CHECKING:			
SPECTROMETER		Wavelength Accuracy check by use emission line of Hg Lamp Mercury line 253.652 nm. Plasma View (Dual View) CMOS Detector check Align View by Mn line 257.610 nm.	OK OK OK OK
RF GENERATOR		Incident Power 1,200 ±10 Watt Reading = 1200 Watt	OK
SAMPLE INTRODUCTION		Plasma Torch, Injector, Spray chamber, Nebulizer Partialtic pump & Tubing	OK OK
EXHAUSTING & COOLING SYSTEM		Safety Interlock Switch (Door, Argon pressure, Water pressure) Cooling System, water flowrate & low pressure switch Flowrate of Air blower	OK OK OK
COMPUTER & SOFTWARE		Plasma Ignitation software & Analytical Software	OK
ANALYTICAL TEST		Full Frame Capture & Echellogram check Calibration Cuve & QC Test	OK OK

DATE : Dec 12, 2022

Mr. Somchai Chumyung
Engineer Sign

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PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท อีสเทิร์นไทย คอนกรีต 1992 จำกัด	Date: Dec 12, 2022
Instrument: ICP-OES	Model: Prodigy 7
	S/N: P70177

1. Gas Supply /Water Re-circulator/Exhaust Hood Check:

Gas system: ตรวจสอบแรงดันแก๊สและทำการทึ่ม Argon Pressure: 5-10 psi Leak inspected (✓) No leak Nitrogen Pressure: 5-10 psi Leak inspected (✓) No leak Oxygen Pressure: 5-10 psi Leak inspected (✓) No leak	
() Change camera purge gas Dehydrator (1 times /years) Next time replacement 25/12/2562 เปลี่ยนตัวความชื้นดีไฮเดรต ทุก 1 ปี	
Water Chiller: RF generator flow rate 4.44 LPM Temperature 25.0 °C ตรวจอุณหภูมิ Leak inspected (✓) No leak ตรวจท่อทุกตัว	
Water Chiller : Camera (✓) check water level and refill ตรวจระดับน้ำและเติมน้ำ (✓) change water เปลี่ยนน้ำ Temperature -31 °C ตรวจอุณหภูมิ	
Exhaust Hood Flow rate 270 CFM (system request > 150)	

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PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท อีทีพีไทย คอนสตรัคชั่น 1992 จำกัด	Date: Dec 12, 2022
Instrument: ICP-OES	Model: Prodigy 7

2. Computer & Software Check

Description	Status
Interface Cable USB (✓) No broken	OK
Software Version	OK
(✓) Operation function check :	OK
(✓) Open /Save /Edit method	OK
(✓) Instrument Control	OK
(✓) Sequence	OK
(✓) Full Frame Capture (Echelle Mode)	OK
(✓) Auto alignment /Hg alignment	OK
(✓) Calibration Curve	OK
(✓) Re-Calculation	OK
(✓) Print Report	OK

PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท อีทีพีไทย คอนสตรัคชั่น 1992 จำกัด	Date: Dec 12, 2022
Instrument: ICP-OES	Model: Prodigy 7

3. Instrument Control

Description	Status
Optical view position: ตรวจสอบตำแหน่งพัฒนาที่ติดตั้งในเตาและมุมอง	
Hg Lamp Deltas	
X 2 Y - 9	OK
XUV 0	OK
Axial peak positions X 3325 Y 1225	OK
Radial peak positions X 4151 Y 1225	OK
Hg lamp peak positions X 2220 Y 2630	OK
Plasma Control ตรวจสอบการทำงานภาคและดับพลาสมา	
(✓) Auto Start	OK
(✓) Extinguish	OK
(✓) RF power setting	OK
(✓) Igniter	OK
(✓) Air Knife	OK
Torch Gas ตรวจสอบการทำงานระบบแก๊สที่ใช้ในเตาพลาสมา	
(✓) Coolant/Plasma Flow control	OK
(✓) Aux Flow	OK
(✓) Nebulizer Flow	OK
(✓) Optimize sample introduction function	OK
(✓) Peristaltic pump control	OK
(✓) Auto sampler Control	OK
(✓) Camera Support Module	OK
(✓) Diagnostic	OK

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PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท อีสเทิร์นไทย คอนสตรัคชั่น 1992 จำกัด	Date: Dec 12, 2022
Instrument: ICP-OES	Model: Prodigy 7

