

*ภาคผนวก ค : เอกสารสอบเทียบความถูกต้อง  
ของเครื่องมือเก็บตัวอย่าง*

**ANALYTICAL BALANCE**

**Model : MS204TS/00**

**Serial No. : B904136539**

Mettler-Toledo (Thailand) Ltd.  
846/4 - 846/5 Lasele Rd., Bangna Tai Sub-District  
Bangna District, Bangkok 10260  
+662 723 0382  
MT-T.H.ServiceSupport@mtl.com



NSC-TIS-TIS 17025  
CALIBRATION 0062

## Accuracy Calibration Certificate

### Customer

Company: EASTERN THAI CONSULTING 1992 CO., LTD.  
Address: 683 Moo 11, Sukhaphiban 8 Rd., Nong Kham  
City: Sriracha  
Contact: Sasiporn Nakin  
Zip / Postal: 20230  
State / Province: Chonburi  
Order Number: 0332630077

### Weighing Device

Manufacturer: Mettler Toledo  
Model: MS204TS000  
Serial No.: B904136539  
Building: Laboratory  
Floor: 1  
Room: Balance  
Instrument Type: Weighing Instrument  
Asset Number: LABE 05/4  
Terminal Model: N/A  
Terminal Serial No.: N/A  
Terminal Asset No.: N/A

Range	Max. Capacity	Readability (d)
1	220 g	0.0001 g

### Procedure

Calibration Guideline: EURAMET cg-18 v. 4.0 (11/2015)  
CPW002/20  
Mettler Toledo Work Instruction:  
This calibration certificate contains measurements for As Found calibration. No As Left calibration was performed because the device was not modified after As Found calibration. Therefore, results for As Left correspond to As Found.  
The sensitivity/span of the weighing instrument was adjusted before calibration with a built-in weight.  
In accordance with EURAMET cg-18 (11/2015), the test loads were selected to reflect the specific use of the weighing device or to accommodate specific calibration conditions.

Temperature		Humidity	
As Found	Start: 25.6 °C	End: 25.2 °C	Start: 50.5 %
As Found	End: 44.6 %		

As Found Calibration Date: 06-Feb-2023  
As Left Calibration Date: N/A  
Issue Date: 07-Feb-2023  
Calibrator: Thiraphong Salanoi

Approved Signatory:   
Technical Manager / Head of Calibration Center



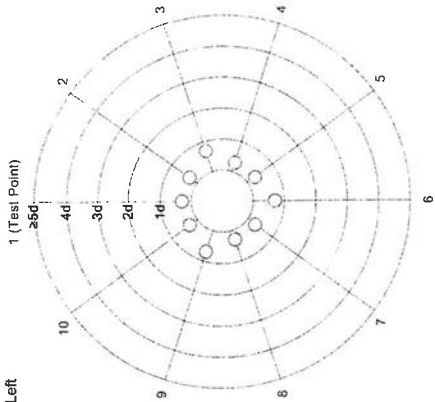
## Measurement Results

### Repeatability

Test Load: 100 g

	As Found	As Left
1	100.0002 g	N/A
2	100.0002 g	N/A
3	100.0001 g	N/A
4	100.0002 g	N/A
5	100.0002 g	N/A
6	100.0001 g	N/A
7	100.0002 g	N/A
8	100.0002 g	N/A
9	100.0001 g	N/A
10	100.0002 g	N/A

Standard Deviation	0.00005 g	N/A
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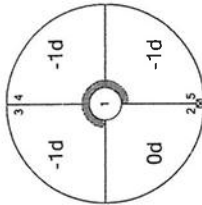
The "d" in the graph represents the readability of the range/interval in which the test was performed.  
The results of this graph are based upon the absolute values of the differences from the mean value.

### Eccentricity

Test Load: 100 g

Position	As Found	As Left
1	100.0002 g	N/A
2	100.0002 g	N/A
3	100.0001 g	N/A
4	100.0001 g	N/A
5	100.0001 g	N/A

Maximum Deviation	0.0001 g	N/A
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As Found

The "d" in the graph represents the readability of the range/interval in which the test was performed.



Remarks

FACT adjustment functionality activated  
Equipment condition: Good  
Next calibration according to customer's procedure  
Calibration data not decide by calibration laboratory

End of Accredited Section

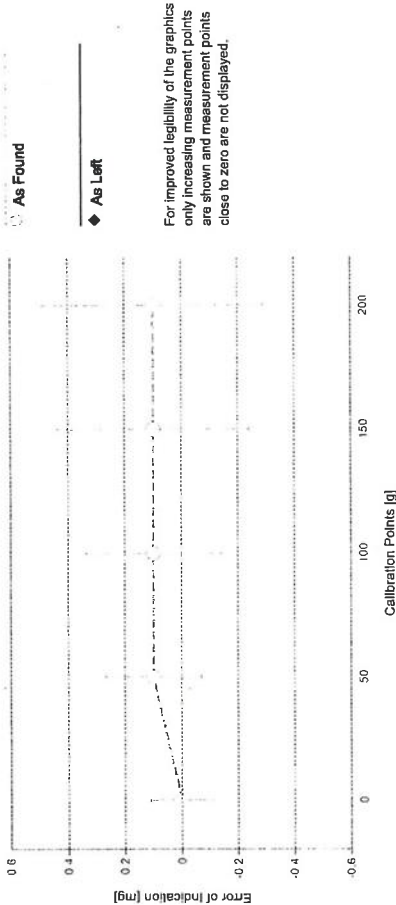
The information below and any attachments to this calibration certificate are not part of the accredited calibration.

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Error of Indication

As Found

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.0000 g	0.0000 g	0.0000 g	0.11 mg	2
2	0.0100 g	0.0100 g	0.0000 g	0.13 mg	2
3	0.0500 g	0.0500 g	0.0000 g	0.13 mg	2
4	0.1000 g	0.0999 g	-0.0001 g	0.13 mg	2
5	1.0000 g	0.9999 g	-0.0001 g	0.13 mg	2
6	5.0000 g	4.9999 g	-0.0001 g	0.13 mg	2
7	10.0000 g	9.9999 g	-0.0001 g	0.14 mg	2
8	50.0000 g	50.0001 g	0.0001 g	0.17 mg	2
9	100.0001 g	100.0002 g	0.0001 g	0.24 mg	2
10	150.0001 g	150.0002 g	0.0001 g	0.34 mg	2
11	200.0001 g	200.0002 g	0.0001 g	0.39 mg	2



The uncertainty stated is the expanded uncertainty at calibration obtained by multiplying the standard combined uncertainty by the coverage factor  $k$  – which can be larger than 2 according to EURAMET cg-18. The value of the measurand lies within the assigned range of values with a probability of approximately 95 %.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated.

Test Equipment

All weights used for metrological testing are traceable to national or international standards. The weights were calibrated and certified by an accredited calibration laboratory.

Weight Set 1: OIML E2

Weight Set No.: WS28

Certificate Number: 178498

Thermo Hygrometer

Equipment No.: IN306

Certificate Number: 23H4

Date of Issue: 01-Apr-2022

Calibration Due Date: 17-Sep-2023

Date of Issue: 10-Jan-2023

Calibration Due Date: 03-Jan-2024

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TH2069-014-020623-ACC-TH

Measurement Uncertainty of the Weighing Instrument in Use

Stated is the expanded uncertainty with k=2 in use. The formula shall be used for the estimation of the uncertainty under consideration of the errors of indication. The value R represents the net load indication in the unit of measure of the device.

Temperature coefficient for the evaluation of the measurement uncertainty in use: 1.5 · 10<sup>-5</sup> / K  
Temperature range on site for the evaluation of the measurement uncertainty in use: 5 K

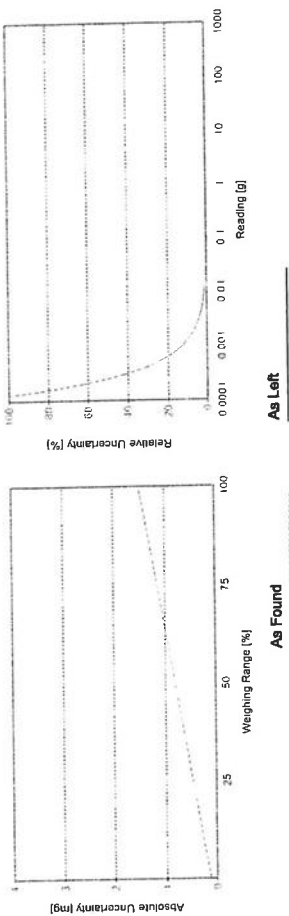
Uncertainty of Uncertainty Equation

Range		As Found		As Left	
d	Max				
1	0.0001 g	220 g	U <sub>1</sub> = 0.13 mg + 0.00625 mg/g · R	N/A	N/A

To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

Absolute and Relative Measurement Uncertainty in Use for Various Net Indications (Examples)

Net Indication		As Found		As Left	
0.0220 g	0.13 mg	0.59%	N/A	N/A	N/A
0.2200 g	0.13 mg	0.060%	N/A	N/A	N/A
2.2000 g	0.14 mg	0.0065%	N/A	N/A	N/A
22.0000 g	0.27 mg	0.0012%	N/A	N/A	N/A
220.0000 g	1.5 mg	0.00068%	N/A	N/A	N/A



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# GWP® Certificate

As Found ✓ As Left ✓

The weighing device meets the given process requirements.

The weighing device meets the given process requirements.

Tests Performed: ☒ As Found ☐ As Left ☐ No adjustments/modifications made, As Left results correspond to As Found.

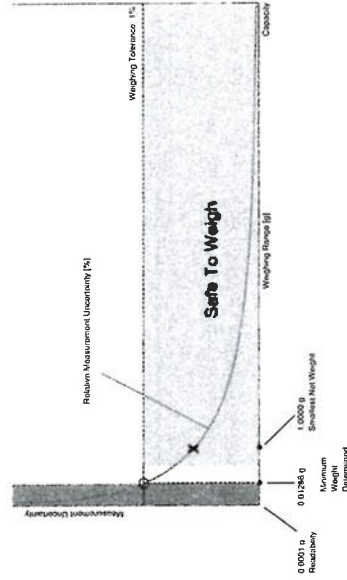
## Process Requirements

Weighting Tolerance: 1%

Smallest Net Weight: 1.0000 g

Safety Factor: 2

### Safe Weighing Range



While the values in this graph reflect the actual calibration results, the measurement uncertainty curves are simply a visual representation. This graph reflects As Left testing, unless only As Found was performed.

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## Minimum Weight

### As Found Minimum Weight Table

Minimum weights for different weighing tolerances and safety factors					
Safety Factor					
Tolerance	1	2	3	5	10
0.1%	0.12729 g	0.25618 g	0.38672 g	0.65284 g	1.34917 g
0.2%	0.06344 g	0.12729 g	0.19153 g	0.32124 g	0.65284 g
0.5%	0.02533 g	0.05072 g	0.07618 g	0.12729 g	0.25618 g
1%	0.01266 g	0.02533 g	0.03802 g	0.06344 g	0.12729 g
2%	0.00633 g	0.01266 g	0.01899 g	0.03167 g	0.06344 g
5%	0.00253 g	0.00506 g	0.00759 g	0.01266 g	0.02533 g

Pass: The determined minimum weight meets the requirement for the smallest net weight.

### As Left Minimum Weight Table

Minimum weights for different weighing tolerances and safety factors					
Safety Factor					
Tolerance	1	2	3	5	10
0.1%	0.12729 g	0.25618 g	0.38672 g	0.65284 g	1.34917 g
0.2%	0.06344 g	0.12729 g	0.19153 g	0.32124 g	0.65284 g
0.5%	0.02533 g	0.05072 g	0.07618 g	0.12729 g	0.25618 g
1%	0.01266 g	0.02533 g	0.03802 g	0.06344 g	0.12729 g
2%	0.00633 g	0.01266 g	0.01899 g	0.03167 g	0.06344 g
5%	0.00253 g	0.00506 g	0.00759 g	0.01266 g	0.02533 g

Pass: The determined minimum weight meets the requirement for the smallest net weight.

At these net minimum weight values, the measurement uncertainty of the weighing device is equal to or less than 1/1 (no safety factor), 1/2, 1/3, 1/5, or 1/10 of the required tolerance. The values are calculated with  $k = 2$  and based on the linear formula of the measurement uncertainty of the weighing device in use.

The safety factor for As Found is always 1. This implies no safety factor. As Found testing looks at the behavior of the instrument from the past until test occurred. For the past, it is necessary to know that the tolerance was met, but not the safety factor. The safety factor is a proactive measure to apply for future measurements.

#### Notes on minimum weight values in above table:

1. If "N/A" is shown above, no appropriate value could be calculated.
2. METTLER TOLEDO is not responsible for the definition of the process requirements.

## Measurement Results

### Results Summary

Repeatability		Eccentricity		Error of Indication	
As Found	As Left	As Found	As Left	As Found	As Left
✓	✓	✓	✓	✓	✓

✓ = Passed  
✗ = Failed  
✗ = Safety Factor not met

### Repeatability

Test Load: 100 g

Control Limit		As Found		As Left	
Tolerance	Control Limit	Std. Deviation	Result	Std. Deviation	Result
0.1%	0.00050 g		✓		✓
0.2%	0.00100 g		✓		✓
0.5%	0.00250 g		✓		✓
1%	0.00500 g	0.00005 g	✓	0.00005 g	✓
2%	0.01000 g		✓		✓
5%	0.02500 g		✓		✓

The weighing tolerance is met if the standard deviation is less than or equal to the corresponding control limit.

### Eccentricity

Test Load: 100 g

Control Limit		As Found		As Left	
Tolerance	Control Limit	Deviation	Result	Deviation	Result
0.1%	0.0500 g		✓		✓
0.2%	0.1000 g		✓		✓
0.5%	0.2500 g		✓		✓
1%	0.5000 g	0.0001 g	✓	0.0001 g	✓
2%	1.0000 g		✓		✓
5%	2.5000 g		✓		✓

The weighing tolerance is met if the deviation is less than or equal to the corresponding control limit.

Error of Indication

As Found

Reference Value	Error	Control limits for various weighing tolerances				
		0.1%	0.2%	0.5%	1%	5%
0.0000 g	0.0000 g	N/A	N/A	N/A	N/A	N/A
50.0000 g	0.0001 g	0.0250 g	0.0500 g	0.1250 g	0.2500 g	1.2500 g
100.0001 g	0.0001 g	0.0500 g	0.1000 g	0.2500 g	0.5000 g	2.5000 g
150.0001 g	0.0001 g	0.0750 g	0.1500 g	0.3750 g	0.7500 g	3.7500 g
200.0001 g	0.0001 g	0.1000 g	0.2000 g	0.5000 g	1.0000 g	5.0000 g
Result		✓	✓	✓	✓	✓

As Left

Reference Value	Error	Control limits for various weighing tolerances				
		0.1%	0.2%	0.5%	1%	5%
0.0000 g	0.0000 g	N/A	N/A	N/A	N/A	N/A
50.0000 g	0.0001 g	0.0250 g	0.0500 g	0.1250 g	0.2500 g	1.2500 g
100.0001 g	0.0001 g	0.0500 g	0.1000 g	0.2500 g	0.5000 g	2.5000 g
150.0001 g	0.0001 g	0.0750 g	0.1500 g	0.3750 g	0.7500 g	3.7500 g
200.0001 g	0.0001 g	0.1000 g	0.2000 g	0.5000 g	1.0000 g	5.0000 g
Result		✓	✓	✓	✓	✓

The weighing tolerance is met if the error (of indication) for each test point is less than or equal to the corresponding control limit for that particular weighing tolerance. Results at or close to the zero point cannot be assessed.

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## **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 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: *Sorayuth T.*  
( Mr. Sarayuth Tochua)

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

STD Reading	UUC Reading (mbar)	UUC Reading (mbar)	UUC Error	Uncertainty
mbar	Before Adjusted	After Adjusted	mbar	± 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<sup>3</sup> @ 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**



## Results of Calibration

Resolution : 0.5 °C

### 1. Reporting of Temperature

Calibration point (°C)	UUC <sup>*</sup> setting (°C) reading (°C)	Measured temperature at each positions (°C)										Uncertainty z (°C)	Coverage factor k
		# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	# 9 <sup>60%</sup>	# 10		
104	103.5	104.11	103.91	103.85	103.84	103.97	103.93	103.64	103.51	104.23		0.47	2.00

### 2. Characterization results

Calibration point (°C)	Stability ± (°C)	Uniformity (°C)	Overall variation (°C)
104	0.04	0.78	0.81

Notes

UUC<sup>\*</sup> = Unit Under Calibration

*[Signature]*

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.  
683 Moo 11, Sukhapibarn 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

Serial No. : G511.0182

Date of Receipt : 22 December 2023

ID No. : LABE 17/4

Date of Calibration : 22 December 2023

Condition of Calibration

1. Environment

1.1 Ambient temperature : Maximum 30.9 °C : Minimum 29.6 °C

1.2 Relative humidity : Maximum 54.5 % : Minimum 46.8 %

1.3 Line voltage supplied : Maximum 227.6 VAC : Minimum 224.2 VAC

### 2. Calibration method

TLAS-C-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-P1100)	LB-DA-08 (RTD-248 to RTD-256)	23-084070	06 August 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. Pisek Inio  
Scientist

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

Issue date : 25 December 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 been established the measurement results of the laboratory and its traceability to recognised 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. : 23-148804  
Sample Code : 23-56200-006

## 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 = 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.

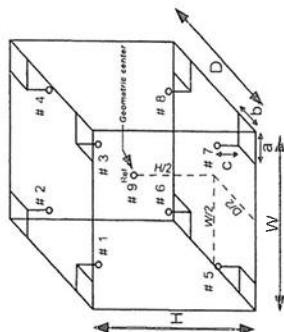


Figure: Example of sensor  
installation Positions

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  
877.263.7810 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 Orifice I.D. - 0136 Pa (mm) - 742.95

PLATE OR Run #	VOLUME START (m3)	VOLUME STOP (m3)	DIFF VOLUME (m3)	DIFF TIME (min)	METER DIFF HG (mm)	ORIFICE DIFF H2O (in.)
1	NA	NA	1.00	1.3400	3.2	2.00
2	NA	NA	1.00	0.9510	6.3	4.00
3	NA	NA	1.00	0.8510	7.8	5.00
4	NA	NA	1.00	0.8130	8.6	5.50
5	NA	NA	1.00	0.6690	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	2.2221	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	1.7823
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)]					

CALCULATIONS

Vstd = Diff. Vol [(Pa-Diff. Hg)/760] (298/Ta)  
Qstd = Vstd/Time

Va = Diff Vol [(Pa-Diff Hg)/Pa]  
Qa = Va/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-TIS17025  
CALIBRATION0152

Page 1 of 2

## CERTIFICATE OF CALIBRATION

Certificate No. : 23-055203  
Sample Code : 23-21440-001

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.  
663 Moo 11, Sukhapiarn 8 Rd., Nongtham,  
Sriracha, Chonburi 20230

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

Equipment : Digital thermo-hygrometer  
Manufacturer : testo  
Serial No. : 45106737  
Date of Receipt : 25 May 2023

Model : 608-H1  
ID No. : LABE 09/7  
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 Lohabai Scientist  
Issue date 31 May 2023

Approved by (Mr. Somchai Neampunt)  
Signed for Director

## Issue date

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

NSC-TISI-TIS17025  
CALIBRATION0152

Page 2 of 2

## 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 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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31 May 2023

Miss Pornsuda Lohabai  
Scientist

Approved by

(Mr. Somchai Neampunt)  
Signed for Director

## Issue date

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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**SOUND LEVEL CALIBRATOR**

**MODEL : NC-75**

**SERIAL No. : 34802645**

# 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



MSC-TSI-TIS 17025  
CALIBRATION 0394

Cert. No. : ACC23037

Pages : 1 of 3

## Calibration Certificate

**Equipment :** SOUND CALIBRATOR  
**Manufacturer :** RION  
**Model :** NC-75  
**Serial No.:** 34802643  
**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 :** 06 SEPTEMBER 2023  
**Calibration Date :** 12 OCTOBER 2023  
**Date of Issue :** 16 OCTOBER 2023

**Calibrated by :** Natthakorn Pisutpaisan

**Approved by :**   
( Thanakal 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.

QF-TS12-04-04-020664

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# SITHIPORN ASSOCIATES CO.,LTD.

## CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACC23037  
Job No. : VC66AC0097  
Pages : 2 of 3

**Calibration Procedure :** CP-AC-03

### Calibration Method :

This equipment was calibrated by based on IEC-60942-2003 Standard.  
The sound pressure level, frequency and total distortion of the sound calibrator was measured using the reference microphone.

### Condition of this result of calibration :

#### 1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33511B	MY52302742	EF-0010-23	07-FEB-24
Digital Multimeter	33461A	MY53220104	EEL-BP 30/02/66	13-FEB-24
Digital Multimeter	33461A	MY53220076	EEL-BP 30/02/67	13-FEB-24
Digital Multimeter	33461A	MY60024273	EEL-BP 31/02/66	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EF-0011-23	08-FEB-24
Condenser Microphone	4180	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KAI	34560495	AA-3002-23	14-FEB-24
Audio Analyzer	AVR-3360A	V744B6069	EF-0012-23	10-FEB-24

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. : AOC23037  
Job No. : VC66AC0097  
Pages : 3 of 3

**Result of calibration :**

**1. Sound pressure level**

Specified sound pressure level (dB)	Measured value (dB)	Deviated value (dB)	Uncertainty (dB)	Acceptance limit (dB)
94	93.94	-0.06	0.14	0.40

**2. Frequency**

Specified Frequency (Hz)	Measured value (Hz)	Deviated value (%)	Uncertainty (%)	Acceptance limit (%)
1000	1000.0	0.0	0.1	1.0

**3. Total distortion**

Measured value (%)	Uncertainty (%)	Acceptance limit (%)
0.24	0.10	3.0

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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*7. P. P. P.*

**SOUND LEVEL METER**

**MODEL : NL-52A**

**SERIAL No. : 00230992**

Request No.21-66/0343

## CALIBRATION CERTIFICATE

**Submitted by** : Eastern Thai Consulting 1992 Co., Ltd.  
**Address** : 683 Moo 11 Sukhapiarn 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.

### Ambient Environment

**Instrument Calibrated :**  
**Description** : Sound Level Meter :  $(23 \pm 3) ^\circ\text{C}$   
**Manufacturer** : Rion :  $(50 \pm 15) \%$   
**Model** : NL-52A :  $(101.325 \pm 1.5) \text{ kPa}$

**Serial No.** : 00230992  
**Microphone** : Type UC-59 No.22769  
**Pre-amplifier** : Type NH-25 No.22428

### 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. Pistophone Rion NC-72 S/N 00402446.
8. Measuring Amplifier Brüel&Kjær 2636 S/N 1537484.

**Date of Receipt** : 27 Feb. 2023

**Date of Calibration** : 21-23 Mar. 2023

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Request No. 21-66/0343

MTC No. EEL. BP. 154/0266

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** : 21-23 Mar. 2023

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### 1. Absolute Sensitivity

Reference Acoustic Signal (dB)	Measured value (dB)		Deviation value (dB)	Acceptance limit Class I (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	Before adjust	After adjust				
113.89	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 123.9 dB.

### 2. Self-generated noise

#### 2.1 Normal test

Measured value (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
20.8	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	10.8	0.10	N/A
C-Weight	15.2	0.10	N/A
Flat	20.8	0.10	N/A

Date of Calibration : 21-23 Mar. 2023

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E-mail : mtc@tistr.or.th

### 3. Acoustical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response (dB)			Acceptance limit class I (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	A-weight	C-weight	Flat			
125	0.4	0.5	0.3	±1.0	0.45	0.6
1 000	-0.2	-0.2	-0.2	±0.7	0.45	0.6
8 000	-1.2	-1.2	-1.3	+1.5; -2.5	0.45	0.7

### 4. Electrical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response (dB)			Acceptance limit class I (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	A-weight	C-weight	Flat			
63	-0.1	0.0	0.0	±1.0	0.20	0.6
125	-0.1	0.0	0.0	±1.0	0.20	0.6
250	-0.1	0.0	0.0	±1.0	0.20	0.6
500	0.0	0.0	0.0	±1.0	0.20	0.6
1 000	0.0	0.0	0.0	±0.7	0.20	0.6
2 000	0.0	0.1	0.0	±1.0	0.20	0.6
4 000	0.0	0.0	0.0	±1.0	0.20	0.6
8 000	0.1	0.1	0.0	+1.5; -2.5	0.20	0.7
16 000	-1.3	-1.3	0.1	+2.5; -16.0	0.20	0.7

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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	94.1	0.1	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)
137	137.1	0.1	0.8	0.30	0.3
136	136.1	0.1	0.8	0.30	0.3
135	135.1	0.1	0.8	0.30	0.3
134	134.1	0.1	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

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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 I (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
74	74.0	0.0	0.8	0.30	0.3
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	27.0	0.0	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

At reference sound level on the reference level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class I (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
30-130	94.0	94.0	0.0	0.8	0.00	0.3

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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 I (±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 I (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
SEL	200	120.0	0.0	+0.5	0.20	0.3
	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

Date of Calibration : 21-23 Mar. 2023

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### 10. Peak C sound level

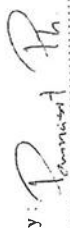
Number of cycles in test signal	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 1 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Complete cycle	125.4	125.4	0.0	2.0	0.20	0.35
Positive half cycle	124.4	124.1	-0.3	1.0	0.20	0.35
Negative half 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 1 (±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 1 (±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 :   
(Mr. Pannasit Phasingri)

Approved by :

  
(Mr. Pravee Khunpua)  
Director  
Electrical and Electronic Standards Laboratory  
Industrial Metrology and Testing Service Centre

Date of Calibration : 21-23 Mar. 2023

Date of Issue : 23 Mar. 2023

Ref : 2011266022700825007

End of Certificate

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Fax. (66) 0 2579 8592  
E-mail : sunalee@tistr.or.th



**SOUND LEVEL METER**

**MODEL : NL-52A**

**SERIAL No. : 00230986**

Request No. 21-66/0343

## CALIBRATION CERTIFICATE

**Submitted by** : Eastern Thai Consulting 1992 Co., Ltd.  
**Address** : 683 Moo 11, Sukhapibam 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 :  $(23 \pm 3) ^\circ\text{C}$   
**Manufacturer** : Rion :  $(50 \pm 15) \%$   
**Model** : NL-52A :  $(101.325 \pm 1.5) \text{ kPa}$

**Serial No.** : 00230986  
**Microphone** : UC-59 No.22210  
**Preamplifier** : NH-25 No.22422

**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** : 23 Mar. 2023

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Fax. (66) 0 2579 8592  
E-mail : sunalee@tistr.or.th

Request No. 21-66/0343

MTC No. EEL. BP. 149/0266

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** : 23 Mar. 2023

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E-mail : sunalee@tistr.or.th

### 1. Absolute Sensitivity

Reference Acoustic Signal (dB)	Measured value (dB)		Deviation value (dB)	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)
15.4	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	9.6	0.10	N/A
C-Weight	14.3	0.10	N/A
Flat	19.7	0.10	N/A

**Date of Calibration** : 23 Mar. 2023

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Tel. (66) 0 2323 1672-80 ext. 115, 116  
Fax (66) 0 2323 9165  
E-mail : mt@tistr.or.th

### 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	0.2	0.3	+1.0	0.45	0.6
1 000	-0.3	-0.3	+0.7	0.45	0.6
8 000	-0.5	-0.5	+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	0.1	+1.0	0.20	0.6
250	-0.1	0.1	+1.0	0.20	0.6
500	-0.1	0.1	+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** : 23 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

Date of Calibration : 23 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	137.1	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	89.1	0.1	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 : 23 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	43.9	-0.1	0.8	0.30	0.3
39	38.9	-0.1	0.8	0.30	0.3
34	33.9	-0.1	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

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 : 23 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 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	109.1	0.1	+1.0; -1.5	0.20	0.3
	0.25	100.2	0.2	+1.0; -3.0	0.20	0.3
Slow	200	119.8	0.2	+0.5	0.20	0.3
	2	100.1	0.1	+1.0; -3.0	0.20	0.3
	200	120.0	0.0	+0.5	0.20	0.3
SEL	2	100.2	0.2	+1.0; -1.5	0.20	0.3
	0.25	91.2	0.2	+1.0; -3.0	0.20	0.3

Date of Calibration : 23 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 :

*Prawat Klunying*

(Mr. Prawat Klunying)

Director

Electrical and Electronic Standards Laboratory  
Industrial Metrology and Testing Service Centre

Date of Calibration : 23 Mar. 2023

Date of Issue : 23 Mar. 2023

Ref : 2011266022700825002

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**SOUND LEVEL METER**

**MODEL : NL-52A**

**SERIAL No. : 00230994**





THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

MTC No. EEL. BP. 156/0266

Request No. 21-66/0343

## CALIBRATION CERTIFICATE

**Submitted by** : Eastern Thai Consulting 1992 Co., Ltd..  
**Address** : 683 Moo 11 Sukhaphibam 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.

### Ambient Environment

Temperature :  $(23 \pm 3) ^\circ\text{C}$   
Relative Humidity :  $(50 \pm 15) \%$   
Ambient Pressure :  $(101.325 \pm 1.5) \text{ kPa}$

### Instrument Calibrated :

Description : Sound Level Meter  
Manufacturer : Rion  
Model : NL-52A  
Serial No. : 00230994  
Microphone : Type UC-59 No.22777  
Preamplifier : Type NH-25 No.22430

### 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 : 21-23 Mar. 2023

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

MTC No. EEL. BP. 156/0266

Request No. 21-66/0343

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 :

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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 : 21-23 Mar. 2023

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NSC-TIS-TIS 17025  
CALIBRATION 0037

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0343

MTC No. EEL. BP. 156/0266

## 1. Absolute Sensitivity

Reference Acoustic Signal (dB)	Measured value (dB)		Deviation value (dB)	Acceptance limit Class I (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	Before adjust	After adjust				
113.89	114.1	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 123.7 dB.

## 2. Self-generated noise

## 2.1 Normal test

Measured value (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
20.5	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	10.5	0.10	N/A
C-Weight	14.8	0.10	N/A
Flat	20.4	0.10	N/A



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## 3. Acoustical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response (dB)		Acceptance limit class I (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	A-weight	C-weight			
125	0.0	0.1	±1.0	0.45	0.6
1 000	-0.5	-0.5	±0.7	0.45	0.6
8 000	0.0	0.0	+1.5; -2.5	0.45	0.7

## 4. Electrical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response (dB)		Acceptance limit class I (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	A-weight	C-weight			
63	-0.1	-0.1	±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	0.0	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	0.0	+1.5; -2.5	0.20	0.7
16 000	-1.3	-1.4	+2.5; -16.0	0.20	0.7

Date of Calibration : 21-23 Mar. 2023

Date of Calibration : 21-23 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	94.1	0.1	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

### 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	137.1	0.1	0.8	0.30	0.3
136	136.1	0.1	0.8	0.30	0.3
135	135.1	0.1	0.8	0.30	0.3
134	134.1	0.1	0.8	0.30	0.3
133	133.1	0.1	0.8	0.30	0.3
132	132.0	0.0	0.8	0.30	0.3
131	131.1	0.1	0.8	0.30	0.3
130	130.1	0.1	0.8	0.30	0.3
129	129.1	0.1	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





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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 I (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
74	74.1	0.1	0.8	0.30	0.3
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	44.0	0.0	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	29.0	0.0	0.8	0.30	0.3
28	28.0	0.0	0.8	0.30	0.3
27	27.0	0.0	0.8	0.30	0.3
26	25.9	-0.1	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

At reference sound level on the reference level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class I (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
30-130	94.0	94.0	0.0	0.8	0.00	0.3

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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 I (±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, T <sub>b</sub> (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limit class I (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	119.6	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	90.8	-0.2	+1.0; -3.0	0.20	0.3

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MTC No. EEL. BP. 156/0266

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#### 10. Peak C sound level

Number of cycles in test signal	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 1 (±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 1 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Positive one-half cycle				
136.5	0.0	1.5	0.20	0.25

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#### 12. High-level stability

Time	Measured value (dB)	Deviated value (dB)	Acceptance limit class 1 (±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 *Pannasit Phasingst*

(Mr. Pannasit Phasingst)

Approved by :

(Mr. Prawade Klappala)

Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 21-23 Mar. 2023

Date of Issue : 23 Mar. 2023

End of Certificate

Ref : 2011266022700825009

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**SOUND LEVEL METER**

**MODEL : NL-52A**

**SERIAL No. : 00230991**



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MTC No. EEL. BP. 153/0266

MTC No. EEL. BP. 153/0266

Request No. 21-66/0343

Request No. 21-66/0343

## CALIBRATION CERTIFICATE

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

Address : 683 Moo 11 Sukhapibarn 8 Rd., Nongkham, Siracha, 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.

### Ambient Environment

Temperature : (23 ± 3) °C

Relative Humidity : (50 ± 15) %

Ambient Pressure : (101.325 ± 1.5) kPa

### Instrument Calibrated :

Description : Sound Level Meter

Manufacturer : Rion

Model : NL-52A

Serial No. : 00230991

Microphone : Type UC-59 No.22709

Preamplifier : Type NH-25 No.22427

### Standards used :

1. Band Pass Filter Stamford 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 MY 44042668.
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 : 21-23 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				
113.91	114.1	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 123.9 dB.

### 2. Self-generated noise

#### 2.1 Normal test

Measured value (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
21.0	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	10.6	0.10	N/A
C-Weight	15.0	0.10	N/A
Flat	20.3	0.10	N/A

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### 3. Acoustical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response (dB)		Acceptance limit class 1 (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	A-weight	C-weight			
125	0.7	0.8	±1.0	0.45	0.6
1 000	-0.5	-0.5	±0.7	0.45	0.6
8 000	-1.8	-1.9	+1.5; -2.5	0.45	0.7

### 4. Electrical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response (dB)		Acceptance limit class 1 (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	A-weight	C-weight			
63	-0.1	-0.1	±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	0.0	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	0.1	0.0	+1.5; -2.5	0.20	0.7
16 000	-1.4	-1.3	+2.5; -16.0	0.20	0.7

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MTC No. EEL. BP. 153/0266

Request No. 21-66/0343

#### 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	94.1	0.1	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)
137	137.1	0.1	0.8	0.30	0.3
136	136.1	0.1	0.8	0.30	0.3
135	135.1	0.1	0.8	0.30	0.3
134	134.1	0.1	0.8	0.30	0.3
133	133.1	0.1	0.8	0.30	0.3
132	132.1	0.1	0.8	0.30	0.3
131	131.1	0.1	0.8	0.30	0.3
130	130.1	0.1	0.8	0.30	0.3
129	129.1	0.1	0.8	0.30	0.3
124	124.0	0.0	0.8	0.30	0.3
119	119.1	0.1	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

Date of Calibration : 21-23 Mar. 2023

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Request No. 21-66/0343

MTC No. EEL. BP. 153/0266

## 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)
74	74.1	0.1	0.8	0.30	0.3
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	54.0	0.0	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	29.0	0.0	0.8	0.30	0.3
28	28.0	0.0	0.8	0.30	0.3
27	27.0	0.0	0.8	0.30	0.3
26	26.0	0.0	0.8	0.30	0.3
25	25.0	0.0	0.8	0.30	0.3

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## 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	0.00	0.3

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Request No. 21-66/0543

MTC No. EEL. BP. 153/0266

## 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	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	119.6	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	90.8	-0.2	+1.0; -3.0	0.20	0.3

Date of Calibration : 21-23 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 1 (±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

11. Overload indication					
Measured value (dB)		Deviated value (dB)	Acceptance limit class 1 (±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

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#### 12. High-level stability

Time	Measured value (dB)	Deviated value (dB)	Acceptance limit class 1 (±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 :

*Pannasit P.*

(Mr. Pannasit Phasingstri)

Approved by :



Electrical and Electronic Standards Laboratory  
Industrial Metrology and Testing Service Centre

Date of Calibration : 21-23 Mar. 2023

Date of Issue : 23 Mar. 2023

Ref : 2011266022700825006

End of Certificate

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**COPY**

**SOUND LEVEL METER**

**MODEL : NL-52A**

**SERIAL No. : 00230985**





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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, Sukhapibarn 8 Rd., Nongkham, Sitracha, 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

**Ambient Environment**  
**Temperature** : (23 ± 3) °C  
**Relative Humidity** : (50 ± 15) %  
**Ambient Pressure** : (101.325 ± 1.5) kPa

### 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

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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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### 1. Absolute Sensitivity

Reference Acoustic Signal (dB)	Measured value (dB)		Deviation value (dB)	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	Flat			
125	0.3	0.4	0.4	+1.0	0.45	0.6
1 000	-0.4	-0.4	-0.4	+0.7	0.45	0.6
8 000	-0.8	-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	Flat			
63	-0.1	0.0	0.0	±1.0	0.20	0.6
125	-0.1	0.0	0.0	±1.0	0.20	0.6
250	-0.1	0.0	0.1	±1.0	0.20	0.6
500	-0.1	0.0	0.1	±1.0	0.20	0.6
1 000	0.0	0.0	0.0	+0.7	0.20	0.6
2 000	0.0	0.0	0.0	±1.0	0.20	0.6
4 000	0.0	0.0	0.0	±1.0	0.20	0.6
8 000	0.0	0.1	0.0	+1.5 ; -2.5	0.20	0.7
16 000	0.0	0.0	0.0	+2.5 ; -16.0	0.20	1.0

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Request No. 21-66/0343

MTC No. EEL. BP. 148/0266

### 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 I (±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

At reference sound level on the reference level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class I (±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

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

Head Office  
35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,  
Changwat Pathumthani 12120, Thailand  
Tel. (66) 0 2577 9000  
Fax. (66) 0 2577 9009  
E-mail : mtc@tistr.or.th

Office/Laboratory  
Sri 1C, Bangpoo Industrial Estate, Sukhumvit Road,  
Amphoe Muang, Changwat Samutprakan 10280, Thailand  
Tel. (66) 0 2323 1672-80 ext. 115, 116  
Fax. (66) 0 2323 9165  
E-mail : mtc@tistr.or.th

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 I (±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 I (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

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

Head Office  
35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,  
Changwat Pathumthani 12120, Thailand  
Tel. (66) 0 2577 9000  
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Office/Laboratory  
Sri 1C, Bangpoo Industrial Estate, Sukhumvit Road,  
Amphoe Muang, Changwat Samutprakan 10280, Thailand  
Tel. (66) 0 2323 1672-80 ext. 115, 116  
Fax. (66) 0 2323 9165  
E-mail : mtc@tistr.or.th



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 :

*Prasanna Kluaypa*

(Mr. Prasanna 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

9 / 9

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

FMBL.MTC.002 Rev.