4. Cleaning & Replacement

Description	Status
(✓) O-Ring Torch replacement	OK
(✓) Pump Tubing replacement	OK
(✓) Glassware cleaning (Torch, Nebulizer, Spray chamber)	OK
(✓) Lube the roll peristaltic pump	OK
(✓) Optical windows cleaning	OK
(✓) Camera Water Re-circulator (water change/ refilled)	OK
(✓) RF Generator Water Re-circulator (water change/ refilled)	OK
(✓) Cleaning Electronics Board with spray cleaner	OK
(✓) Cleaning dust inside Unit	OK
(✓) Cleaning dust filter	OK

5. Safety Interlock

Description	Status
(✓) Door switch	OK
(✓) RF Water Re-circulator	OK
(✓) Camera Water Re-circulator	OK
(✓) Camera purge gas	OK
(✓) Argon pressure	OK
(✓) Nitrogen pressure	OK

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PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท อีสเทิร์นไทย คอนสตรัคชั่น 1992 จำกัด	Date: Dec 12, 2022
Instrument: ICP-OES	Model: Prodigy 7

6. Hardware Check with SALSA.EXE Diagnostics

Power Supply	Value	Status
-12 VDC (11 - 14.5 VDC)	-13.555	OK
+12 VDC (11 - 14.5 VDC)	+12.012	OK
+3.3VDC	3.266	OK
+5.0 VDC	4.945	OK
+13.5 VDC	13.489	OK

Plasma Generator	Value	Status
ICP Current 0.500A = 1kW	0.546	OK
ICP Ref 5.0Vdc = 1kW	5.464	OK
ICP Current 0.00 Vdc = 0kW	0	OK
ICP Ref 0.00Vdc = 0kW	0	OK
RF Water (Hz) OFF	0	OK
RF Water (Hz) ON	23	OK
Air Knife Pres. (0.00V) OFF	0	OK
Air Knife Pres. (3.0 - 7.0 V) ON	4.054	OK
Neb 25 @ setting of 25 PSI	25	OK
Cool 18 @ setting of 18 LPM	18	OK
Aux 0.6 @ setting of 6 LPM	0.6	OK
Pump Current (0.000 A) OFF	0	OK
Pump Voltage (0.000 V) OFF	0	OK
Pump Current (0.8 to 4.0A) ON	1.04	OK
Pump Voltage (8 to 13 V) ON	12.52	OK

Set Points	Value	Status
Air In Set Point 32°C	31	OK
Cam Tee Temperature -32°C	-32	OK
Op Purge Low 0.77 LPM	0.7	OK
Op Purge High 15.50 LPM	15.5	OK
Cam Wtr T 28°C	28	OK



COPY

PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท อีทีพี เทคโนโลยี จำกัด	Date: Dec 12, 2022
Instrument: ICP-OES	Model: Prodigy 7
	S/N: P70177

7. Mn Check for performance Test

	Condition for performance Test	Condition Test	Status
Standard	1 ppm, 5 ppm, 10 ppm	10 ppm	ok
Power plasma	1.20 kw	1.2	ok
Plasma gas	16.0 LPM	16	ok
Auxiliary Gas	0.8 LPM	0.8	ok
Nebulizer	1.2 LPM	25 LPM	ok
Pump Speed	25 RPM	25	ok
Integration time	15 s Axial, 5 s Radial	10 s, 5 s	ok
Nebulizer Type	Seaspray, Conical, Meinhard	Seaspray	ok
Intensity first performance	1 ppm ≥ 4,000,000 5 ppm ≥ 15,000,000 10 ppm ≥ 50,000,000	265,000,000	ok

Engineer Sign	12 Dec 2022
	
Somchai Chumyaung	TELEDYNE LEMMAN LABS Everywhere you look

COPY

LIQUID IN GLASS THERMOMETER

Model : Total Immersion

Serial No. : 43560



QUALITY CALIBRATION CO.,LTD.

235 Petchkasem 63/2 Road, Laksong, Bangkok, Bangkok 10160
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584
www.qcalibration.com



CERTIFICATE No : 23T10864
REFERENCE No : 71117-1

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : LIQUID IN GLASS THERMOMETER
MANUFACTURER : PRECISION
MODEL : 0 °C TO 100 °C

SERIAL No : 43560

ID No : LABE 16/1

RESOLUTION : 0.1 °C

TYPE : TOTAL IMMERSION

CONDITION AS RECEIVED : USED ITEM

SUBMITTED BY : EASTERN THAI CONSULTING 1992 CO., LTD.

683 MOO 11, SUKHAPIBAN 8 ROAD, NONGKHAM,
SRIRACHA, CHONBURI 20230

CALIBRATED BY

CHARUKIT L.

CALIBRATION DATE

09-Nov-23

APPROVED BY

PONGSAK J.

ISSUED DATE

09-Nov-23

RECEIVED DATE

02-Nov-23

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF
QUALITY CALIBRATION CO., LTD.