**ANALYTICAL BALANCE (DU)**

**Model : XS205DU**

**Serial No. : 1126323724**





Certificate No. : 23-148799  
Sample Code : 23-56200-001

## CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.  
683 Moo 11, Sukhapibarn 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 : 22 December 2023

Date of Calibration : 22 December 2023

Calibrated by : Mr. Somwang Sangdee  
Scientist  
Approved by : (Mr. Somchai Neampunt)  
Signed for Director

Issue date : 25 December 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. : 23-148799  
Sample Code : 23-56200-001

## 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
<input type="checkbox"/> No adjustment	Nominal value	40 80 40 80	
<input checked="" type="checkbox"/> Adjustment	Standard weight	40.000054 80.000048 40.000054 80.000048	
	Average reading of indicator	40.000026 80.000037 40.000017 80.000017	
	Standard deviation	0.000015 0.000016 0.000008 0.000009	

Unit : g	Range : 200	Before adjustment	After adjustment
<input type="checkbox"/> No adjustment	Nominal value	100 200 100 200	
<input checked="" type="checkbox"/> Adjustment	Standard weight	100.000042 200.000041 100.000042 200.000041	
	Average reading of indicator	100.00003 200.00004 100.00001 200.00001	
	Standard deviation	0.000005 0.000005 0.000003 0.000005	





Certificate No. : 23-148799

Sample Code : 23-56200-001

## 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 : 80 200

Test Point	Sensitivity, S	Test Point	Sensitivity, S
0	1.00748	0	1.0274
40	0.98753	100	0.9975
80	0.99751	200	0.9975

## 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	0.00000	0.00000	0.000012	2.05
0.01	0.0100025	0.01000	0.00000	0.000012	2.05
0.1	0.1000019	0.10001	-0.00001	0.000013	2.03
1	1.0000125	1.00001	0.00000	0.000015	2.02
5	5.0000208	5.00004	-0.00002	0.000021	2.00
10	10.0000004	10.00008	-0.00008	0.000026	2.00
20	20.0000030	20.00011	-0.00008	0.000036	2.00
50	50.000014	50.00014	-0.00013	0.000088	2.00
100	100.000042	100.0001	-0.0001	0.00016	2.00
150	150.000056	150.0001	0.0000	0.00022	2.00
200	200.000041	200.0002	-0.0002	0.00027	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. : 23-148799

Sample Code : 23-56200-001

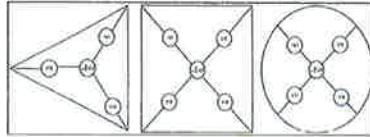
## REPORT OF CALIBRATION

## 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.

<div><input type="radio"/> Circle</div>		Test weight : 50 and 100 Unit : g
<div><input type="radio"/> Triangular</div>		
<div><input checked="" type="radio"/> Rectangular</div>		
Range	80	200
Position	Reading of indicator	Reading of indicator
1	50.00015	100.0001
2	50.00022	100.0001
3	50.00008	100.0001
4	50.00002	100.0000
5	50.00016	100.0002
6	50.00014	100.0001
Maximum difference		0.0001



## Condition of Calibration

- Calibration Method : W1-CL-004 base on UKAS LAB 14: 2019
- This result of calibration was found accurate as shown on date and place of calibration only.
- Condition of Calibration tem: Normal
- 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).

6. Ambient conditions	Min	Max
Temperature (°C)	22.8	23.0
Relative Humidity (%rh)	43.5	51.1
Air pressure (hPa)	1012.5	1014.5

Instrument : 1) STANDARD WEIGHT 1 kg to 1 kg  
Class : E2  
ID No. : LB-WE-79  
Certificate No. : 23-105642  
Due Date : 10 September 2024

End of Report

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# **ATOMIC ABSORPTION SPECTROPHOTOMETER**

**Model : PinAAcle 900F**

**Serial No. : PFBS22080801**

# PinAAcle 900F Preventive Maintenance (PM)

Company Name:	Eastern Thai Consulting 1992 Co., Ltd.		
Address (Instrument Location):	683 Moo 11 Sukapibal 8 Rd. Nong Kham, Si Racha, Chonburi 20230		
Serial Number:	PFBS22080801	PM Number:	2 of 2
Customer Name (if applicable):		Telephone Number:	
Customer Support Engineer Name:	Khwanchai	Service Order Number:	WO-01886639
Date PM Performed: (DD-MM-YY)	24-Oct-2023	Next PM Due Date: (DD-MM-YY)	24-Apr-2024
Standard Labor Hours to Complete PM :		5 hours	

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

## Scope

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

The customer should save their method before the PM begins.

## General Instructions:

The customer must provide the engineer operational data to demonstrate recent instrument performance prior to starting the PM.

Always check with the customer before making any changes that may affect the customer's analysis or calibration, including a current back-up of system software and/or data files.

The completed document should be signed by an authorized PerkinElmer and customer representative and left with the customer.

Update the PM sticker and instrument logbook as required.

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# Component List

Component / Specific Model	Serial #	Configuration Notes
FIAS100		

# Parts Lists

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

## Additional Reagents and Standards Required for PM

Part Number (if applicable)	Description	Quality	Batch/Lot #	Expired Date (MM/YY)
N9300183	1000 mg/L Copper Standard	AR	26-87/CLY1	30-Jan-2024

## Additional Reagents and Standards Required for PM (Customer Support Solution)

Part Number (if applicable)	Description	Quantity	Batch/Lot #	Expiration Date (MM/YY)
N/A	DI Water	250 ml.	AR	AR
N/A	0.5% HNO <sub>3</sub>	250 ml.	AR	AR

Additional Tools Required for PM

Part Number (if applicable)	Description	Quantity	Serial #
N1013000	0.2A Neutral density filter	1	MG0-056
N1013002	1.0A Neutral density filter	1	MG2-054
03030997	System 2 EDL Driver	1	03030997
N3050605	As System 2 EDL	1	16148
N3050121	Cu Lumina HCL	1	092216-010130
N3050109	Ba Lumina HCL	1	102416-040160
N3050139	K Lumina HCL	1	110716-010060
N3050152	Ni Lumina HCL	1	100516-030190

## Procedure Checklist

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

### 1. General:

- ☒ Review the instrument performance with the customer and document any recent problems.
- ☒ Inspect the customer log book and make any appropriate PM entries.
- ☒ Perform general inspection of system for cleanliness.

### 2. PC Instrument Software:

- ☒ Instrument Software user files/databases archived, packed, and/or deleted as needed.

### 3. Mechanical:

- ☒ Inspect and clean all fans and filters. Replace filters if necessary
- ☒ Inspect all gas lines for leaks and/or wear. Replace if needed.
- ☒ Clean exterior of the instrument.
- ☒ Inspect the burner head, burner chamber, and nebulizer. Clean if needed as stated in the Hardware Guide.
- ☒ Check burner head dimensions with the feeler gauge as stated in the Hardware Guide in the Maintenance chapter section on cleaning the burner head and checking sloth width. Replace if out of specification
- ☒ Check the condition of the end cap, burner head, and nebulizer O-rings. Replace if necessary.
- ☒ Check the drain system for signs of wear. Replace worn or damaged parts.
- ☒ Visually check for proper flame conditions when igniting the Air-C2H2 and N2O-C2H2 flames (if applicable).

### 4. Electrical:

- ☒ Inspect PC boards. Clean if necessary.
- ☒ Carefully check all internal and external cable connections.
- ☒ Check instrument firmware revisions upgrade to current levels (if necessary)
- ☒ Run Diagnostics Test within the Advanced function of the Spectrometer page. Check the results in the service log folder in the Spectrometer BM Log Viewer.

### 5. Optics:

- ☒ Inspect and clean the sample compartment windows, if needed.
- ☒ Inspect optics. Clean or replace if necessary.

### 6. Gasses:

- ☒ Verify that the Gasses supplied to the instrument are within the pressure and purity specifications found in the PinAAcle 900 Series Pre-installation Checklist SDB.
- ☒ Verify that the acetylene filter and air filter element is dry. Replace if necessary.



#### 7. Flame Interlock Check:

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

Parameter	Specification	Test Results	Pass/Fail
Flame Sensor	Air/C <sub>2</sub> H <sub>2</sub> Flame correctly shuts down	Active	Pass
Drain Sensor	Air/C <sub>2</sub> H <sub>2</sub> Flame correctly shuts down	Active	Pass
Nebulizer Sensor	Air/C <sub>2</sub> H <sub>2</sub> Flame correctly shuts down	Active	Pass
C <sub>2</sub> H <sub>2</sub> Pressure Sensor	Air/C <sub>2</sub> H <sub>2</sub> Flame correctly shuts down	Active	Pass
Air Pressure Sensor	Air/C <sub>2</sub> H <sub>2</sub> Flame correctly shuts down	Active	Pass
Burner Head Sensor	Choosing Nitrous Oxide as the oxidant should trigger an interlock shuts down	Active	Pass

#### 8. After PM Performance tests:

##### 8.1 Detector Linearity with Barium

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

Parameter	Specification	Certificate Value at 553.6 nm (Abs.)	Test Results	Pass/Fail
1.0 A ND Filter	±5% from Cert.	1.0531	1.0230	Pass
0.2 A ND Filter	±5% from Cert.	0.1806	0.1783	Pass

##### 8.2 Baseline Noise at 1.0 Absorbance with Barium

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

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤0.010	0.0015	Pass

##### 8.3 AA Baseline Noise with Copper

Description: Check baseline noise.

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

#### 8.4 D<sub>2</sub> Background Compensation with Copper

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

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤0.010	0.0054	Pass

#### 8.5 AA-BG Baseline Noise with Copper

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

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

#### 8.6 AA-BG Baseline Noise with Arsenic

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

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤0.005	0.0002	Pass

#### 8.7 Flame Sensitivity

Description: Instrument Sensitivity checked against Copper standard.

Standard Copper Sensitivity	Specification	Results (Abs.)	Pass/Fail
5 mg/L Sensitivity S5 Neb (if applicable)	> 0.250 Abs.	NA	NA
2 mg/L Sensitivity HS Neb (if applicable)	> 0.250 Abs.	0.3878	Pass

#### 10. Review:

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

### Additional Comments

Additional Comments Regarding the PM

### Review

The preventive maintenance checks and if applicable performance tests for PinAAcle 900F have been completed.	
This PinAAcle 900F Passes <input checked="" type="checkbox"/> Fails <input type="checkbox"/> the preventive maintenance.	
Review of Preventive Maintenance:	
Authorized PerkinElmer Representative:	Date: 24-Oct-2023 (DD-MM-YY)
Authorized Customer Representative:	Date: 24-Oct-2023 (DD-MM-YY)

**COPY**

**ANALYTICAL BALANCE**

**Model : SECURA224-1S**

**Serial No. : 0036707137**



Certificate No. : 23-148800

Sample Code : 23-56200-002

## CERTIFICATE OF CALIBRATION

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

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

Equipment : ELECTRONIC BALANCE

Manufacturer : SARTORIUS

Model : SECURA224-1S

Serial No. : 0036707137

ID No. : LABE 05/2

Date of Receipt : 22 December 2023

Date of Calibration : 22 December 2023

Calibrated by Mr. Somwang Sangdee  
Scientist

Issue date : 25 December 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. : 23-148800

Sample Code : 23-56200-002

## REPORT OF CALIBRATION

Equipment : ELECTRONIC BALANCE  
Manufacturer : SARTORIUS  
Model : SECURA224-1S  
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	Before adjustment	After adjustment
<input type="checkbox"/> No adjustment	Nominal value	100 200 100	200
<input checked="" type="checkbox"/> Adjustment	Standard weight	100.000042 200.000041 100.000042	200.000041
	Average reading of indicator	99.9998 199.9998	100.0000 200.0000
	Standard deviation	0.00006 0.00007	0.00003 0.00007

Unit :	Range :	Before adjustment	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. : 23-148800

Sample Code : 23-56200-002

## 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 : 220

Test Point	Sensitivity, S	Test Point	Sensitivity, S
0	0.7980	-	-
100	0.8978	-	-
200	0.8978	-	-

## 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	0.000086	2.00
0.01	0.0100025	0.0100	0.0000	0.000086	2.00
0.1	0.1000019	0.1000	0.0000	0.000087	2.00
1	1.0000125	1.0000	0.0000	0.000087	2.00
2	2.0000089	2.0000	0.0000	0.000087	2.00
5	5.0000208	5.0001	-0.0001	0.000088	2.00
10	10.000004	10.0000	0.0000	0.000090	2.00
20	20.000030	20.0000	0.0000	0.000093	2.00
50	50.000014	50.0000	0.0000	0.00011	2.00
100	100.000042	100.0000	0.0000	0.00016	2.00
200	200.000041	200.0000	0.0000	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. : 23-148800

Sample Code : 23-56200-002

## REPORT OF CALIBRATION

## Result of Calibration :

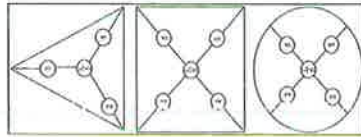
## 4. Eccentric or off-centre loading

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.

Range	Position	Reading of indicator	Reading of indicator
1	100.0000	-	-
2	100.0000	-	-
3	100.0000	-	-
4	99.9999	-	-
5	100.0000	-	-
6	100.0000	-	-
Maximum difference	0.0001	-	-

Weighing pan : ☒ Circle  
☐ Triangular  
☐ Rectangular

Test weight : 100  
Unit : g



## Condition of Calibration

- Calibration Method : WI-CL-004 base on UKAS LAB 14: 2019
- This result of calibration was found accurate as shown on date and place of calibration only.
- Condition of Calibration item: Norma
- 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-WF-79

Certificate No.

23-105642

Due Date

10 September 2024

End of Report -

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**AUTOCLAVE**

**Model : FLS-1000**

**Serial No. : 55169083**



## CERTIFICATE OF CALIBRATION

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 2648 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

(Mr. Somchai Neempunt)  
Signed for Director

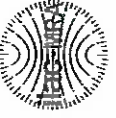
## Issue date

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  
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

Certificate No. : 23-082126  
Sample Code : 23-30826-004

## 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
		Temperature (°C)	Pressure ( MPa )				
		# 1	# 2	# 3	# 4		
121	121	122	0.11	121.78	121.76	0.63	2.00

## 2. Characterization results

Calibration Point (°C)	Stability ± (°C)	Uniformity (°C)	Overall Variation (°C)
121	0.05	0.04	0.12

## Notes

1. UUC\* = Unit Under Calibration
2. The quoted uncertainty includes "Stability of chamber and leading effect in chamber at 20% of uniformity".
3. 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.
4. Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.
5. Overall variation - the difference of the maximum and the minimum measured temperatures throughout observation time.
6. UUC\* reading - the average reading of indicating device that forms the integral part of the autoclave.
7. Calibration results without adjustment.

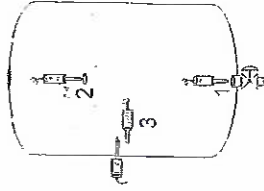


Figure: Example of sensor installation Positions

- Location 1 : 1000 mm diameter chamber with 1000 mm diameter
- Location 2 : In the upper half of the U.C. region
- Location 3 : Attached to the load temperature probe, within 20 mm

The above expressed result of measurement is issued as the standard uncertainty of measurement under a which is a normal distribution of measurement 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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WWW.AMARC.CO.TH  
Effective Date: 15/10/21

## **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)

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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 =  $1.19 \text{ kg/m}^3$  @  $20^{\circ}\text{C}$ , 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**

**Model : TC445S**

**Serial No. : 0223/007275**



**SK**

S K SALES AND SERVICE CO.,LTD.  
194/56, 194/57 Thakham Rd. Samsae Dam  
Bang Khun Thien Bangkok 10150  
Tel : 02-417-2144 Fax : 02-417-2155



## Certificate of Calibration

Reference No. : C03190/2309-025  
Customer : Eastern Thai Consulting 1992 Co.,Ltd.  
683 Moo 11, Sukhaphiban 8, Tambol Nongkham,  
Sisacha District, Chonburi 20230, Thailand

Equipment : Incubator  
Manufacturer : Lovibond  
Model : TC445S  
Serial No. : 0223/007275  
ID No. :  
Received Date : 15 September 2023  
Calibrated Date : 15 September 2023  
Issued Date : 18 September 2023  
Environment :

	Minimum Value	Maximum Value
Ambient Temperature ( °C )	27.5	28.1
Relative Humidity ( % RH )	57	58
AC Line Voltage ( VAC )	224	226

Place Of Calibration : Production Line  
Calibrated by : Mr. Teerasak Chalyaporn

### Calibration Method

In-house method : SK-WI-23 base on Thai Laboratory Accreditation Scheme Publication Reference G-20

### Condition of this result of calibration

- Reference standard instrument
 

Instrument	Serial No.	Certificate No.	Due Date
1) Data acquisition/Switch unit	MY44047397	L2305-268	4 November 2023
2) Multiplexer Module	MY41105123	L2305-268	4 November 2023
- This result of calibration was found accurate as shown on date and place of calibration only
- This certificate can be traceable to International System of Unit :
  - Through Thailand Institute of Scientific And Technological Research (TISTR)

Approved by :  
☒ Mr. Suphachai Saksi  
☐ Mr. Phayak Toolit  
☐ Miss Tantaraporn Petpong

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor  $k = 2.0$ , providing a level of confidence level of approximately 95 %

This certificate may not be reproduced other than in full except with the prior written approval of the S K Sales And Service Company Limited

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Certificate No. : S2309-3014

Page 2 of 2

Table1 General Information

Working Area ( W*L*H ) Fresh Air	60 *56 *145 cm OFF
-------------------------------------	-----------------------

Table2 Chamber Performance

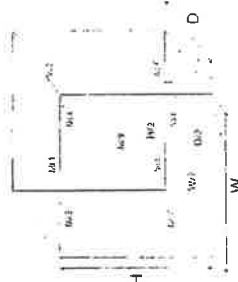
Setting Temperature ( °C )	Average Indicating Temperature ( °C )	Measured Stability ( ± °C )	Measured Uniformity ( °C )	Overall Variation ( °C )
20.0	20.0	0.37	0.64	0.98

Table3 Temperature Distribution

Setting Temperature ( °C )	Average Standard Reading ( °C )									Uncertainty ( ± °C )
	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	
20.0	19.52	19.40	19.70	19.43	19.33	19.39	19.45	19.58	19.67	0.55

Resolution : 0.1 ( °C )

\* Probe No. 9 is Reference Probe



- Notes :
- The temperature stability is the one-half of greatest maximum difference of measured temperatures at any one probe.
  - The temperature uniformity is the maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time
  - Overall variation is the difference of maximum and minimum measured temperatures throughout observation time.
  - The reported uncertainty of measurement were excluded Uniformity and Stability

\*\* End of Calibration Report \*\*

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*[Signature]*

**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 <sup>nd</sup>
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

*[Signature]*

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 : Tc445S  
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 : 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

(Mr. Somchai Neampunt)

Signed for Director

Issue date

24 April 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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Rev 01

Effective Date: 15/11/21

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FAX 02-516-6949  
Rev 05

CONTACT@AMARC.CO.TH  
WWW.AMARC.CO.TH  
Effective Date: 15/11/21

**DO**

**Model : YSI 5000**

**Serial No. : 18E101961**



CERT.No.: HS-U055H

Calibration Date : 25 Aug 23

Submitted by : Eastern Thai Consulting 1992 Company Limited  
683 Moo.11 Sukaphitbail Rd., Nongkham, Sriracha,  
Chonburi 20230

Avg Room Temp : 20 °C

Avg Water Temp : 20 °C

Air Pressure : 760.00 mmHg

Salinity : 0 ppt

Harikul Science Co.,Ltd.  
694 Soi Ratchadaniwet 24 , Pracharabamphen,  
Samsaenmok , HuaiKhwang , Bangkok 10310  
Tel: 0-2274-2456 Fax: 0-2274-2443  
Email: info@harikul.com www.harikul.com  
Certificate of Calibration

Model : YSI 5000  
S/N : 18E101961  
Probe : YSI 5010  
S/N : 18A100724  
ID NO. :  
Air Temp ref : S/N. F8085C26  
Barometric ref : S/N. F8085C26  
Water Temp ref : S/N. 11430

Technician : Kittipong M.