COPY



QUALITY CALIBRATION CO.,LTD.

235 Petchkasem 63/2 Road, Laksong, Bangkok, Bangkok 10160
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584
www.qcalibration.com

CERTIFICATE No : 23T10864

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : LIQUID IN GLASS THERMOMETER
MANUFACTURER : PRECISION
MODEL : 0 °C TO 100 °C
ID No : LABE 16/1
RESOLUTION : 0.1 °C
RECEIVED DATE : 02-Nov-23
AMBIENT TEMPERATURE : 23 °C ± 3 °C
SERIAL NUMBER : 43560
TYPE : TOTAL IMMERSION
CALIBRATION DATE : 09-Nov-23
RELATIVE HUMIDITY : 50 %RH ± 20 %RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BASED ON ASTM E77:1992 BY COMPARISON WITH STANDARD PLATINUM RESISTANCE THERMOMETER (SPRT) INTO LIQUID BATH TEMPERATURE CONTROLLER. THE TEMPERATURE SCALE USED WAS BASED ON ITS-90.

2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) STANDARD THERMOMETER	1502	77964	23T3927	08-Mar-24
2) SPRT PROBE	5614	636636	23T3927	08-Mar-24
3) PRECISION BATH	7320	A21105	22T13199	14-Dec-23
4) PRECISION BATH	CTR-40	A68155	22T13198	09-Dec-23
5) PRECISION BATH	6045	3C023	22T13200	19-Dec-23

3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.

4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.

5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-

- NATIONAL INSTITUTE OF METROLOGY (THAILAND).

RESULT OF CALIBRATION : WITHOUT ADJUSTMENT

STANDARD READING (°C)	UUC* READING (°C)	IMMERSION DEPTH (mm)	CORRECTION (°C)	EMERGENT STEM TEMPERATURE (°C)	UNCERTAINTY OF MEASUREMENT (±°C)
0.009	0.0	60	0.0090	N/A	0.26
25.01	25.0	165	0.0050	N/A	0.26
50.00	50.0	275	0.0040	N/A	0.26
99.991	100.0	360	-0.009	29.3	0.26

UUC* : UNIT UNDER CALIBRATION

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT

COPY

MERCURY ANALYZER

Model : RA-4500

Serial No. : 21780504

Automatic Mercury Analyzer

Model RA-4500

Preventive Maintenance Report

Serial No. : 21780504

Soft version : Ver 2.0.7

ROM version : Ver 2.0.1

Date : August 9, 2023

PM by :  (Pathom S.)

Approved by :  (Phongpan R.)



Coax Group Corporation Ltd.

1131/62,64,325-331 Nakornchaisri road,

Kwang ThanonNakornchaisri, Dusit, Bangkok 10300 Thailand

Tel. 02-2435263, 02-6682436 Fax. 02-2437386

COPY

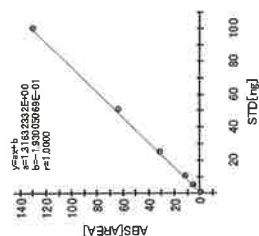
Inspection result

ITEM	STANDARD	RESULT	JUDGE
1. Self Check			
1.1 Leak check	0.14 - 2.0 L/min.	0.18 L/min	PASS
1.2 Sig/Ref check	3.0 - 4.0 volte	Sig:4.01V, Ref:4.09V.	PASS
1.3 Drift check	0.0000047 - 0.0000014	0.0000038	PASS
2. Analytical curve inspection(AREA)			
2.1 No Pretreatment	Correlation coefficient (r) ≥ 0.9990	1.0000	PASS
3. Repeatability(AREA)			
3.1 No Pretreatment 50ug/L, n=3		1. 50.353 ug/L 2. 51.477 ug/L 3. 51.306 ug/L	PASS
	C.V. ≤ 5%	1.19%	
4. Blank	Below 1.0(AREA)	0.386	OK

COPY

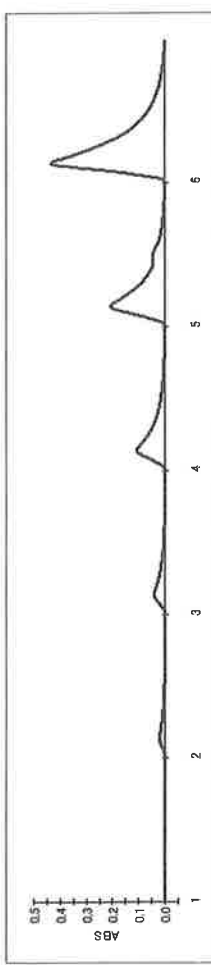
Title : RA-4500 Preventive Maintenance
 Date : 9/8/2566
 Name : Coax Group
 Memo : Calibration curve (No Pretreatment)