#### Calibration Details

Calibration Point	100% air sat. (@20 °C, DO = 9.09 mg/l)	(status)	(status)
Measurement 1 (mg/l)	9.08	(PASS)	✓
Measurement 2 (mg/l)	9.07	(PASS)	✓
Measurement 3 (mg/l)	9.08	(PASS)	✓
Measurement 4 (mg/l)	9.08	(PASS)	✓
Measurement 5 (mg/l)	9.08	(PASS)	✓
Measurement 6 (mg/l)	9.08	(PASS)	✓
Measurement 7 (mg/l)	9.08	(PASS)	✓
Measurement 8 (mg/l)	9.07	(PASS)	✓
Measurement 9 (mg/l)	9.07	(PASS)	✓
Measurement 10 (mg/l)	9.07	(PASS)	✓

Mean Measurement	9.07	mg/l	✓
Inaccuracy	0.02	mg/l	✓
Overall Status	(PASS)		

#### Manufacturer Specification

Accuracy = +/- 0.02 mg/l

- 1) This certificate is issued based on the result that are found as shown on date and place of test only.
- 2) The calibration procedure followed in accordance with Harikul Science Co., Ltd.
- 3) This result shall not be used for advertising purpose.

Technician Signature  
(Kittipong Maekwong)

Laboratory Manager  
(Supreecha Sumaniam)

**COPY**



**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 <sup>Ref</sup>	
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.

2-73

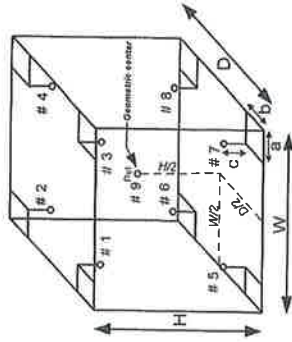


Figure: Example of sensor installation Positions

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.

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**



## Preventive Maintenance Report

Customer Name:	Eastern Thai Consulting 1992 Co., Ltd	Date: Dec 13, 2023
Instrument/Equipment:	ICP-OES	Model: Prodigy 7
Brand:	Teledyne Leeman Labs	S/N: P70177

1. Gas Supply / Water Chiller / Exhaust Hood:	Status
Gas systems:	
Argon Pressure (85-95 psi): 90 psi	OK <input checked="" type="checkbox"/>
Nitrogen Pressure (85-95 psi): - psi	OK <input checked="" type="checkbox"/> use Ar.
No leak inspected	OK <input checked="" type="checkbox"/>
Replace camera purge gas Dehydrator	OK <input type="checkbox"/> waiting spare parts
Water Chiller for RF generator	
Minimum flowrate detected	OK <input checked="" type="checkbox"/>
No leak inspected	OK <input checked="" type="checkbox"/>
Water Chiller for Detector	
Check water level and refill	OK <input checked="" type="checkbox"/>
Change water	OK <input checked="" type="checkbox"/>
Temperature: 25 °C	OK <input checked="" type="checkbox"/>
Exhaust Hood:	
Minimum Air flowrate checked	OK <input checked="" type="checkbox"/>

2. Spectrometer	Status
Optical view position	
Axial peak positions x 332.5 y 430.5	OK <input checked="" type="checkbox"/>
Radial peak positions x 420.6 y 422.0	OK <input checked="" type="checkbox"/>
Hg lamp peak positions x 224.5 y 361.5	OK <input checked="" type="checkbox"/>
Wavelength Calibrate with Hg Lamp	OK <input checked="" type="checkbox"/>
Full Frame Image	OK <input checked="" type="checkbox"/>
Temperature controlled 31 °C	OK <input checked="" type="checkbox"/>
Purge gas flow control Low/High	OK <input checked="" type="checkbox"/>
Purge gas flow for Detector	OK <input checked="" type="checkbox"/>
Camera Support Module	OK <input checked="" type="checkbox"/>

Engineer Sign

*Signature*  
**COPY**



## Instrument Performance Certificate for ICP-OES

PRODUCT ID  
Serial Number  
Prodigy 7, Teledyne Leeman Labs  
P70177

Customer Name  
Address  
EASTERN THAI CONSULTING 1992 CO., LTD.  
999 Moo 11 Tambon Nong Kham, Amphoe Si Racha,  
Chonburi 20230

Date of Qualified  
Next Due date  
Dec 13, 2023  
May 13, 2024

This certifies for products which was performed in acceptable criteria specifications

Gas supply / Water chiller / Exhaust hood  
Cooling Systems  
Spectrometer  
RF Generator  
Sample Introduction & Autosampler  
Software & Computer  
Hardware Diagnostics Test  
Analytical Test  
PASSED  
PASSED  
PASSED  
PASSED  
PASSED  
PASSED

Provided by

Scientist Instrument Co., Ltd.  
113 Soi Ekachai 44, Ekachai Road  
Khlong Bang Phran, Bangkok  
Bangkok 10150 Thailand

Certified by  
Thunraphol Sakdayos

Service Engineer

*Signature*  
**COPY**



<b>3. RF Generator</b>	
Plasma Control	Status
Auto Start	OK <input checked="" type="checkbox"/>
Extinguish	OK <input checked="" type="checkbox"/>
RF power setting	OK <input checked="" type="checkbox"/>
Igniter	OK <input checked="" type="checkbox"/>
Air Knife	OK <input checked="" type="checkbox"/>
Coolant /Plasma Flow control	OK <input checked="" type="checkbox"/>
Aux Flow	OK <input checked="" type="checkbox"/>
Optimize sample introduction function	OK <input checked="" type="checkbox"/>
<b>4. Sample Introduction &amp; Autosampler</b>	
Plasma torch	Status
Plasma Torch	OK <input checked="" type="checkbox"/>
Spray chamber	OK <input checked="" type="checkbox"/>
Injector	OK <input checked="" type="checkbox"/>
Nebulizer pressure	OK <input checked="" type="checkbox"/>
Peristaltic pump and control	
Speed control	OK <input checked="" type="checkbox"/>
Sample tubing	OK <input checked="" type="checkbox"/>
Drain tubing	OK <input checked="" type="checkbox"/>
Autosampler Control	<input type="checkbox"/> Available <input checked="" type="checkbox"/> Not Available
Position movement	OK <input type="checkbox"/>
Drain tubing	OK <input type="checkbox"/>
Auto Rinse	OK <input type="checkbox"/>
<b>5. Computer &amp; Software Check:</b>	
Interface Cable USB	Status
Software Version 5.2	OK <input checked="" type="checkbox"/>
Operation function check :	OK <input checked="" type="checkbox"/>
Open /Save /Edit method	OK <input checked="" type="checkbox"/>
Instrument Control	OK <input checked="" type="checkbox"/>
Sequence	OK <input checked="" type="checkbox"/>
Full Frame Capture	OK <input checked="" type="checkbox"/>
Auto alignment /Hg alignment	OK <input checked="" type="checkbox"/>
Calibration Curve	OK <input checked="" type="checkbox"/>
Re-Calculation	OK <input checked="" type="checkbox"/>
Print Report	OK <input checked="" type="checkbox"/>

Engineer Sign

*SSWARD*

<b>6. Hardware Diagnostics Test</b>		
Power Supply	Value	Status
-12 VDC (+/- 5 %)	-12.7 V	Passed <input checked="" type="checkbox"/>
+12 VDC (+/- 5 %)	+11.91 V	Passed <input checked="" type="checkbox"/>
+3.3 VDC (+/- 5 %)	3.3 V	Passed <input checked="" type="checkbox"/>
+5.0 VDC (+/- 5 %)	4.945 V	Passed <input checked="" type="checkbox"/>
+13.5 VDC (+/- 5 %)	13.41 V	Passed <input checked="" type="checkbox"/>
Plasma Generator		
ICP Current 0.500A = 1kW	0.502 A	Passed <input checked="" type="checkbox"/>
ICP Ref 5.0Vdc = 1kW	5.002 V	Passed <input checked="" type="checkbox"/>
ICP Current 0.00 Vdc = 0kW	0 A	Passed <input checked="" type="checkbox"/>
ICP Ref 0.00Vdc = 0kW	0 V	Passed <input checked="" type="checkbox"/>
RF Water (Hz) OFF (1 Hz)	0 Hz	Passed <input checked="" type="checkbox"/>
RF Water (Hz) ON (25-35 Hz)	25 Hz	Passed <input checked="" type="checkbox"/>
Air Knife Pres. (0.00V ) OFF	0 V	Passed <input checked="" type="checkbox"/>
Air Knife Pres. (3.0 – 7.0 V) ON	3.56 V	Passed <input checked="" type="checkbox"/>
Neb setting to 25 psi	reading 25 psi	Passed <input checked="" type="checkbox"/>
Cool setting to 16 lpm	reading 16 lpm	Passed <input checked="" type="checkbox"/>
Aux setting to 0.5 lpm	reading 0.5 lpm	Passed <input checked="" type="checkbox"/>
Camera Water pump		
Pump Current (0.000 A) OFF	0 A	Passed <input checked="" type="checkbox"/>
Pump Voltage (0.000 V) OFF	0 V	Passed <input checked="" type="checkbox"/>
Pump Current (0.8 to 4.0A) ON	1.1 A	Passed <input checked="" type="checkbox"/>
Pump Voltage (8 to 13 V) ON	12.49 V	Passed <input checked="" type="checkbox"/>
Set Points		
Cam Tec Temperature (-30 to -38°C)	Set -32 °C Read -31 °C	Passed <input checked="" type="checkbox"/>
Op Purge Low (0-15.5 lpm)	Set 5 lpm Read 5.1 lpm	Passed <input checked="" type="checkbox"/>
Op Purge High (0-15.5 lpm)	Set 10 lpm Read 10.1 lpm	Passed <input checked="" type="checkbox"/>
Cam Wtr T (25-30°C)	Set 25 °C Read 25 °C	Passed <input checked="" type="checkbox"/>

### 7. Cleaning & Replacement

O-Ring Torch replacement	Status
Pump Tubing replacement	OK <input checked="" type="checkbox"/>
Glassware cleaning	OK <input checked="" type="checkbox"/>
Lubricate the roll peristaltic pump	OK <input checked="" type="checkbox"/>
Optical windows cleaning	OK <input checked="" type="checkbox"/>
Change & refilled Detector water chiller	OK <input checked="" type="checkbox"/>
Change & refilled RF Generator water Chiller	OK <input checked="" type="checkbox"/>
Clean All Electronics Board	OK <input checked="" type="checkbox"/>

Engineer Sign

*SSWARD*



**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.

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# 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

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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

COPY

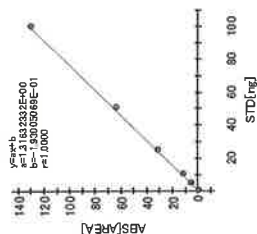
Inspection result

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

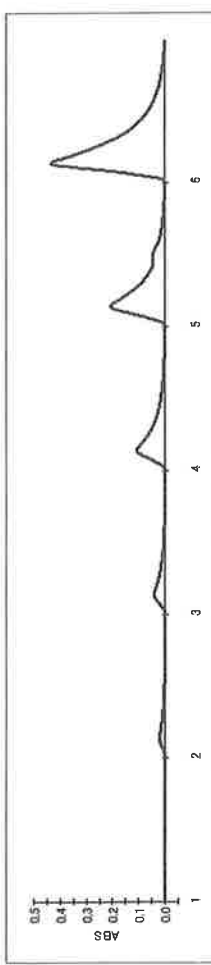
Title : RA-4500 Preventive Maintenance  
 Date : 9/8/2566  
 Name : Coax Group  
 Memo : Calibration curve (No Pretreatment)

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	

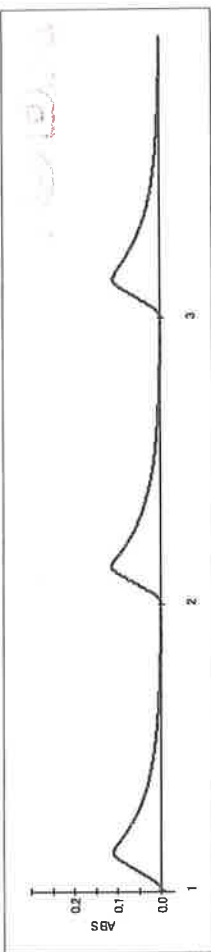


SMP

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**



## CERTIFICATE OF CALIBRATION

Page 1 of 3  
Certificate No. : 23-011524  
Sample Code : 23-04833-001Customer : EASTERN THAI CONSULTING 1992 CO., LTD.  
683 Moo 11, Sukhapiban 8 Rd., Nongkham,  
Siracha, Chonburi 20230Location 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.	Expire Date
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)

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 2 of 3  
Certificate No. : 23-011524  
Sample Code : 23-04833-001Equipment : 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 : InLab Expert Pro-ISM

Electrode Serial No. : 2365921

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

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## 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

DD

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

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 ( $\rho_{ref}$ ) of 8000 kg.m<sup>-3</sup> which it balances in air of a reference density ( $\rho_0$ ) of 1.2 kg.m<sup>-3</sup>

Description	Deviation (mg)	Conventional Mass	Expanded Uncertainty (mg)	Maximum Permissible Error $\pm$ (mg)	ID No.
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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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  $1.20 \text{ kg/m}^3$
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,  
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

( Mr. Somchai Neampunt )  
Signed for Director

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 ( $\rho_{ref}$ ) of 8000 kg.m<sup>-3</sup> which it balances in air of a reference density ( $\rho_a$ ) of 1.2 kg.m<sup>-3</sup>

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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Certificate No. : 22-052239

Sample Code : 22-19150-004

## 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/m<sup>3</sup>

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 ( $\rho_{ref}$ ) of 8000 kg.m<sup>-3</sup> which it balances in air of a reference density ( $\rho_0$ ) of 1.2 kg.m<sup>-3</sup>

Description	Deviation	Conventional		Expanded	Maximum		ID No.
		Mass			Permissible Error		
				Uncertainty	$\pm$ (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

COPY

NSC-TIS-7025  
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/m<sup>3</sup>
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 Lohabal  
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 -

COPY



**ANALYTICAL BALANCE (DU)**

**Model : XS205DU**

**Serial No. : 1126323724**



Certificate No. : 23-148799  
Sample Code : 23-56200-001

## CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.  
683 Moo 11, Sukhapibarn 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 : 22 December 2023

Date of Calibration : 22 December 2023

Calibrated by : Mr. Somwang Sangdee  
Scientist  
Approved by : (Mr. Somchai Neampunt)  
Signed for Director

Issue date : 25 December 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. : 23-148799  
Sample Code : 23-56200-001

## 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
<input type="checkbox"/> No adjustment	Nominal value	40 80 40 80	
<input checked="" type="checkbox"/> Adjustment	Standard weight	40.000054 80.000048 40.000054 80.000048	
	Average reading of indicator	40.000026 80.000037 40.000017 80.000017	
	Standard deviation	0.000015 0.000016 0.000008 0.000009	

Unit : g	Range : 200	Before adjustment	After adjustment
<input type="checkbox"/> No adjustment	Nominal value	100 200 100 200	
<input checked="" type="checkbox"/> Adjustment	Standard weight	100.000042 200.000041 100.000042 200.000041	
	Average reading of indicator	100.00003 200.00004 100.00001 200.00001	
	Standard deviation	0.000005 0.000005 0.000003 0.000005	



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


# **ATOMIC ABSORPTION SPECTROPHOTOMETER**

**Model : PinAAcle 900F**

**Serial No. : PFBS22080801**

# PinAAcle 900F Preventive Maintenance (PM)

Company Name:	Eastern Thai Consulting 1992 Co., Ltd.		
Address (Instrument Location):	683 Moo 11 Sukapibal 8 Rd. Nong Kham, Si Racha, Chonburi 20230		
Serial Number:	PFBS22080801	PM Number:	2 of 2
Customer Name (if applicable):		Telephone Number:	
Customer Support Engineer Name:	Khwanhai	Service Order Number:	WO-01886639
Date PM Performed: (DD-MM-YY)	24-Oct-2023	Next PM Due Date: (DD-MM-YY)	24-Apr-2024
Standard Labor Hours to Complete PM :		5 hours	

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

## Scope

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

The customer should save their method before the PM begins.

## General Instructions:

The customer must provide the engineer operational data to demonstrate recent instrument performance prior to starting the PM.

Always check with the customer before making any changes that may affect the customer's analysis or calibration, including a current back-up of system software and/or data files.

The completed document should be signed by an authorized PerkinElmer and customer representative and left with the customer.

Update the PM sticker and instrument logbook as required.

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## Component List

Component / Specific Model	Serial #	Configuration Notes
FIAS100		

## Parts Lists

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

## Additional Reagents and Standards Required for PM

Part Number (if applicable)	Description	Quality	Batch/Lot #	Expired Date (MM/YY)
N9300183	1000 mg/L Copper Standard	AR	26-87/CLY1	30-Jan-2024

## Additional Reagents and Standards Required for PM (Customer Support Solution)

Part Number (if applicable)	Description	Quantity	Batch/Lot #	Expiration Date (MM/YY)
N/A	DI Water	250 ml.	AR	AR
N/A	0.5% HNO <sub>3</sub>	250 ml.	AR	AR

## Procedure Checklist

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

### 1. General:

- ☒ Review the instrument performance with the customer and document any recent problems.
- ☒ Inspect the customer log book and make any appropriate PM entries.
- ☒ Perform general inspection of system for cleanliness.