Calib



STD

No.	STD [ppb]	SVOL [mL]	CVOL [mL]	DVOL [mL]	STD [ng]	AREA [ON]	MEAS [ng]	Dev [%]	Note
1	0.000	5.000	5.000	5.000	0.000	0.3869	0.4405	-	
2	50.000	0.100	5.000	5.000	5.000	6.6907	5.2295	4.6	
3	50.000	0.200	5.000	5.000	10.000	12.4017	9.5681	4.3	
4	50.000	0.500	5.000	5.000	25.000	32.5205	24.8522	0.6	
5	50.000	1.000	5.000	5.000	50.000	65.2046	49.6820	0.6	
6	50.000	2.000	5.000	5.000	100.000	131.7390	100.2277	0.2	

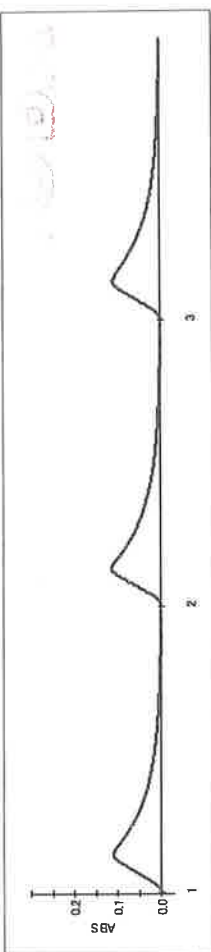


SMP

No.	NAME	SVOL [mL]	CVOL [mL]	DVOL [mL]	AREA [ON]	MEAS [ng]	CONC [ug/L]	Note
1	50ug/L	0.500	5.000	5.000	32.9478	25.1766	50.3536	
2	50ug/L	0.500	5.000	5.000	33.6875	25.7387	51.4774	
3	50ug/L	0.500	5.000	5.000	33.5749	25.6532	51.3084	

Statistics

No.	NAME	TRY	AV [ug/L]	SD [ug/L]	Cv [%]
1	50ug/L	3	51.04580	0.6055294	1.19



Self Check

Heat check: PASS!! (26.0degC[05:00] -> 30.0degC[03:06])
 Sensor check: PASS!! (1113-58=1055)
 Leak check: PASS!! (0.18L/min)
 Sig/Ref check: PASS!! (Sig:4.01V, Ref:4.09V)
 Drift check: PASS!! (0.0000036 - -0.0000002 = 0.0000038)

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pH Meter

Model. : SevenCompact S220

Serial No. : B448305208

NSC-TISI-TSI 7025
CALIBRATION 0152

CERTIFICATE OF CALIBRATION

Page 1 of 3

Certificate No. : 23-011524

Sample Code : 23-04833-001

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapiban 8 Rd., Nongkham,
Siracha, Chonburi 20230

Location of Calibration : Asia Medical and Agricultural Laboratory and Research Center Public Company Limited
(Calibration Laboratory)

Equipment : pH Meter
Manufacturer : METTLER TOLEDO Model : SevenCompact S220
Serial No. : B448305208 ID No. : LABE 11/4
Date of Receipt : 01 February 2023 Date of Calibration : 01 February 2023

Condition of Calibration

1. Environment
1.1 Ambient temperature : 25.0 ± 2.5 °C 1.2 Relative humidity : 55.0 % ± 15.0 %

2. Calibration method

In house method WI-CL-019: based on direct measurement by using standard voltage calibrator and using certified reference material

2) (CRM).

3) Reference standard / Certified reference material

Instrument	ID No.	Certificate No.	Due Date
3.1 Voltage Calibrator	LB-AMC-01	22E3240	03 October 2023
3.2 Digital Thermometer	LB-TH-33	22-107027	02 October 2023
Certified Reference Material			
Lot No.	Ref No.	Expire Date	
3.3 Buffer Solution pH 4.008	838357	15 September 2024	
3.4 Buffer Solution pH 6.985	838358	15 September 2023	
3.5 Buffer Solution pH 10.008	838359	15 September 2023	

4. This certificate is traceable to the international system of unit (SI Unit).

- 4.1 Instrument No. 3.1 through Technology Promotion Association (Thailand-Japan).
4.2 Instrument No. 3.2 through Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.
4.3 Buffer Solution No. 3.3 and No. 3.5 traceable to CPA chem (through primary measurement method-Harned cell using calibrated thermometer, barometer, and nanovoltmeter Accredited laboratory ISO/IEC 17025 and ISO/IEC 17034).
4.4 Buffer Solution No. 3.4 traceable to CPA chem (BIM RefN HI-27 LoIN 04.06.2021 ; BIM RefN HI-28 LoIN 28.05.2021 ; BIM RefN HI-27 LoIN 04.06.2021 ; BIM RefN HI-28 LoIN 28.05.2021 Accredited laboratory ISO/IEC 17025 and ISO/IEC 17034).