### 2. PC Instrument Software:

- ☒ Instrument Software user files/databases archived, packed, and/or deleted as needed.

### 3. Mechanical:

- ☒ Inspect and clean all fans and filters. Replace filters if necessary
- ☒ Inspect all gas lines for leaks and/or wear. Replace if needed.
- ☒ Clean exterior of the instrument.
- ☒ Inspect the burner head, burner chamber, and nebulizer. Clean if needed as stated in the Hardware Guide.
- ☒ Check burner head dimensions with the feeler gauge as stated in the Hardware Guide in the Maintenance chapter section on cleaning the burner head and checking sloth width. Replace if out of specification
- ☒ Check the condition of the end cap, burner head, and nebulizer O-rings. Replace if necessary.
- ☒ Check the drain system for signs of wear. Replace worn or damaged parts.
- ☒ Visually check for proper flame conditions when igniting the Air-C2H2 and N2O-C2H2 flames (if applicable).

### 4. Electrical:

- ☒ Inspect PC boards. Clean if necessary.
- ☒ Carefully check all internal and external cable connections.
- ☒ Check instrument firmware revisions upgrade to current levels (if necessary)
- ☒ Run Diagnostics Test within the Advanced function of the Spectrometer page. Check the results in the service log folder in the Spectrometer BM Log Viewer.

### 5. Optics:

- ☒ Inspect and clean the sample compartment windows, if needed.
- ☒ Inspect optics. Clean or replace if necessary.

### 6. Gasses:

- ☒ Verify that the Gasses supplied to the instrument are within the pressure and purity specifications found in the PinAAcle 900 Series Pre-installation Checklist SDB.
- ☒ Verify that the acetylene filter and air filter element is dry. Replace if necessary.

Additional Tools Required for PM

Part Number (if applicable)	Description	Quantity	Serial #
N1013000	0.2A Neutral density filter	1	MG0-056
N1013002	1.0A Neutral density filter	1	MG2-054
03030997	System 2 EDL Driver	1	03030997
N3050605	As System 2 EDL	1	16148
N3050121	Cu Lumina HCL	1	092216-010130
N3050109	Ba Lumina HCL	1	102416-040160
N3050139	K Lumina HCL	1	110716-010060
N3050152	Ni Lumina HCL	1	100516-030190



#### 7. Flame Interlock Check:

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

Parameter	Specification	Test Results	Pass/Fail
Flame Sensor	Air/C <sub>2</sub> H <sub>2</sub> Flame correctly shuts down	Active	Pass
Drain Sensor	Air/C <sub>2</sub> H <sub>2</sub> Flame correctly shuts down	Active	Pass
Nebulizer Sensor	Air/C <sub>2</sub> H <sub>2</sub> Flame correctly shuts down	Active	Pass
C <sub>2</sub> H <sub>2</sub> Pressure Sensor	Air/C <sub>2</sub> H <sub>2</sub> Flame correctly shuts down	Active	Pass
Air Pressure Sensor	Air/C <sub>2</sub> H <sub>2</sub> Flame correctly shuts down	Active	Pass
Burner Head Sensor	Choosing Nitrous Oxide as the oxidant should trigger an interlock shuts down	Active	Pass

#### 8. After PM Performance tests:

##### 8.1 Detector Linearity with Barium

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

Parameter	Specification	Certificate Value at 553.6 nm (Abs.)	Test Results	Pass/Fail
1.0 A ND Filter	± 5% from Cert.	1.0531	1.0230	Pass
0.2 A ND Filter	± 5% from Cert.	0.1806	0.1783	Pass

##### 8.2 Baseline Noise at 1.0 Absorbance with Barium

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

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.010	0.0015	Pass

##### 8.3 AA Baseline Noise with Copper

Description: Check baseline noise.

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

#### 8.4 D<sub>2</sub> Background Compensation with Copper

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

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.010	0.0054	Pass

#### 8.5 AA-BG Baseline Noise with Copper

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

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

#### 8.6 AA-BG Baseline Noise with Arsenic

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

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.005	0.0002	Pass

#### 8.7 Flame Sensitivity

Description: Instrument Sensitivity checked against Copper standard.

Standard Copper Sensitivity	Specification	Results (Abs.)	Pass/Fail
5 mg/L Sensitivity S5 Neb (if applicable)	> 0.250 Abs.	NA	NA
2 mg/L Sensitivity HS Neb (if applicable)	> 0.250 Abs.	0.3878	Pass

#### 10. Review:

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

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### Additional Comments

Additional Comments Regarding the PM

### Review

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

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

Review of Preventive Maintenance:

Authorized PerkinElmer Representative:	KL S.	Date:	24-Oct-2023 (DD-MM-YY)
Authorized Customer Representative:	001025526	Date:	24-Oct-2023 (DD-MM-YY)

**COPY**

**ANALYTICAL BALANCE**

**Model : SECURA224-1S**

**Serial No. : 0036707137**



Certificate No. : 23-148800

Sample Code : 23-56200-002

## CERTIFICATE OF CALIBRATION

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

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

Equipment : ELECTRONIC BALANCE

Manufacturer : SARTORIUS

Model : SECURA224-1S

Serial No. : 0036707137

ID No. : LABE 05/2

Date of Receipt : 22 December 2023

Date of Calibration : 22 December 2023

Calibrated by Mr. Somwang Sangdee  
Scientist

Issue date : 25 December 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. : 23-148800

Sample Code : 23-56200-002

## REPORT OF CALIBRATION

Equipment : ELECTRONIC BALANCE  
Manufacturer : SARTORIUS  
Model : SECURA224-1S  
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	Before adjustment	After adjustment
<input type="checkbox"/> No adjustment	Nominal value	100 200 100	200
<input checked="" type="checkbox"/> Adjustment	Standard weight	100.000042 200.000041 100.000042	200.000041
	Average reading of indicator	99.9998 199.9998	100.0000 200.0000
	Standard deviation	0.00006 0.00007	0.00003 0.00007

Unit :	Range :	Before adjustment	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. : 23-148800

Sample Code : 23-56200-002

## 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 : 220

Test Point	Sensitivity, S	Test Point	Sensitivity, S
0	0.7980	-	-
100	0.8978	-	-
200	0.8978	-	-

## 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	0.000086	2.00
0.01	0.0100025	0.0100	0.0000	0.000086	2.00
0.1	0.1000019	0.1000	0.0000	0.000087	2.00
1	1.0000125	1.0000	0.0000	0.000087	2.00
2	2.0000089	2.0000	0.0000	0.000087	2.00
5	5.0000208	5.0001	-0.0001	0.000088	2.00
10	10.000004	10.0000	0.0000	0.000090	2.00
20	20.000030	20.0000	0.0000	0.000093	2.00
50	50.000014	50.0000	0.0000	0.00011	2.00
100	100.000042	100.0000	0.0000	0.00016	2.00
200	200.000041	200.0000	0.0000	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. : 23-148800

Sample Code : 23-56200-002

## REPORT OF CALIBRATION

## Result of Calibration :

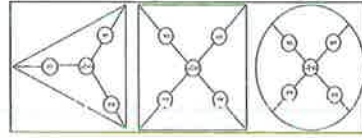
## 4. Eccentric or off-centre loading

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.

Range	Position	Reading of indicator	Reading of indicator
1	100.0000	-	-
2	100.0000	-	-
3	100.0000	-	-
4	99.9999	-	-
5	100.0000	-	-
6	100.0000	-	-
Maximum difference	0.0001	-	-

Weighing pan : ☒ Circle  
☐ Triangular  
☐ Rectangular

Test weight : 100  
Unit : g



## Condition of Calibration

1. Calibration Method : WI-CL-004 base on UKAS LAB 14: 2019	6. Ambient conditions	Min	Max
2. This result of calibration was found accurate as shown on date and place of calibration only.	Temperature (°C)	24.4	24.8
3. Condition of Calibration item: Norma	Relative Humidity (%Rh)	39.9	41.1
4. This certification is traceable to the International System of Unit maintained at : *	Air pressure (hPa)	1012.2	1012.8

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-WF-79

Certificate No.

23-105642

Due Date

10 September 2024

End of Report

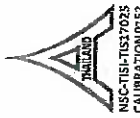
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**AUTOCLAVE**

**Model : FLS-1000**

**Serial No. : 55169083**





## CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.

683 Moo 11, Sukhapibam 8 Rd., Nongkham,  
Siracha, Chonburi 20230Location 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 2648 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 Neampunt)  
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 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  
Effective Date 15/10/21



## REPORT OF CALIBRATION

Certificate No. : 23-082126  
Sample Code : 23-30826-004  
Page 2 of 2

## 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 )				
		# 1	# 2	# 3	# 3		
121	121	122	0.11	121.78	121.78	0.63	2.00

## 2. Characterization results

Calibration Point (°C)	Stability ± (°C)	Uniformity (°C)	Overall Variation (°C)
121	0.05	0.04	0.12

## Notes

1. UUC\* = Unit Under Calibration
2. The quoted uncertainty includes "Stability of chamber and leading effect in chamber at 20% of uniformity".
3. 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.
4. Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.
5. Overall variation - the difference of the maximum and the minimum measured temperatures throughout observation time.
6. UUC\* reading - the average reading of indicating device that forms the integral part of the autoclave.
7. Calibration results without adjustment.

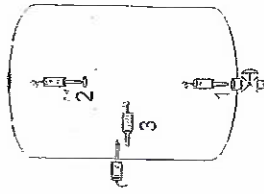


Figure: Example of sensor installation Positions

- Location 1 : 100 mm from top of the U.C. main
- Location 2 : In the upper half of the U.C. main
- Location 3 : Attached to the load temperature probe, within 20 mm

The above expressed result of measurement is issued as the standard uncertainty of measurement under a which has a normal distribution of uncertainty to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined at measurement points (spots).

- End of Report -

COPY

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CONTACT@AMARC.CO.TH  
WWW.AMARC.CO.TH  
TEL. 02-516-2422  
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.

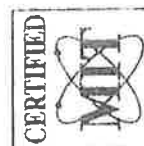
This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

### 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 ± 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/m<sup>3</sup> @ 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

COPY

**BOD INCUBATOR**

**Model : TC445S**

**Serial No. : 0223/007275**

**SK**

S K SALES AND SERVICE CO.,LTD.  
194/56, 194/57 Thakham Rd. Samsae Dam  
Bang Khun Thien Bangkok 10150  
Tel : 02-417-2144 Fax : 02-417-2155



## Certificate of Calibration

Reference No. : C03190/2309-025  
Customer : Eastern Thai Consulting 1992 Co.,Ltd.  
683 Moo 11, Sukhaphiban 8, Tambol Nongkham,  
Siracha District, Chonburi 20230, Thailand

Equipment : Incubator  
Manufacturer : Lovibond  
Model : TC445S  
Serial No. : 0223/007275  
ID No. :  
Received Date : 15 September 2023  
Calibrated Date : 15 September 2023  
Issued Date : 18 September 2023  
Environment :

	Minimum Value	Maximum Value
Ambient Temperature ( °C )	27.5	28.1
Relative Humidity ( % RH )	57	58
AC Line Voltage ( VAC )	224	226

Place Of Calibration : Production Line  
Calibrated by : Mr. Teerasak Chalyaporn

### Calibration Method

In-house method : SK-WI-23 base on Thai Laboratory Accreditation Scheme Publication Reference G-20

### Condition of this result of calibration

- Reference standard instrument
 

Instrument	Serial No.	Certificate No.	Due Date
1) Data acquisition/Switch unit	MY44047397	L2305-268	4 November 2023
2) Multiplexer Module	MY41105123	L2305-268	4 November 2023
- This result of calibration was found accurate as shown on date and place of calibration only
- This certificate can be traceable to International System of Unit :

Through Thailand Institute of Scientific And Technological Research (TISTR)

Approved by

☒ Mr. Suphachai Saksi ☐ Mr. Phayak Toolit ☐ Miss Tantaraporn Petpong

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor  $k = 2.0$ , providing a level of confidence level of approximately 95 %

This certificate may not be reproduced other than in full except with the prior written approval of the S K Sales And Service Company Limited

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Certificate No. : S2309-3014

Page 2 of 2

Table1 General Information

Working Area ( W*L*H )	60 *56 *145 cm
Fresh Air	OFF

Table2 Chamber Performance

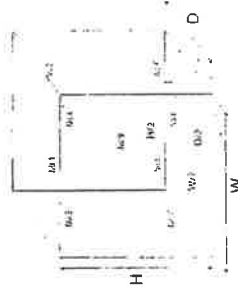
Setting Temperature ( °C )	Average Indicating Temperature ( °C )	Measured Stability ( ± °C )	Measured Uniformity ( °C )	Overall Variation ( °C )
20.0	20.0	0.37	0.64	0.98

Table3 Temperature Distribution

Setting Temperature ( °C )	Average Standard Reading ( °C )									Uncertainty ( ± °C )
	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	
20.0	19.52	19.40	19.70	19.43	19.33	19.39	19.45	19.58	19.67	0.55

Resolution : 0.1 ( °C )

\* Probe No. 9 is Reference Probe



- Notes :
- The temperature stability is the one-half of greatest maximum difference of measured temperatures at any one probe.
  - The temperature uniformity is the maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time
  - Overall variation is the difference of maximum and minimum measured temperatures throughout observation time.
  - The reported uncertainty of measurement were excluded Uniformity and Stability

\*\* End of Calibration Report \*\*

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*[Handwritten signature]*

**BOD INCUBATOR**

**ID No. : LABE 19/5**





REPORT OF CALIBRATION

Certificate No. : 23-040768  
Sample Code : 23-16178-002

CERTIFICATE OF CALIBRATION

Page 1 of 3  
Certificate No. : 23-040768  
Sample Code : 23-16178-002

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 : 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

(Mr. Somchai Neampunt)

Signed for Director

Issue date

24 April 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).

361 Soi Ladprao 122, Ladprao Road,  
Phlabphla, Wang Thonglang, Bangkok 10310  
FW-CL-014  
Rev 01  
Effective Date: 15/11/21

CONTACT@AMARC.CO.TH  
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361 Soi Ladprao 122, Ladprao Road,  
Phlabphla, Wang Thonglang, Bangkok 10310  
FW-CL-014

TEL 02-516-2422  
FAX 02-516-6949  
Rev 06

CONTACT@AMARC.CO.TH  
WWW.AMARC.CO.TH  
Effective Date: 15/11/21

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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.

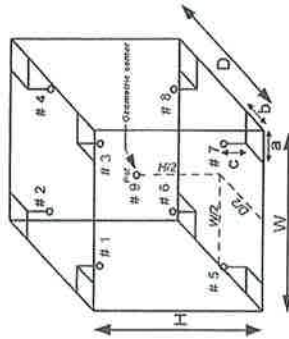


Figure:-Example of sensor  
Installation Positions

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 -

**COPY**

**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 <sup>Ref</sup>	
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

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.

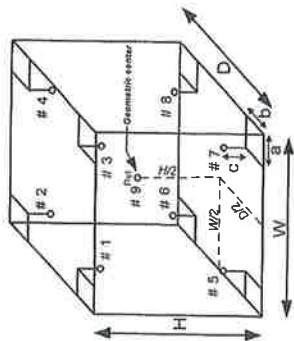


Figure: Example of sensor installation Positions

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 -

**COPY**

**INDUCTIBELY COUPLED PLASMA SPECTROMETER**

**Model : Prodigy 7**

**Serial No. : P70177**





## Preventive Maintenance Report

Customer Name:	Eastern Thai Consulting 1992 Co., Ltd	Date: Dec 13, 2023
Instrument/Equipment:	ICP-OES	Model: Prodigy 7
Brand:	Teledyne Leeman Labs	S/N: P70177

1. Gas Supply / Water Chiller / Exhaust Hood:	Status
Gas systems:	
Argon Pressure (85-95 psi): 90 psi	OK <input checked="" type="checkbox"/>
Nitrogen Pressure (85-95 psi): - psi	OK <input checked="" type="checkbox"/> use Ar.
No leak inspected	OK <input checked="" type="checkbox"/>
Replace camera purge gas Dehydrator	OK <input type="checkbox"/> waiting spare parts
Water Chiller for RF generator	
Minimum flowrate detected	OK <input checked="" type="checkbox"/>
No leak inspected	OK <input checked="" type="checkbox"/>
Water Chiller for Detector	
Check water level and refill	OK <input checked="" type="checkbox"/>
Change water	OK <input checked="" type="checkbox"/>
Temperature: 25 °C	OK <input checked="" type="checkbox"/>
Exhaust Hood:	
Minimum Air flowrate checked	OK <input checked="" type="checkbox"/>

2. Spectrometer	Status
Optical view position	
Axial peak positions x 332.5 y 43.05	OK <input checked="" type="checkbox"/>
Radial peak positions x 42.06 y 42.20	OK <input checked="" type="checkbox"/>
Hg lamp peak positions x 224.5 y 36.15	OK <input checked="" type="checkbox"/>
Wavelength Calibrate with Hg Lamp	OK <input checked="" type="checkbox"/>
Full Frame Image	OK <input checked="" type="checkbox"/>
Temperature controlled 31 °C	OK <input checked="" type="checkbox"/>
Purge gas flow control Low/High	OK <input checked="" type="checkbox"/>
Purge gas flow for Detector	OK <input checked="" type="checkbox"/>
Camera Support Module	OK <input checked="" type="checkbox"/>

Engineer Sign

*Signature*  
**COPY**



## Instrument Performance Certificate for ICP-OES

PRODUCT ID  
Serial Number  
Prodigy 7, Teledyne Leeman Labs  
P70177

Customer Name  
Address  
EASTERN THAI CONSULTING 1992 CO., LTD.  
999 Moo 11 Tambon Nong Kham, Amphoe Si Racha,  
Chonburi 20230

Date of Qualified  
Next Due date  
Dec 13, 2023  
May 13, 2024

This certifies for products which was performed in acceptable criteria specifications

Gas supply / Water chiller / Exhaust hood  
Cooling Systems  
Spectrometer  
RF Generator  
Sample Introduction & Autosampler  
Software & Computer  
Hardware Diagnostics Test  
Analytical Test  
PASSED  
PASSED  
PASSED  
PASSED  
PASSED  
PASSED

Provided by  
Scientist Instrument Co., Ltd.  
113 Soi Ekachai 44, Ekachai Road  
Khlong Bang Phran, Bangkok  
Bangkok 10150 Thailand

Certified by  
Thunraphol Sakdayos  
Service Engineer

*Signature*  
**COPY**

<b>3. RF Generator</b>	
Plasma Control	Status
Auto Start	OK <input checked="" type="checkbox"/>
Extinguish	OK <input checked="" type="checkbox"/>
RF power setting	OK <input checked="" type="checkbox"/>
Igniter	OK <input checked="" type="checkbox"/>
Air Knife	OK <input checked="" type="checkbox"/>
Coolant /Plasma Flow control	OK <input checked="" type="checkbox"/>
Aux Flow	OK <input checked="" type="checkbox"/>
Optimize sample introduction function	OK <input checked="" type="checkbox"/>
<b>4. Sample Introduction &amp; Autosampler</b>	
Plasma torch	Status
Plasma Torch	OK <input checked="" type="checkbox"/>
Spray chamber	OK <input checked="" type="checkbox"/>
Injector	OK <input checked="" type="checkbox"/>
Nebulizer pressure	OK <input checked="" type="checkbox"/>
Peristaltic pump and control	OK <input checked="" type="checkbox"/>
Speed control	OK <input checked="" type="checkbox"/>
Sample tubing	OK <input checked="" type="checkbox"/>
Drain tubing	OK <input checked="" type="checkbox"/>
Position movement	<input type="checkbox"/> Available <input checked="" type="checkbox"/> Not Available
Drain tubing	OK <input type="checkbox"/>
Auto Rinse	OK <input type="checkbox"/>
<b>5. Computer &amp; Software Check:</b>	
Interface Cable USB	Status
Software Version 5.2	OK <input checked="" type="checkbox"/>
Operation function check :	OK <input checked="" type="checkbox"/>
Open /Save /Edit method	OK <input checked="" type="checkbox"/>
Instrument Control	OK <input checked="" type="checkbox"/>
Sequence	OK <input checked="" type="checkbox"/>
Full Frame Capture	OK <input checked="" type="checkbox"/>
Auto alignment /Hg alignment	OK <input checked="" type="checkbox"/>
Calibration Curve	OK <input checked="" type="checkbox"/>
Re-Calculation	OK <input checked="" type="checkbox"/>
Print Report	OK <input checked="" type="checkbox"/>

Engineer Sign

*SSWARD*

<b>6. Hardware Diagnostics Test</b>		
Power Supply	Value	Status
-12 VDC (+/- 5 %)	-12.7 V	Passed <input checked="" type="checkbox"/>
+12 VDC (+/- 5 %)	+11.91 V	Passed <input checked="" type="checkbox"/>
+3.3 VDC (+/- 5 %)	3.3 V	Passed <input checked="" type="checkbox"/>
+5.0 VDC (+/- 5 %)	4.945 V	Passed <input checked="" type="checkbox"/>
+13.5 VDC (+/- 5 %)	13.41 V	Passed <input checked="" type="checkbox"/>
Plasma Generator		
ICP Current 0.500A = 1kW	0.502 A	Passed <input checked="" type="checkbox"/>
ICP Ref 5.0Vdc = 1kW	5.002 V	Passed <input checked="" type="checkbox"/>
ICP Current 0.00 Vdc = 0kW	0 A	Passed <input checked="" type="checkbox"/>
ICP Ref 0.00Vdc = 0kW	0 V	Passed <input checked="" type="checkbox"/>
RF Water (Hz) OFF (1 Hz)	0 Hz	Passed <input checked="" type="checkbox"/>
RF Water (Hz) ON (25-35 Hz)	25 Hz	Passed <input checked="" type="checkbox"/>
Air Knife Pres. (0.00V ) OFF	0 V	Passed <input checked="" type="checkbox"/>
Air Knife Pres. (3.0 – 7.0 V) ON	3.56 V	Passed <input checked="" type="checkbox"/>
Neb setting to 25 psi	reading 25 psi	Passed <input checked="" type="checkbox"/>
Cool setting to 16 lpm	reading 16 lpm	Passed <input checked="" type="checkbox"/>
Aux setting to 0.5 lpm	reading 0.5 lpm	Passed <input checked="" type="checkbox"/>
Camera Water pump		
Pump Current (0.000 A) OFF	0 A	Passed <input checked="" type="checkbox"/>
Pump Voltage (0.000 V) OFF	0 V	Passed <input checked="" type="checkbox"/>
Pump Current (0.8 to 4.0A) ON	1.1 A	Passed <input checked="" type="checkbox"/>
Pump Voltage (8 to 13 V) ON	12.49 V	Passed <input checked="" type="checkbox"/>
Set Points		
Cam Tec Temperature (-30 to -38°C)	Set -32 °C Read -31 °C	Passed <input checked="" type="checkbox"/>
Op Purge Low (0-15.5 lpm)	Set 5 lpm Read 5.1 lpm	Passed <input checked="" type="checkbox"/>
Op Purge High (0-15.5 lpm)	Set 10 lpm Read 10.1 lpm	Passed <input checked="" type="checkbox"/>
Cam Wtr T (25-30°C)	Set 25 °C Read 25 °C	Passed <input checked="" type="checkbox"/>

### 7. Cleaning & Replacement

O-Ring Torch replacement	Status
Pump Tubing replacement	OK <input checked="" type="checkbox"/>
Glassware cleaning	OK <input checked="" type="checkbox"/>
Lubricate the roll peristaltic pump	OK <input checked="" type="checkbox"/>
Optical windows cleaning	OK <input checked="" type="checkbox"/>
Change & refilled Detector water chiller	OK <input checked="" type="checkbox"/>
Change & refilled RF Generator water Chiller	OK <input checked="" type="checkbox"/>
Clean All Electronics Board	OK <input checked="" type="checkbox"/>

Engineer Sign

*SSWARD*

8. Safety Interlock	
Argon pressure	OK ✓
Air Knife	OK ✓
RF power regulator	OK ✓
RF power temp	OK ✓
RF power current	OK ✓
RF water	OK ✓
Oscillator cover	OK ✓
Door switch	OK ✓
Camera purge	OK ✓
Camera TE cooler	OK ✓
Water chiller	OK ✓
Heater Fans	OK ✓

9. Analytical Test	
Method name	Mn Setup
SRM Standard	Mn
Calibration curve type	Linear
Rho	1
Element	Mn
QC standard Check	OK

Customer Sign	Engineer Sign
_____	_____
_____	_____
_____	_____

**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.

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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**

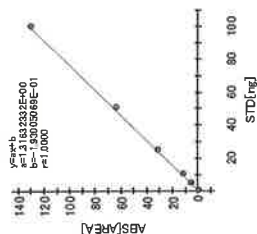
Inspection result

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  C.V. ≤ 5%	PASS
4. Blank	Below 1.0(AREA)	0.386	OK

**COPY**

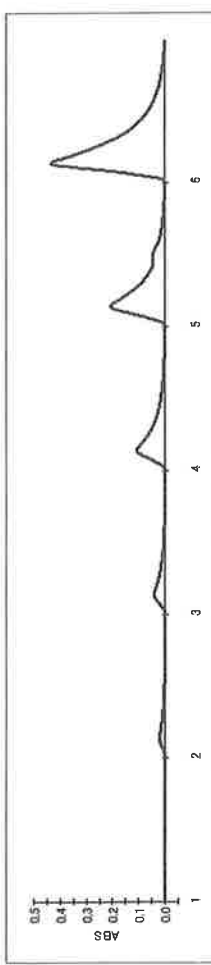
Title : RA-4500 Preventive Maintenance  
 Date : 9/8/2566  
 Name : Coax Group  
 Memo : Calibration curve (No Pretreatment)

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	

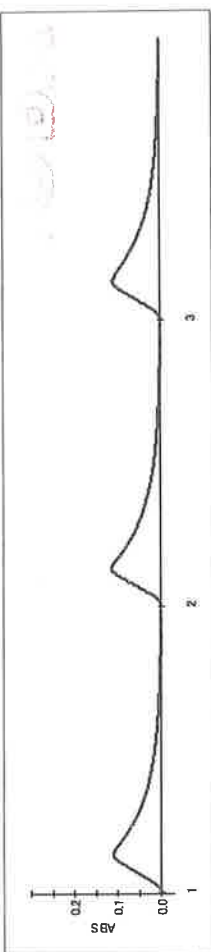


SMP

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)

COPY

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**pH Meter**

**Model. : SevenCompact S220**

**Serial No. : B448305208**

NSC-TISI-TSI 7025  
CALIBRATION 0152

Page 1 of 3

## 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

D(CRM).

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)

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Effective Date 15/10/23

NSC-TISI-TSI 7025  
CALIBRATION 0152

Page 2 of 3

## 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

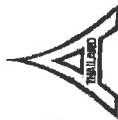
Standard Buffer Solution pH (@ 25 °C)	Average indicator reading		Error Value pH	Uncertainty pH	Coverage factor k
	pH	mV			
4.008	4.01	184.2	0.002	± 0.011	2.00
6.985	6.99	8.9	0.005	± 0.010	2.00
10.008	10.01	-166.8	0.002	± 0.010	2.00

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.



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WWW.AMARC.CO.TH  
Effective Date 15/10/23



## 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

DD

- End of report -

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**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).

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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 ( $\rho_{ref}$ ) of 8000 kg.m<sup>-3</sup> which it balances in air of a reference density ( $\rho_0$ ) of 1.2 kg.m<sup>-3</sup>

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

**COPY**

361 Soi Ladprao 122, Ladprao Road,

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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  $1.20 \text{ kg/m}^3$
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 ( $\rho_{ref}$ ) of 8000 kg.m<sup>-3</sup> which it balances in air of a reference density ( $\rho_a$ ) of 1.2 kg.m<sup>-3</sup>

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/m<sup>3</sup>

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-TS1-TS17025  
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-TS1-TS17025  
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 ( $\rho_{ref}$ ) of 8000 kg.m<sup>-3</sup> which it balances in air of a reference density ( $\rho_0$ ) of 1.2 kg.m<sup>-3</sup>

Description	Deviation	Conventional		Expanded	Maximum		ID No.
		Mass			Permissible Error		
				Uncertainty	± (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 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

Page 3 of 3

Sample Code : 22-19150-002

## 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/m<sup>3</sup>
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

Issue date

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

Number of Page(s)

Certificate No. BSCC-UV-152/23

Certificate No.	Equipment	Model	Manufacturer	Serial No.	ID No.	Date of receipt	Date of calibration	Date of issue	Customer name	Address	Temperature	Humidity	Equipment condition	Calibration Location	Calibration Procedure	Traceability	Calibrated by
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	94780 and 94775 94808 and 100147 94791	Mr.Pannaphong Phannmekakul

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



**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.	Equipment	Model	Manufacturer	Serial No.	ID No.	Date of receipt	Date of calibration	Date of issue	Customer name	Address	Temperature	Humidity	Equipment condition	Calibration Location	Calibration Procedure	Traceability	Calibrated by
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	94780 and 94775 94808 and 100147 94791	Mr.Pannaphong Phannmekakul

Approved by

*Signature*

**Mr.Kanchit Choothep**  
Technical Manager



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# 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  
Advertising the report / Certificate and publicity of the results are prohibited and also shall not be reproduced  
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**ANALYTICAL BALANCE (DU)**

**Model : XS205DU**

**Serial No. : 1126323724**



Certificate No. : 23-148799  
Sample Code : 23-56200-001

## CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.  
683 Moo 11, Sukhapibam 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 : 22 December 2023

Date of Calibration : 22 December 2023

Calibrated by : Mr. Somwang Sangdee  
Scientist  
Approved by : (Mr. Somchai Neampunt)  
Signed for Director

Issue date : 25 December 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. : 23-148799  
Sample Code : 23-56200-001

## 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
<input type="checkbox"/> No adjustment	Nominal value	40 80 40 80	
<input checked="" type="checkbox"/> Adjustment	Standard weight	40.000054 80.000048 40.000054 80.000048	
	Average reading of indicator	40.000026 80.000037 40.000017 80.000017	
	Standard deviation	0.000015 0.000016 0.000008 0.000009	

Unit : g	Range : 200	Before adjustment	After adjustment
<input type="checkbox"/> No adjustment	Nominal value	100 200 100 200	
<input checked="" type="checkbox"/> Adjustment	Standard weight	100.000042 200.000041 100.000042 200.000041	
	Average reading of indicator	100.00003 200.00004 100.00001 200.00001	
	Standard deviation	0.000005 0.000005 0.000003 0.000005	





Certificate No. : 23-148799

Sample Code : 23-56200-001

## 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 : 80 200

Test Point	Sensitivity, S	Test Point	Sensitivity, S
0	1.00748	0	1.0274
40	0.98753	100	0.9975
80	0.99751	200	0.9975

## 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	0.00000	0.00000	0.000012	2.05
0.01	0.0100025	0.01000	0.00000	0.000012	2.05
0.1	0.1000019	0.10001	-0.00001	0.000013	2.03
1	1.0000125	1.00001	0.00000	0.000015	2.02
5	5.0000208	5.00004	-0.00002	0.000021	2.00
10	10.0000004	10.00008	-0.00008	0.000026	2.00
20	20.0000030	20.00011	-0.00008	0.000036	2.00
50	50.000014	50.00014	-0.00013	0.000088	2.00
100	100.000042	100.0001	-0.0001	0.00016	2.00
150	150.000056	150.0001	0.0000	0.00022	2.00
200	200.000041	200.0002	-0.0002	0.00027	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. : 23-148799

Sample Code : 23-56200-001

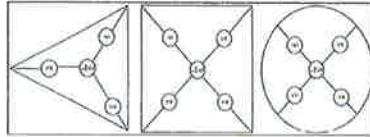
## REPORT OF CALIBRATION

## 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.

<div><input type="radio"/> Circle</div>		Test weight : 50 and 100 Unit : g
<div><input type="radio"/> Triangular</div>		
<div><input checked="" type="radio"/> Rectangular</div>		
Range	80	200
Position	Reading of indicator	Reading of indicator
1	50.00015	100.0001
2	50.00022	100.0001
3	50.00008	100.0001
4	50.00002	100.0000
5	50.00016	100.0002
6	50.00014	100.0001
Maximum difference		0.0001



## Condition of Calibration

1. Calibration Method : W1-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 tem: 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	Class	ID No.	Certificate No.	Due Date
1) STANDARD WEIGHT 1 kg to 1 kg	E2	LB-WE-79	23-105642	10 September 2024

End of Report

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# **ATOMIC ABSORPTION SPECTROPHOTOMETER**

**Model : PinAAcle 900F**

**Serial No. : PFBS22080801**

# PinAAcle 900F Preventive Maintenance (PM)

Company Name:	Eastern Thai Consulting 1992 Co., Ltd.		
Address (Instrument Location):	683 Moo 11 Sukapibal 8 Rd. Nong Kham, Si Racha, Chonburi 20230		
Serial Number:	PFBS22080801	PM Number:	2 of 2
Customer Name (if applicable):		Telephone Number:	
Customer Support Engineer Name:	Khwanchai	Service Order Number:	WO-01886639
Date PM Performed: (DD-MM-YY)	24-Oct-2023	Next PM Due Date: (DD-MM-YY)	24-Apr-2024
Standard Labor Hours to Complete PM :		5 hours	

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

## Scope

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

The customer should save their method before the PM begins.

## General Instructions:

The customer must provide the engineer operational data to demonstrate recent instrument performance prior to starting the PM.

Always check with the customer before making any changes that may affect the customer's analysis or calibration, including a current back-up of system software and/or data files.

The completed document should be signed by an authorized PerkinElmer and customer representative and left with the customer.

Update the PM sticker and instrument logbook as required.

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# Component List

Component / Specific Model	Serial #	Configuration Notes
FIAS100		

# Parts Lists

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

Additional Reagents and Standards Required for PM			
Part Number (if applicable)	Description	Quality	Expired Date (MM/YY)
N9300183	1000 mg/L Copper Standard	AR	30-Jan-2024

Additional Reagents and Standards Required for PM (Customer Support Solution)				
Part Number (if applicable)	Description	Quantity	Batch/Lot #	Expiration Date (MM/YY)
N/A	DI Water	250 ml.	AR	AR
N/A	0.5% HNO <sub>3</sub>	250 ml.	AR	AR



Additional Tools Required for PM

Part Number (if applicable)	Description	Quantity	Serial #
N1013000	0.2A Neutral density filter	1	MG0-056
N1013002	1.0A Neutral density filter	1	MG2-054
03030997	System 2 EDL Driver	1	03030997
N3050605	As System 2 EDL	1	16148
N3050121	Cu Lumina HCL	1	092216-010130
N3050109	Ba Lumina HCL	1	102416-040160
N3050139	K Lumina HCL	1	110716-010060
N3050152	Ni Lumina HCL	1	100516-030190

## Procedure Checklist

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

### 1. General:

- ☒ Review the instrument performance with the customer and document any recent problems.
- ☒ Inspect the customer log book and make any appropriate PM entries.
- ☒ Perform general inspection of system for cleanliness.

### 2. PC Instrument Software:

- ☒ Instrument Software user files/databases archived, packed, and/or deleted as needed.

### 3. Mechanical:

- ☒ Inspect and clean all fans and filters. Replace filters if necessary
- ☒ Inspect all gas lines for leaks and/or wear. Replace if needed.
- ☒ Clean exterior of the instrument.
- ☒ Inspect the burner head, burner chamber, and nebulizer. Clean if needed as stated in the Hardware Guide.
- ☒ Check burner head dimensions with the feeler gauge as stated in the Hardware Guide in the Maintenance chapter section on cleaning the burner head and checking sloth width. Replace if out of specification
- ☒ Check the condition of the end cap, burner head, and nebulizer O-rings. Replace if necessary.
- ☒ Check the drain system for signs of wear. Replace worn or damaged parts.
- ☒ Visually check for proper flame conditions when igniting the Air-C2H2 and N2O-C2H2 flames (if applicable).

### 4. Electrical:

- ☒ Inspect PC boards. Clean if necessary.
- ☒ Carefully check all internal and external cable connections.
- ☒ Check instrument firmware revisions upgrade to current levels (if necessary)
- ☒ Run Diagnostics Test within the Advanced function of the Spectrometer page. Check the results in the service log folder in the Spectrometer BM Log Viewer.

### 5. Optics:

- ☒ Inspect and clean the sample compartment windows, if needed.
- ☒ Inspect optics. Clean or replace if necessary.

### 6. Gasses:

- ☒ Verify that the Gasses supplied to the instrument are within the pressure and purity specifications found in the PinAAcle 900 Series Pre-installation Checklist SDB.
- ☒ Verify that the acetylene filter and air filter element is dry. Replace if necessary.

#### 7. Flame Interlock Check:

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

Parameter	Specification	Test Results	Pass/Fail
Flame Sensor	Air/C <sub>2</sub> H <sub>2</sub> Flame correctly shuts down	Active	Pass
Drain Sensor	Air/C <sub>2</sub> H <sub>2</sub> Flame correctly shuts down	Active	Pass
Nebulizer Sensor	Air/C <sub>2</sub> H <sub>2</sub> Flame correctly shuts down	Active	Pass
C <sub>2</sub> H <sub>2</sub> Pressure Sensor	Air/C <sub>2</sub> H <sub>2</sub> Flame correctly shuts down	Active	Pass
Air Pressure Sensor	Air/C <sub>2</sub> H <sub>2</sub> Flame correctly shuts down	Active	Pass
Burner Head Sensor	Choosing Nitrous Oxide as the oxidant should trigger an interlock shuts down	Active	Pass

#### 8. After PM Performance tests:

##### 8.1 Detector Linearity with Barium

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

Parameter	Specification	Certificate Value at 553.6 nm (Abs.)	Test Results	Pass/Fail
1.0 A ND Filter	±5% from Cert.	1.0531	1.0230	Pass
0.2 A ND Filter	±5% from Cert.	0.1806	0.1783	Pass

##### 8.2 Baseline Noise at 1.0 Absorbance with Barium

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

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.010	0.0015	Pass

##### 8.3 AA Baseline Noise with Copper

Description: Check baseline noise.