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

6. Condition of calibration item : Normal

Calibrated by : Mr. Anupong Lakawin Approved by : (Ms. Pawana Pan-on)

Scientist

Issue date : 03 February 2023

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC)

NSC-TISI-TSI 7025
CALIBRATION 0152

REPORT OF CALIBRATION

Page 2 of 3

Certificate No. : 23-011524

Sample Code : 23-04833-001

Equipment : pH Meter Resolution : ± 0.01 pH ; 0.1 mV ; 0.1°C
Manufacturer : METTLER TOLEDO Model : SevenCompact S220
Serial No. : B448305208 ID No. : LABE 11/4
Range : -2.000 pH to 20.000 pH ; ± 2000.0 mV ; -5.0°C to 130.0°C

Results of Calibration

Part 1. DC Voltage measurement

pH Meter Serial No. : B448305208

Nominal Value	Applied DC Voltage	Average indicator reading		Uncertainty	Coverage factor
		mV	pH		
0	414.113	414.0	0.00	± 0.083	2.00
4	177.477	177.5	4.00	± 0.083	2.00
7	0.000	0.1	7.00	± 0.083	2.00
10	-177.477	-178.3	10.00	± 0.083	2.00
14	-414.113	-413.8	14.00	± 0.083	2.00

Part 2. Performance of Electrode system

Electrode Manufacturer : METTLER TOLEDO

Model

Electrode Serial No. : 2365921

InLab Expert Pro-ISM

Three-Point Calibration at pH4 and pH7 Percent Slope : 99.6 ; at pH7 and pH10 Percent Slope : 98.4

Standard Buffer Solution	Average indicator reading		Error Value	Uncertainty	Coverage factor
pH (@ 25 °C)	pH	mV			
4.008	4.01	184.2	0.002	± 0.011	2.00
6.985	6.99	8.9	0.005	± 0.010	2.00
10.008	10.01	-166.8	0.002	± 0.010	2.00

The result expanded uncertainty (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%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003

D.D.

361 Soi Ladprao 122, Ladprao Road,
Phlabphla, Wang Thonglang, Bangkok 10310
FM-CL-114

Approved by : (Ms. Pawana Pan-on)

Scientist

Issue date : 03 February 2023

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC)



REPORT OF CALIBRATION

Page 3 of 3

Certificate No. : 23-011524

Sample Code : 23-04833-001

Equipment : pH Meter (Digital Thermometer with sensor)

Thermometer readout

Manufacturer : METTLER TOLEDO Model : SevenCompact S220

Serial No. : B448305208 ID No. : LABE 11/4

Resolution : 0.1 °C Range : -5.0 °C to 130.0 °C

Thermometer sensor

Manufacturer : METTLER TOLEDO Model : InLab Expert Pro-ISM

Serial No. : 2365921 ID No. : N/A

Condition of Calibration

1. Environment
 - 1.1 Ambient temperature : 23.0 °C ± 3.0 °C
 - 1.2 Relative humidity : 55.0 % ± 15.0 %

2. Calibration method

- 2.1 The calibration use in house method WI-CL-021 : by comparison with standard thermometer
- 2.2 The calibration by comparison unit under calibration (UUC) to the standard thermometer in a calibration bath at the controlled temperature.

2.3 The temperature scale in use of this laboratory is the international temperature scale of 1990 (ITS-90).

2.4 Reference standard instrument

Instrument	Model	ID No.	Certificate No.	Due date
3.1 Platinum Resistance Thermometer	PT-100	RTD-90	22-107027	02 October 2023
3.2 Thermometer Readout	GT-11	LB-TM-33	22-107027	02 October 2023

4. This certificate is traceable to the international system of unit (SI Unit).

Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (Accreditation Under TLAS Laboratory Calibration No.0152)

5. This result of calibration was found accurate as shown on date and place of calibration only.
6. Condition of Calibration item : Normal

Results of Calibration

Calibration point °C	Average of standard reading °C	Unit under calibration		Expanded uncertainty °C	Coverage factor k
		Immersion depth mm	Average reading °C		
25	25.002	120	25.0	± 0.13	2.00

Notes

- Calibration results without adjustment

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%. The standard uncertainty of measurement has been determined in accordance with JGAS M3003

- End of report -

COPY

STANDARD WEIGHT 50 g



Certificate No. : 22-052238
Sample Code : 22-19150-003

Page 1 of 3

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapiban 8 Rd., Nongkham,
Sriracha, Chonburi 20230