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

#### 8.4 D<sub>2</sub> Background Compensation with Copper

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

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.010	0.0054	Pass

#### 8.5 AA-BG Baseline Noise with Copper

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

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

#### 8.6 AA-BG Baseline Noise with Arsenic

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

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.005	0.0002	Pass

#### 8.7 Flame Sensitivity

Description: Instrument Sensitivity checked against Copper standard.

Standard Copper Sensitivity	Specification	Results (Abs.)	Pass/Fail
5 mg/L Sensitivity SS Neb (if applicable)	> 0.250 Abs.	NA	NA
2 mg/L Sensitivity HS Neb (if applicable)	> 0.250 Abs.	0.3878	Pass

#### 10. Review:

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

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### Additional Comments

Additional Comments Regarding the PM

### Review

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

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

Review of Preventive Maintenance:

Authorized PerkinElmer Representative:

KL S.

Date:

24-Oct-2023  
(DD-MM-YY)

Authorized Customer Representative:

001025506

Date:

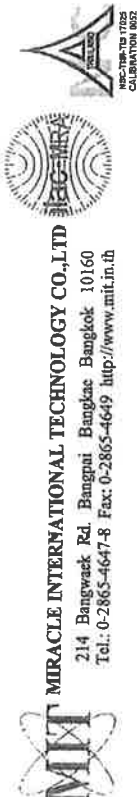
24-Oct-2023  
(DD-MM-YY)

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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.

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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 =  $1.19 \text{ kg/m}^3$  @  $20^{\circ}\text{C}$ , 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 <sup>Ref</sup>	
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 :  
 $W = 40 \text{ cm}$ ;  $D = 28 \text{ cm}$ ;  $H = 39 \text{ cm}$
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.

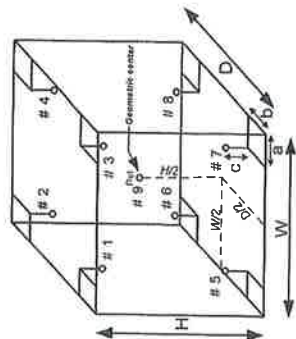


Figure: Example of sensor  
installation Positions

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**



Preventive Maintenance Report

Customer Name:	Eastern Thai Consulting 1992 Co., Ltd	Date: Dec 13, 2023
Instrument/Equipment:	ICP-OES	Model: Prodigy 7
Brand:	Teledyne Leeman Labs	S/N: P70177

1. Gas Supply / Water Chiller / Exhaust Hood:	Status
Gas systems:	
Argon Pressure (85-95 psi): 90 psi	OK <input checked="" type="checkbox"/>
Nitrogen Pressure (85-95 psi): - psi	OK <input checked="" type="checkbox"/> use Ar.
No leak inspected	OK <input checked="" type="checkbox"/>
Replace camera purge gas Dehydrator	OK <input type="checkbox"/> waiting spare parts
Water Chiller for RF generator	
Minimum flowrate detected	OK <input checked="" type="checkbox"/>
No leak inspected	OK <input checked="" type="checkbox"/>
Water Chiller for Detector	
Check water level and refill	OK <input checked="" type="checkbox"/>
Change water	OK <input checked="" type="checkbox"/>
Temperature: 25 °C	OK <input checked="" type="checkbox"/>
Exhaust Hood:	
Minimum Air flowrate checked	OK <input checked="" type="checkbox"/>

2. Spectrometer	Status
Optical view position	
Axial peak positions x 332.5 y 430.5	OK <input checked="" type="checkbox"/>
Radial peak positions x 420.6 y 422.0	OK <input checked="" type="checkbox"/>
Hg lamp peak positions x 224.5 y 361.5	OK <input checked="" type="checkbox"/>
Wavelength Calibrate with Hg Lamp	OK <input checked="" type="checkbox"/>
Full Frame Image	OK <input checked="" type="checkbox"/>
Temperature controlled 31 °C	OK <input checked="" type="checkbox"/>
Purge gas flow control Low/High	OK <input checked="" type="checkbox"/>
Purge gas flow for Detector	OK <input checked="" type="checkbox"/>
Camera Support Module	OK <input checked="" type="checkbox"/>

Engineer Sign

*Signature*  
**COPY**



Instrument Performance Certificate  
for ICP-OES

PRODUCT ID  
Serial Number  
Prodigy 7, Teledyne Leeman Labs  
P70177

Customer Name  
Address  
EASTERN THAI CONSULTING 1992 CO., LTD.  
999 Moo 11 Tambon Nong Kham, Amphoe Si Racha,  
Chonburi 20230

Date of Qualified  
Next Due date  
Dec 13, 2023  
May 13, 2024

This certifies for products which was performed in acceptable criteria specifications

Gas supply / Water chiller / Exhaust hood  
Cooling Systems  
Spectrometer  
RF Generator  
Sample Introduction & Autosampler  
Software & Computer  
Hardware Diagnostics Test  
Analytical Test  
PASSED  
PASSED  
PASSED  
PASSED  
PASSED

Provided by

Scientist Instrument Co., Ltd.  
113 Soi Ekachai 44, Ekachai Road  
Khlong Bang Phran, Bangkok  
Bangkok 10150 Thailand

Certified by  
Thunraphol Sakdayos

Service Engineer

*Signature*  
**COPY**

<b>3. RF Generator</b>	
Plasma Control	Status
Auto Start	OK <input checked="" type="checkbox"/>
Extinguish	OK <input checked="" type="checkbox"/>
RF power setting	OK <input checked="" type="checkbox"/>
Igniter	OK <input checked="" type="checkbox"/>
Air Knife	OK <input checked="" type="checkbox"/>
Coolant /Plasma Flow control	OK <input checked="" type="checkbox"/>
Aux Flow	OK <input checked="" type="checkbox"/>
Optimize sample introduction function	OK <input checked="" type="checkbox"/>
<b>4. Sample Introduction &amp; Autosampler</b>	
Plasma torch	Status
Plasma Torch	OK <input checked="" type="checkbox"/>
Spray chamber	OK <input checked="" type="checkbox"/>
Injector	OK <input checked="" type="checkbox"/>
Nebulizer pressure	OK <input checked="" type="checkbox"/>
Peristaltic pump and control	
Speed control	OK <input checked="" type="checkbox"/>
Sample tubing	OK <input checked="" type="checkbox"/>
Drain tubing	OK <input checked="" type="checkbox"/>
Autosampler Control	<input type="checkbox"/> Available <input checked="" type="checkbox"/> Not Available
Position movement	OK <input type="checkbox"/>
Drain tubing	OK <input type="checkbox"/>
Auto Rinse	OK <input type="checkbox"/>
<b>5. Computer &amp; Software Check:</b>	
Interface Cable USB	Status
Software Version 5.2	OK <input checked="" type="checkbox"/>
Operation function check :	OK <input checked="" type="checkbox"/>
Open /Save /Edit method	OK <input checked="" type="checkbox"/>
Instrument Control	OK <input checked="" type="checkbox"/>
Sequence	OK <input checked="" type="checkbox"/>
Full Frame Capture	OK <input checked="" type="checkbox"/>
Auto alignment /Hg alignment	OK <input checked="" type="checkbox"/>
Calibration Curve	OK <input checked="" type="checkbox"/>
Re-Calculation	OK <input checked="" type="checkbox"/>
Print Report	OK <input checked="" type="checkbox"/>

Engineer Sign

*SSWARD*

<b>6. Hardware Diagnostics Test</b>		
Power Supply	Value	Status
-12 VDC (+/- 5 %)	-12.7 V	Passed <input checked="" type="checkbox"/>
+12 VDC (+/- 5 %)	+11.91 V	Passed <input checked="" type="checkbox"/>
+3.3VDC (+/- 5 %)	3.3 V	Passed <input checked="" type="checkbox"/>
+5.0 VDC (+/- 5 %)	4.945 V	Passed <input checked="" type="checkbox"/>
+13.5 VDC (+/- 5 %)	13.41 V	Passed <input checked="" type="checkbox"/>
Plasma Generator		
ICP Current 0.500A = 1kW	0.502 A	Passed <input checked="" type="checkbox"/>
ICP Ref 5.0Vdc = 1kW	5.002 V	Passed <input checked="" type="checkbox"/>
ICP Current 0.00 Vdc = 0kW	0 A	Passed <input checked="" type="checkbox"/>
ICP Ref 0.00Vdc = 0kW	0 V	Passed <input checked="" type="checkbox"/>
RF Water (Hz) OFF (1 Hz)	0 Hz	Passed <input checked="" type="checkbox"/>
RF Water (Hz) ON (25-35 Hz)	25 Hz	Passed <input checked="" type="checkbox"/>
Air Knife Pres. (0.00V ) OFF	0 V	Passed <input checked="" type="checkbox"/>
Air Knife Pres. (3.0 – 7.0 V) ON	3.56 V	Passed <input checked="" type="checkbox"/>
Neb setting to 25 psi	reading 25 psi	Passed <input checked="" type="checkbox"/>
Cool setting to 16 lpm	reading 16 lpm	Passed <input checked="" type="checkbox"/>
Aux setting to 0.5 lpm	reading 0.5 lpm	Passed <input checked="" type="checkbox"/>
Camera Water pump		
Pump Current (0.000 A) OFF	0 A	Passed <input checked="" type="checkbox"/>
Pump Voltage (0.000 V) OFF	0 V	Passed <input checked="" type="checkbox"/>
Pump Current (0.8 to 4.0A) ON	1.1 A	Passed <input checked="" type="checkbox"/>
Pump Voltage (8 to 13 V) ON	12.49 V	Passed <input checked="" type="checkbox"/>
Set Points		
Cam Tec Temperature (-30 to -38°C)	Set -32 °C Read -31 °C	Passed <input checked="" type="checkbox"/>
Op Purge Low (0-15.5 lpm)	Set 5 lpm Read 5.1 lpm	Passed <input checked="" type="checkbox"/>
Op Purge High (0-15.5 lpm)	Set 10 lpm Read 10.1 lpm	Passed <input checked="" type="checkbox"/>
Cam Wtr T (25-30°C)	Set 25 °C Read 25 °C	Passed <input checked="" type="checkbox"/>

<b>7. Cleaning &amp; Replacement</b>	
O-Ring Torch replacement	Status
Pump Tubing replacement	OK <input checked="" type="checkbox"/>
Glassware cleaning	OK <input checked="" type="checkbox"/>
Lubricate the roll peristaltic pump	OK <input checked="" type="checkbox"/>
Optical windows cleaning	OK <input checked="" type="checkbox"/>
Change & refilled Detector water chiller	OK <input checked="" type="checkbox"/>
Change & refilled RF Generator water Chiller	OK <input checked="" type="checkbox"/>
Clean All Electronics Board	OK <input checked="" type="checkbox"/>

Engineer Sign

*SSWARD*

8. Safety Interlock	Status
Argon pressure	OK <input checked="" type="checkbox"/>
Air Knife	OK <input checked="" type="checkbox"/>
RF power regulator	OK <input checked="" type="checkbox"/>
RF power temp	OK <input checked="" type="checkbox"/>
RF power current	OK <input checked="" type="checkbox"/>
RF water	OK <input checked="" type="checkbox"/>
Oscillator cover	OK <input checked="" type="checkbox"/>
Door switch	OK <input checked="" type="checkbox"/>
Camera purge	OK <input checked="" type="checkbox"/>
Camera TH cooler	OK <input checked="" type="checkbox"/>
Water chiller	OK <input checked="" type="checkbox"/>
Heater Fans	OK <input checked="" type="checkbox"/>

9. Analytical Test	Details	Status
Method name	Mn Schup	
SRM Standard	Mn	
Calibration curve type	Linear	
R <sup>2</sup> to	1	
Element	Mn	
QC standard Check		OK

Customer Sign	Engineer Sign
<u>Kenneth Bell</u>	<u>Samuel</u> 13/12/2023

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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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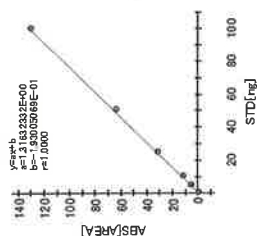
Inspection result

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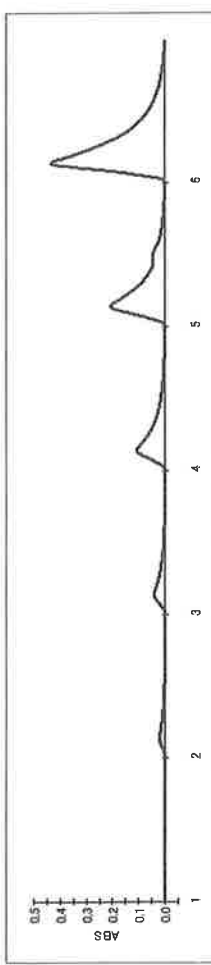
Title : RA-4500 Preventive Maintenance  
 Date : 9/8/2566  
 Name : Coax Group  
 Memo : Calibration curve (No Pretreatment)

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	

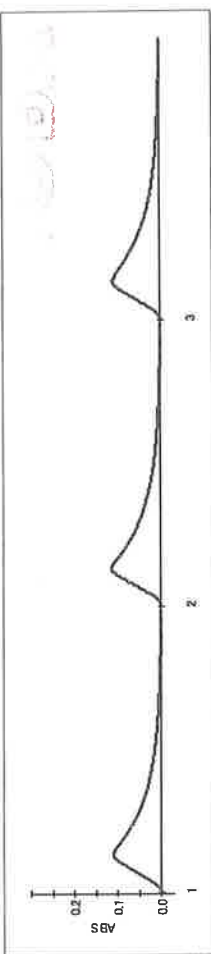


SMP

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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**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 ( $\rho_{ref}$ ) of 8000 kg.m<sup>-3</sup> which it balances in air of a reference density ( $\rho_0$ ) of 1.2 kg.m<sup>-3</sup>

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

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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  $1.20 \text{ kg/m}^3$
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 -

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**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

Approved by

( Mr. Somchai Neampunt )

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 ( $\rho_{ref}$ ) of 8000 kg.m<sup>-3</sup> which it balances in air of a reference density ( $\rho_a$ ) of 1.2 kg.m<sup>-3</sup>

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

*Somchai*

*Copy*





Certificate No. : 22-052239

Sample Code : 22-19150-004

## 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/m<sup>3</sup>

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 ( $\rho_{ref}$ ) of 8000 kg.m<sup>-3</sup> which it balances in air of a reference density ( $\rho_0$ ) of 1.2 kg.m<sup>-3</sup>

Description	Deviation	Conventional		Expanded	Maximum		ID No.
		Mass			Permissible Error		
				Uncertainty	$\pm$ (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 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

( Mr. Somchai Neampunt )

Signed for Director

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/m<sup>3</sup>
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  
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 Lohabal  
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).

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



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 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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361 Soi Ladprao 122, Ladprao Road,  
Phlabphla, Wang Thonglang, Bangkok 10310  
FM-CL-018

TEL 02-516-2422  
FAX 02-516-6949  
Rev 01

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

Bara Scientific  
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

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate  
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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

Bara Scientific  
Calibration & Services

# 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 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  
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**ANALYTICAL BALANCE (DU)**

**Model : XS205DU**

**Serial No. : 1126323724**



Certificate No. : 23-148799

Sample Code : 23-56200-001

## CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.  
683 Moo 11, Sukhapibarn 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 : 22 December 2023

Date of Calibration : 22 December 2023

Calibrated by Mr. Somwang Sangdee  
Scientist

Approved by (Mr. Somchai Neampunt)  
Signed for Director

Issue date 25 December 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. : 23-148799

Sample Code : 23-56200-001

## 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
<input type="checkbox"/> No adjustment	Nominal value	40 80 40 80	
<input checked="" type="checkbox"/> Adjustment	Standard weight	40.000054 80.000048 40.000054 80.000048	
	Average reading of indicator	40.000026 80.000037 40.000017 80.000017	
	Standard deviation	0.000015 0.000016 0.000008 0.000009	

Unit : g	Range : 200	Before adjustment	After adjustment
<input type="checkbox"/> No adjustment	Nominal value	100 200 100 200	
<input checked="" type="checkbox"/> Adjustment	Standard weight	100.000042 200.000041 100.000042 200.000041	
	Average reading of indicator	100.00003 200.00004 100.00001 200.00001	
	Standard deviation	0.000005 0.000005 0.000003 0.000005	

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Certificate No. : 23-148799

Sample Code : 23-56200-001

## 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 : 80		Range : 200	
Test Point	Sensitivity, S	Test Point	Sensitivity, S
0	1.00748	0	1.0274
40	0.98753	100	0.9975
80	0.99751	200	0.9975

## 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	0.00000	0.00000	0.000012	2.05
0.01	0.0100025	0.01000	0.00000	0.000012	2.05
0.1	0.1000019	0.10001	-0.00001	0.000013	2.03
1	1.0000125	1.00001	0.00000	0.000015	2.02
5	5.0000208	5.00004	-0.00002	0.000021	2.00
10	10.0000004	10.00008	-0.00008	0.000026	2.00
20	20.0000030	20.00011	-0.00008	0.000036	2.00
50	50.000014	50.00014	-0.00013	0.000088	2.00
100	100.000042	100.0001	-0.0001	0.00016	2.00
150	150.000056	150.0001	0.0000	0.00022	2.00
200	200.000041	200.0002	-0.0002	0.00027	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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fumi



Certificate No. : 23-148799

Sample Code : 23-56200-001

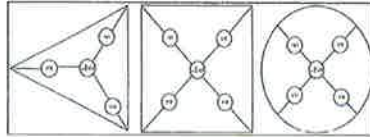
## REPORT OF CALIBRATION

## 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	50.00015	100.0001
	2	50.00022	100.0001
	3	50.00008	100.0001
200	4	50.00002	100.0000
	5	50.00016	100.0002
	6	50.00014	100.0001
Maximum difference		0.00013	0.0001



## Condition of Calibration

Calibration Method : W1-CL-004 base on UKAS LAB 14: 2019		Ambient conditions	
		Min	Max
2. This result of calibration was found accurate as shown on date and place of calibration only.		Temperature (°C)	22.8 23.0
3. Condition of Calibration tem: Normal		Relative Humidity (%rh)	43.5 51.1
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).		Air pressure (hPa)	1012.5 1014.5

5. Reference standard instrument :

Instrument 1) STANDARD WEIGHT 1 kg to 1 kg

Class E2

ID No. LB-WE-79

Certificate No. 23-105642

Due Date 10 September 2024

End of Report

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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**

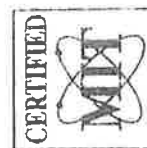
In-house method : CP-21 base on DKD-R 6-1: Edition 3 2014.

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)

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 =  $1.19 \text{ kg/m}^3$  @  $20^{\circ}\text{C}$ , 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 <sup>Ref</sup>	
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

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.