Location of Calibration : Asia Medical and Agricultural Laboratory and Research Center Public Company Limited
(Calibration Laboratory)

Equipment : Standard Weight 50 g

Manufacturer : METTLER TOLEDO

Class : F1

Serial No. : N/A

ID No. : LABE 10/1

Date of Receipt : 18 May 2022

Date of Calibration : 30 May 2022

Calibrated by : Mr. Somwang Sangdee
Scientist

Issue date : 31 May 2022

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

361 Soi Ladprao 122, Ladprao Road,
Phlabphla, Wang Thonglang, Bangkok 10310
FM-CL-007

TEL 02-516-2422

FAX 02-516-6949

Rev.05

CONTACT@AMARC.CO.TH

WWW.AMARC.CO.TH

Effective Date: 15/10/21



Certificate No. : 22-052238
Sample Code : 22-19150-003

Page 2 of 3

REPORT OF CALIBRATION

Equipment : Standard Weight 50 g

Manufacturer : METTLER TOLEDO

Class : F1

Serial No. : N/A

ID No. : LABE 10/1

Result of Calibration :

☒ Without adjustment

☐ Adjustment

Conventional value of the result of weighing in air. For a weight taken at a reference temperature (t_{ref}) of 20°C, the conventional mass is the mass of a reference weight of a density (ρ_{ref}) of 8000 kg.m⁻³ which it balances in air of a reference density (ρ_0) of 1.2 kg.m⁻³

Description	Deviation	Conventional	Expanded	Maximum	ID No.
		Mass	Uncertainty	Permissible Error	
	(mg)		(mg)	\pm (mg)	
50 g	-0.324	49.999676 g	0.10	0.30	LABE 10/1

The result expanded uncertainty of measurement U is stated as the standard uncertainty multiplied by the coverage factor $k=2.0$, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003

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361 Soi Ladprao 122, Ladprao Road,

Phlabphla, Wang Thonglang, Bangkok 10310

FM-CL-084

TEL 02-516-2422

FAX 02-516-6949

Rev.03

CONTACT@AMARC.CO.TH

WWW.AMARC.CO.TH

Effective Date: 15/10/21



Certificate No. : 22-052238

Sample Code : 22-19150-003

Page 3 of 3

REPORT OF CALIBRATION

Condition of Calibration

1. Ambient Conditions : Temperature $20^{\circ}\text{C} \pm 1.5^{\circ}\text{C}$, Relative humidity $50\% \pm 10\%$ and air density 1.20 kg/m^3
2. Calibration Method : Direct comparison weighing according to OIML R111-1 : 2004(E)
3. Reference standard instrument

Instrument	Class	ID No.	Certificate No.	Due Date
1) Standard Weight 1 mg to 1 kg	E2	LB-WE-79	21-078366	22 September 2022

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

Asia Medical and Agricultural Laboratory and Research Center Public Company Limited

(Instrument number 1).

5. Condition of Calibration item: Normal

6. Description of Calibrated Item :

Type and Nominal Value :	Standard Weight 50 g
Shape :	Cylindrical weight with knob
Material :	Stainless steel
Case :	Wooden Box
Comments :	Recalibration

- End of Report -

COPY

STANDARD WEIGHT 100 g



Certificate No. : 22-052239
Sample Code : 22-19150-004

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapiban 8 Rd., Nongkham,
Sriracha, Chonburi 20230

Location of Calibration : Asia Medical and Agricultural Laboratory and Research Center Public Company Limited
(Calibration Laboratory)

Equipment : Standard Weight 100 g

Manufacturer : N/A

Class : N/A

Serial No. : N/A

ID No. : LABE 10/2

Date of Receipt : 18 May 2022

Date of Calibration : 30 May 2022

Calibrated by : Mr. Somwang Sangdee
Scientist

Issue date : 31 May 2022

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).



Certificate No. : 22-052239
Sample Code : 22-19150-004

REPORT OF CALIBRATION

Equipment : Standard Weight 100 g

Manufacturer : N/A

Class : N/A

Serial No. : N/A

ID No. : LABE 10/2

Result of Calibration : ☒ Without adjustment ☐ Adjustment

Conventional value of the result of weighing in air. For a weight taken at a reference temperature (t_{ref}) of 20°C, the conventional mass is the mass of a reference weight of a density (ρ_{ref}) of 8000 kg.m⁻³ which it balances in air of a reference density (ρ_a) of 1.2 kg.m⁻³

Description	Deviation	Conventional	Expanded	Maximum	ID No.
		Mass	Uncertainty	Permissible Error	
	(mg)		(mg)	± (mg)	
100 g	-0.171	99.999829 g	0.16	0.50	LABE 10/2

The result expanded uncertainty of measurement U is stated as the standard uncertainty multiplied by the coverage factor $k = 2.0$, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003

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Certificate No. : 22-052239

Sample Code : 22-19150-004

Page 3 of 3

REPORT OF CALIBRATION

Condition of Calibration

1. Ambient Conditions : Temperature 20 °C ± 1.5°C, Relative humidity 50% ± 10% and air density 1.18 kg/m³

2. Calibration Method : WI-CL-007 base on OIML R 111-1 : 2004(E)

3. Reference standard instrument

Instrument	Class	ID No.	Certificate No.	Due Date
1) Standard Weight 1 mg to 1 kg	E2	LB-WE-78	21-079366	22 September 2022

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

Asia Medical and Agricultural Laboratory and Research Center Public Company Limited

(Instrument number 1).

5. Condition of Calibration item: Normal

6. Description of Calibrated item :

Type and Nominal Value :	Standard Weight 100 g
Shape :	Cylindrical weight with knob
Material :	Stainless steel
Case :	Wooden Box
Comments :	Recalibration

- End of Report -

COPY

STANDARD WEIGHT 50 g



Certificate No. : 22-052237

Sample Code : 22-19150-002

Page 3 of 3

REPORT OF CALIBRATION

Condition of Calibration

1. Ambient Conditions : Temperature 20 °C ± 1.5°C, Relative humidity 50% ± 10% and air density 1.18 kg/m³
2. Calibration Method : WI-CL-007 base on OIML R 111-1 : 2004(E)

3. Reference standard instrument

Instrument	Class	ID No.	Certificate No.	Due Date
1) Standard Weight 1 mg to 1 kg	E2	LB-WE-79	21-079366	22 September 2022

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

Asia Medical and Agricultural Laboratory and Research Center Public Company Limited

(Instrument number 1).

5. Condition of Calibration item: Normal

6. Description of Calibrated Item :

Type and Nominal Value :	Standard Weight 50 g
Shape :	Cylindrical weight with knob
Material :	Stainless steel
Case :	Wooden Box
Comments :	Recalibration

- End of Report -

COPY

THERMO-HYGROMETER

Model : 608-H1

Serial No. : 45106737



CERTIFICATE OF CALIBRATION

Page 1 of 2
Certificate No. : 23-055203
Sample Code : 23-21440-001

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapiarn 8 Rd., Nongkham,
Siiracha, Chonburi 20230

Location of Calibration : Asia Medical and Agricultural Laboratory and Research Center Public Company Limited
(Calibration laboratory)

Equipment : Digital thermo-hygrometer

Manufacturer : testo

Model : 60B-H1

Serial No. : 45106737

ID No. : LABE 09/7

Date of Receipt : 25 May 2023

Date of Calibration : 29 May 2023

Condition of Calibration

1. Environment

1.1 Ambient temperature : 23.0 °C ± 3.0 °C

1.2 Relative humidity : 55.0 % ± 15.0 %

2. Calibration method

2.1 In-house method: WI-CL-045 By comparison with thermometer standard / chilled mirror hygrometer in controlled chamber.

2.2 The calibration by comparison unit under calibration (UUC) to the thermometer standard / chilled mirror hygrometer in a chamber at the controlled temperature / relative humidity.

3. Reference standard instrument

Instrument Model ID No. Certificate No. Due Date

3.1 Chilled Mirror Optidew Vision LB-OP-02 & LB-OP-02 (DP) TH-0157-22 05 December 2023

3.2 Digital Thermometer Optidew Vision LB-OP-02 & LB-OP-02 (Temp.) 23-014916 12 February 2024

3.3 Digital Thermometer 34972A LB-DA-07 with RTD-89 22-095535 06 September 2023

4. This certificate is traceable to the international system of unit (SI Unit).

4.1 Instrument No. 3.1 through National Institute of Metrology (Thailand).

4.2 Instrument No. 3.2 and 3.3 through Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.

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

6. Condition of calibration item : Normal

Calibrated by Miss Pornsuda Lohabal

Scientist

31 May 2023

(Mr. Somchai Neampunt)

Signed for Director

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

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WWW.AMARC.CO.TH
Effective Date 15/10/21



REPORT OF CALIBRATION

Certificate No. : 23-055203
Sample Code : 23-21440-001

Results of Calibration

Temperature measurement

Resolution : 0.1 °C
Range : 0 °C to 50 °C

Calibration point °C	Average of standard reading		Unit under calibration		Expanded uncertainty °C
	Controlled humidity %RH	Temperature °C	Average reading °C	Correction value °C	
20	50	20.00	20.0	0.00	± 0.39
25	50	25.02	25.1	0.08	± 0.39
30	50	30.00	30.0	0.00	± 0.39

Humidity measurement

Resolution : 0.1 %RH
Range : 10 %RH to 95 %RH

Calibration point %RH	Average of standard reading		Unit under calibration		Expanded uncertainty %RH
	Air temperature °C	Calculated humidity %RH	Average reading %RH	Correction value %RH	
45	25.00	45.18	53.5	8.32	± 1.3
60	25.00	60.03	68.3	8.27	± 1.5
75	25.00	75.20	83.2	8.00	± 1.7

Notes

* Calibration results without adjustment.

The result expanded uncertainty of measurement U is stated as the standard uncertainty multiplied by the coverage factor k , which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with GUM 2008

- End of Report -

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UV/VIS SPECTROPHOTOMETER

Model : UV - 1800

Serial No. : A11635101643 CD



Bara Scientific Co., Ltd.
968 U Chu Liang Building Floor 7 Rama4 Road
Silom Bangkok Bangkok Thailand 10500
Tel : 02-6324300 Fax : 02-6375496-7
www.barascientific.com

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Calibration & Services

Certificate of Calibration

Number of Page(s) 1 of 3

Certificate No. BSCC-UV-152/23
Equipment UV/Vis Spectrophotometer
Model UV-1800
Manufacturer Shimadzu
Serial No. A11635101643 CD
ID No. N/A
Date of receipt 25 April 2023
Date of calibration 25 April 2023
Date of issue 27 April 2023
Customer name Eastern Thai Consulting 1992 Co., Ltd
Address 683 Moo 11, Sukkaphibarn 8 Rd., Nongkham, Sriracha, Chonburi 20230

Temperature (22.4-23.1) °C (On site)
Humidity (44.5-45.2) %RH (On site)

Equipment condition Good Operation

Calibration Location Analysis Department

Calibration Procedure In-house method WI-UV-702-01 based on ASTM E275-01
Traceability Wavelength Accuracy is traceable to certificate No. 94780 and 94775
Photometric Accuracy is traceable to certificate No. 94808 and 100147
Stray Light is traceable to certificate No. 94791
The above certificate are traceable to SI unit through Starna Scientific Ltd.
(UKAS accredited calibration laboratory NO. 0659)

Calibrated by Mr.Pannaphong Phannmekakul

Approved by

Mr.Kanchit Choothep
Technical Manager

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Certificate of Calibration

Number of Page(s) 2 of 3

Certificate No. BSCC-UV-152/23

Calibration Results:

1. Wavelength Accuracy

Certified Wavelength (nm)	UUC (nm)	Error (nm)	Uncertainty (±nm)
287.71	287.65	-0.06	0.18
445.82	445.80	-0.02	0.18
536.52	536.35	-0.17	0.18
741.02	740.99	-0.03	0.18
879.41	879.27	-0.14	0.18

2. Photometric Accuracy (UV)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (±A)
235	0.0000	0.0000	0.0000	0.0075
	0.7311	0.7313	0.0002	0.0075
257	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
313	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
350	0.0000	0.0000	0.0000	0.0075
	0.6306	0.6314	0.0008	0.0075

*CNR = Customer not request



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Certificate No. **BSCC-UV-152/23** Number of Page(s) **3 of 3**

Calibration Results:

3. Photometric Accuracy (Visible)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty ($\pm A$)
420.0	0.0000	0.0000	0.0000	0.0042
	0.5488	0.5508	0.0020	0.0042
	0.7527	0.7535	0.0008	0.0042
	1.0756	1.0758	0.0002	0.0042
440.0	0.0000	0.0000	0.0000	0.0042
	0.5391	0.5406	0.0015	0.0042
	0.7355	0.7360	0.0005	0.0042
	1.0509	1.0501	-0.0008	0.0042
465.0	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
546.1	0.0000	0.0000	0.0000	0.0042
	0.5045	0.5044	-0.0001	0.0042
	0.6884	0.6885	0.0001	0.0042
	0.9816	0.9808	-0.0008	0.0042
590.0	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
635.0	0.0000	0.0000	0.0000	0.0042
	0.5183	0.5178	-0.0005	0.0042
	0.6864	0.6868	0.0004	0.0042
	0.9747	0.9739	-0.0008	0.0042

*CNR = Customer not request

4. Stray Light*

Standard cut-off wavelength (nm)	Unit Under Calibration(UUC)	
	Wavelength (nm)	Absorbance (A)
200.75 \pm 0.1 nm	200.72	2.0164

The Stray light transmission reference is less than 1.0%T and Stray light absorbance reference is greater than 2.00A

The measurement uncertainty is base on a standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95%

End of Certificate

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