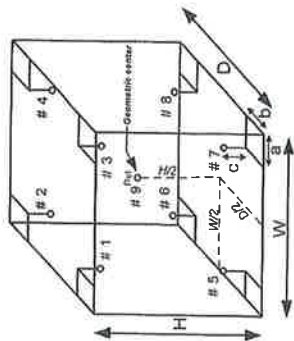


Figure: Example of sensor installation Positions

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 -

**COPY**

**INDUCTIBELY COUPLED PLASMA SPECTROMETER**

**Model : Prodigy 7**

**Serial No. : P70177**



## Preventive Maintenance Report

Customer Name:	Eastern Thai Consulting 1992 Co., Ltd	Date: Dec 13, 2023
Instrument/Equipment:	ICP-OES	Model: Prodigy 7
Brand:	Teledyne Leeman Labs	S/N: P70177

1. Gas Supply / Water Chiller / Exhaust Hood:	Status
Gas systems:	
Argon Pressure (85-95 psi): 90 psi	OK <input checked="" type="checkbox"/>
Nitrogen Pressure (85-95 psi): - psi	OK <input checked="" type="checkbox"/> use Ar.
No leak inspected	OK <input checked="" type="checkbox"/>
Replace camera purge gas Dehydrator	OK <input type="checkbox"/> waiting spare parts
Water Chiller for RF generator	
Minimum flowrate detected	OK <input checked="" type="checkbox"/>
No leak inspected	OK <input checked="" type="checkbox"/>
Water Chiller for Detector	
Check water level and refill	OK <input checked="" type="checkbox"/>
Change water	OK <input checked="" type="checkbox"/>
Temperature: 25 °C	OK <input checked="" type="checkbox"/>
Exhaust Hood:	
Minimum Air flowrate checked	OK <input checked="" type="checkbox"/>

2. Spectrometer	Status
Optical view position	
Axial peak positions x 332.5 y 430.5	OK <input checked="" type="checkbox"/>
Radial peak positions x 420.6 y 422.0	OK <input checked="" type="checkbox"/>
Hg lamp peak positions x 224.5 y 361.5	OK <input checked="" type="checkbox"/>
Wavelength Calibrate with Hg Lamp	OK <input checked="" type="checkbox"/>
Full Frame Image	OK <input checked="" type="checkbox"/>
Temperature controlled 31 °C	OK <input checked="" type="checkbox"/>
Purge gas flow control Low/High	OK <input checked="" type="checkbox"/>
Purge gas flow for Detector	OK <input checked="" type="checkbox"/>
Camera Support Module	OK <input checked="" type="checkbox"/>

Engineer Sign

*Signature*  
**COPY**



## Instrument Performance Certificate for ICP-OES

PRODUCT ID  
Serial Number  
Prodigy 7, Teledyne Leeman Labs  
P70177

Customer Name  
Address  
EASTERN THAI CONSULTING 1992 CO., LTD.  
999 Moo 11 Tambon Nong Kham, Amphoe Si Racha,  
Chonburi 20230

Date of Qualified  
Next Due date  
Dec 13, 2023  
May 13, 2024

This certifies for products which was performed in acceptable criteria specifications

Gas supply / Water chiller / Exhaust hood  
Cooling Systems  
Spectrometer  
RF Generator  
Sample Introduction & Autosampler  
Software & Computer  
Hardware Diagnostics Test  
Analytical Test  
PASSED  
PASSED  
PASSED  
PASSED  
PASSED  
PASSED

Provided by  
Scientist Instrument Co., Ltd.  
113 Soi Ekachai 44, Ekachai Road  
Khlong Bang Phran, Bangkok  
Bangkok 10150 Thailand

Certified by  
Thunraphol Sakdayos  
Service Engineer

*Signature*  
**COPY**

<b>3. RF Generator</b>	
Plasma Control	Status
Auto Start	OK <input checked="" type="checkbox"/>
Extinguish	OK <input checked="" type="checkbox"/>
RF power setting	OK <input checked="" type="checkbox"/>
Igniter	OK <input checked="" type="checkbox"/>
Air Knife	OK <input checked="" type="checkbox"/>
Coolant /Plasma Flow control	OK <input checked="" type="checkbox"/>
Aux Flow	OK <input checked="" type="checkbox"/>
Optimize sample introduction function	OK <input checked="" type="checkbox"/>
<b>4. Sample Introduction &amp; Autosampler</b>	
Plasma torch	Status
Plasma Torch	OK <input checked="" type="checkbox"/>
Spray chamber	OK <input checked="" type="checkbox"/>
Injector	OK <input checked="" type="checkbox"/>
Nebulizer pressure	OK <input checked="" type="checkbox"/>
Peristaltic pump and control	
Speed control	OK <input checked="" type="checkbox"/>
Sample tubing	OK <input checked="" type="checkbox"/>
Drain tubing	OK <input checked="" type="checkbox"/>
Autosampler Control	<input type="checkbox"/> Available <input checked="" type="checkbox"/> Not Available
Position movement	OK <input type="checkbox"/>
Drain tubing	OK <input type="checkbox"/>
Auto Rinse	OK <input type="checkbox"/>
<b>5. Computer &amp; Software Check:</b>	
Interface Cable USB	Status
Software Version 5.2	OK <input checked="" type="checkbox"/>
Operation function check :	OK <input checked="" type="checkbox"/>
Open /Save /Edit method	OK <input checked="" type="checkbox"/>
Instrument Control	OK <input checked="" type="checkbox"/>
Sequence	OK <input checked="" type="checkbox"/>
Full Frame Capture	OK <input checked="" type="checkbox"/>
Auto alignment /Hg alignment	OK <input checked="" type="checkbox"/>
Calibration Curve	OK <input checked="" type="checkbox"/>
Re-Calculation	OK <input checked="" type="checkbox"/>
Print Report	OK <input checked="" type="checkbox"/>

Engineer Sign

*SSWARD*

<b>6. Hardware Diagnostics Test</b>		
Power Supply	Value	Status
-12 VDC (+/- 5 %)	-12.7 V	Passed <input checked="" type="checkbox"/>
+12 VDC (+/- 5 %)	+11.91 V	Passed <input checked="" type="checkbox"/>
+3.3VDC (+/- 5 %)	3.3 V	Passed <input checked="" type="checkbox"/>
+5.0 VDC (+/- 5 %)	4.945 V	Passed <input checked="" type="checkbox"/>
+13.5 VDC (+/- 5 %)	13.41 V	Passed <input checked="" type="checkbox"/>
Plasma Generator		
ICP Current 0.500A = 1kW	0.502 A	Passed <input checked="" type="checkbox"/>
ICP Ref 5.0Vdc = 1kW	5.002 V	Passed <input checked="" type="checkbox"/>
ICP Current 0.00 Vdc = 0kW	0 A	Passed <input checked="" type="checkbox"/>
ICP Ref 0.00Vdc = 0kW	0 V	Passed <input checked="" type="checkbox"/>
RF Water (Hz) OFF (1 Hz)	0 Hz	Passed <input checked="" type="checkbox"/>
RF Water (Hz) ON (25-35 Hz)	25 Hz	Passed <input checked="" type="checkbox"/>
Air Knife Pres. (0.00V ) OFF	0 V	Passed <input checked="" type="checkbox"/>
Air Knife Pres. (3.0 – 7.0 V) ON	3.56 V	Passed <input checked="" type="checkbox"/>
Neb setting to 25 psi	reading 25 psi	Passed <input checked="" type="checkbox"/>
Cool setting to 16 lpm	reading 16 lpm	Passed <input checked="" type="checkbox"/>
Aux setting to 0.5 lpm	reading 0.5 lpm	Passed <input checked="" type="checkbox"/>
Camera Water pump		
Pump Current (0.000 A) OFF	0 A	Passed <input checked="" type="checkbox"/>
Pump Voltage (0.000 V) OFF	0 V	Passed <input checked="" type="checkbox"/>
Pump Current (0.8 to 4.0A) ON	1.1 A	Passed <input checked="" type="checkbox"/>
Pump Voltage (8 to 13 V) ON	12.49 V	Passed <input checked="" type="checkbox"/>
Set Points		
Cam Tec Temperature (-30 to -38°C)	Set -32 °C Read -31 °C	Passed <input checked="" type="checkbox"/>
Op Purge Low (0-15.5 lpm)	Set 5 lpm Read 5.1 lpm	Passed <input checked="" type="checkbox"/>
Op Purge High (0-15.5 lpm)	Set 10 lpm Read 10.1 lpm	Passed <input checked="" type="checkbox"/>
Cam Wtr T (25-30 °C)	Set 25 °C Read 25 °C	Passed <input checked="" type="checkbox"/>

<b>7. Cleaning &amp; Replacement</b>	
O-Ring Torch replacement	Status
Pump Tubing replacement	OK <input checked="" type="checkbox"/>
Glassware cleaning	OK <input checked="" type="checkbox"/>
Lubricate the roll peristaltic pump	OK <input checked="" type="checkbox"/>
Optical windows cleaning	OK <input checked="" type="checkbox"/>
Change & refilled Detector water chiller	OK <input checked="" type="checkbox"/>
Change & refilled RF Generator water Chiller	OK <input checked="" type="checkbox"/>
Clean All Electronics Board	OK <input checked="" type="checkbox"/>

Engineer Sign

*SSWARD*

8. Safety Interlock	
Argon pressure	OK ✓
Air Knife	OK ✓
RF power regulator	OK ✓
RF power temp	OK ✓
RF power current	OK ✓
RF water	OK ✓
Oscillator cover	OK ✓
Door switch	OK ✓
Camera purge	OK ✓
Camera TE cooler	OK ✓
Water chiller	OK ✓
Heater Fans	OK ✓

9. Analytical Test	
Method name	Mn Setup
SRM Standard	Mn
Calibration curve type	Linear
Rho	1
Element	Mn
QC standard Check	OK

Customer Sign	Engineer Sign
คุณอรรถพร	สมานต์ 13/12/2023

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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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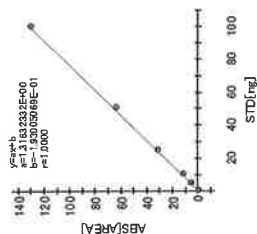
Inspection result

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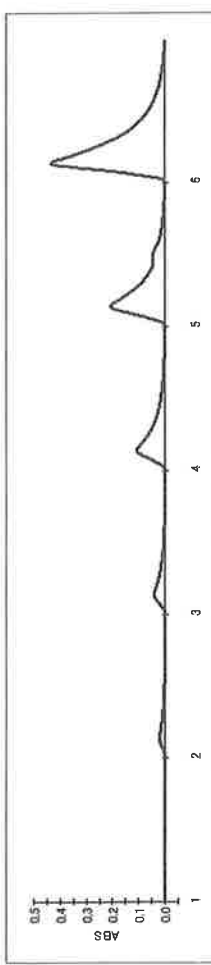
Title : RA-4500 Preventive Maintenance  
 Date : 9/8/2566  
 Name : Coax Group  
 Memo : Calibration curve (No Pretreatment)

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	

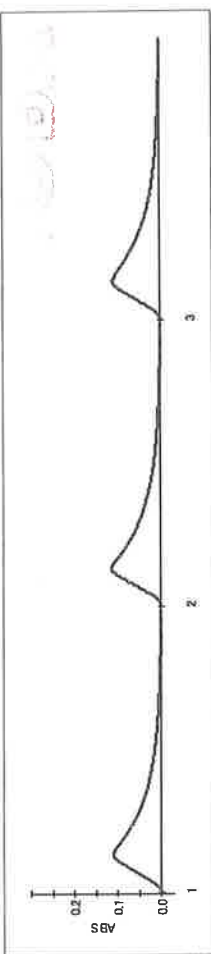


SMP

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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**STANDARD WEIGHT 50 g**

NSC-TSI-TS17025  
CALIBRATION 0152

Page 1 of 3

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

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

NSC-TSI-TS17025  
CALIBRATION 0152

Page 2 of 3

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 ( $\rho_{ref}$ ) of 8000 kg.m<sup>-3</sup> which it balances in air of a reference density ( $\rho_0$ ) of 1.2 kg.m<sup>-3</sup>

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

**COPY**

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  $1.20 \text{ kg/m}^3$
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

## 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 ( $\rho_{ref}$ ) of 8000 kg.m<sup>-3</sup> which it balances in air of a reference density ( $\rho_a$ ) of 1.2 kg.m<sup>-3</sup>

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

( Mr. Somchai Neampunt )  
Signed for Director



Certificate No. : 22-052239

Sample Code : 22-19150-004

## 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/m<sup>3</sup>

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 ( $\rho_{ref}$ ) of 8000 kg.m<sup>-3</sup> which it balances in air of a reference density ( $\rho_0$ ) of 1.2 kg.m<sup>-3</sup>

Description	Deviation	Conventional	Expanded	Maximum	ID No.
		Mass	Uncertainty	Permissible Error	
50 g	(mg)		(mg)	$\pm$ (mg)	
	-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/m<sup>3</sup>
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  
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 Lohabal

Scientist

31 May 2023

(Mr. Somchai Neampunt)

Signed for Director

Issue date

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 30003

- End of Report -

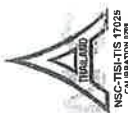
COPY



**UV/VIS SPECTROPHOTOMETER**

**Model : UV - 1800**

**Serial No. : A11635101643 CD**



Bara Scientific Co., Ltd.  
968 U Chu Liang Building Floor 7 Rama4 Road  
Siam 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 ( $\pm$ 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 ( $\pm$ 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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Bara Scientific Co., Ltd.  
968 U Chu Liang Building Floor 7 Rama4 Road  
Siam 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

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

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. : 23-148799  
Sample Code : 23-56200-001

## CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.  
683 Moo 11, Sukhapibarn 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 : 22 December 2023

Date of Calibration : 22 December 2023

Calibrated by : Mr. Somwang Sangdee  
Scientist  
Approved by : (Mr. Somchai Neampunt)  
Signed for Director

Issue date : 25 December 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. : 23-148799  
Sample Code : 23-56200-001

## 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
<input type="checkbox"/> No adjustment	Nominal value	40 80 40 80	
<input checked="" type="checkbox"/> Adjustment	Standard weight	40.000054 80.000048 40.000054 80.000048	
	Average reading of indicator	40.000026 80.000037 40.000017 80.000017	
	Standard deviation	0.000015 0.000016 0.000008 0.000009	

Unit : g	Range : 200	Before adjustment	After adjustment
<input type="checkbox"/> No adjustment	Nominal value	100 200 100 200	
<input checked="" type="checkbox"/> Adjustment	Standard weight	100.000042 200.000041 100.000042 200.000041	
	Average reading of indicator	100.00003 200.00004 100.00001 200.00001	
	Standard deviation	0.000005 0.000005 0.000003 0.000005	

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Certificate No. : 23-148799

Sample Code : 23-56200-001

## 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 : 80 200

Test Point	Sensitivity, S	Test Point	Sensitivity, S
0	1.00748	0	1.0274
40	0.98753	100	0.9975
80	0.99751	200	0.9975

## 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	0.00000	0.00000	0.000012	2.05
0.01	0.0100025	0.01000	0.00000	0.000012	2.05
0.1	0.1000019	0.10001	-0.00001	0.000013	2.03
1	1.0000125	1.00001	0.00000	0.000015	2.02
5	5.0000208	5.00004	-0.00002	0.000021	2.00
10	10.0000004	10.00008	-0.00008	0.000026	2.00
20	20.0000030	20.00011	-0.00008	0.000036	2.00
50	50.000014	50.00014	-0.00013	0.000088	2.00
100	100.000042	100.0001	-0.0001	0.00016	2.00
150	150.000056	150.0001	0.0000	0.00022	2.00
200	200.000041	200.0002	-0.0002	0.00027	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. : 23-148799

Sample Code : 23-56200-001

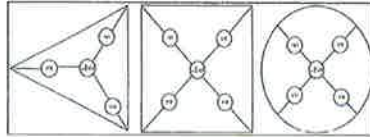
## REPORT OF CALIBRATION

## 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	
<input type="radio"/> Circle		Unit : g	
<input type="radio"/> Triangular			
<input checked="" type="radio"/> Rectangular			
Range	80	200	
Position	Reading of indicator	Reading of indicator	
1	50.00015	100.0001	
2	50.00022	100.0001	
3	50.00008	100.0001	
4	50.00002	100.0000	
5	50.00016	100.0002	
6	50.00014	100.0001	
Maximum difference	0.00013	0.0001	



## Condition of Calibration

6. Ambient conditions	Min	Max
Temperature (°C)	22.8	23.0
Relative Humidity (%rh)	43.5	51.1
Air pressure (hPa)	1012.5	1014.5

1. Calibration Method : W1-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 tem: 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	Class	ID No.	Certificate No.	Due Date
1) STANDARD WEIGHT 1 kg to 1 kg	E2	LB-WE-79	23-105642	10 September 2024

End of Report

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# **ATOMIC ABSORPTION SPECTROPHOTOMETER**


**Model : PinAAcle 900F**

**Serial No. : PFBS22080801**



## PinAAcle 900F Preventive Maintenance (PM)

Company Name:	Eastern Thai Consulting 1992 Co., Ltd.		
Address (Instrument Location):	683 Moo 11 Sukapibal 8 Rd. Nong Kham, Si Racha, Chonburi 20230		
Serial Number:	PFBS22080801	PM Number:	2 of 2
Customer Name (if applicable):		Telephone Number:	
Customer Support Engineer Name:	Khwanchai	Service Order Number:	WO-01886639
Date PM Performed: (DD-MM-YY)	24-Oct-2023	Next PM Due Date: (DD-MM-YY)	24-Apr-2024
Standard Labor Hours to Complete PM :		5 hours	

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

### Scope

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

The customer should save their method before the PM begins.

### General Instructions:

The customer must provide the engineer operational data to demonstrate recent instrument performance prior to starting the PM.

Always check with the customer before making any changes that may affect the customer's analysis or calibration, including a current back-up of system software and/or data files.

The completed document should be signed by an authorized PerkinElmer and customer representative and left with the customer.

Update the PM sticker and instrument logbook as required.

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## Component List

Component / Specific Model	Serial #	Configuration Notes
FIAS100		

## Parts Lists

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

Additional Reagents and Standards Required for PM			
Part Number (if applicable)	Description	Quantity	Expired Date (MM/YY)
N9300183	1000 mg/L Copper Standard	AR	30-Jan-2024

Additional Reagents and Standards Required for PM (Customer Support Solution)			
Part Number (if applicable)	Description	Quantity	Expiration Date (MM/YY)
N/A	DI Water	250 ml.	AR
N/A	0.5% HNO <sub>3</sub>	250 ml.	AR

Additional Tools Required for PM

Part Number (if applicable)	Description	Quantity	Serial #
N1013000	0.2A Neutral density filter	1	MG0-056
N1013002	1.0A Neutral density filter	1	MG2-054
03030997	System 2 EDL Driver	1	03030997
N3050605	As System 2 EDL	1	16148
N3050121	Cu Lumina HCL	1	092216-010130
N3050109	Ba Lumina HCL	1	102416-040160
N3050139	K Lumina HCL	1	110716-010060
N3050152	Ni Lumina HCL	1	100516-030190

## Procedure Checklist

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

### 1. General:

- ☒ Review the instrument performance with the customer and document any recent problems.
- ☒ Inspect the customer log book and make any appropriate PM entries.
- ☒ Perform general inspection of system for cleanliness.

### 2. PC Instrument Software:

- ☒ Instrument Software user files/databases archived, packed, and/or deleted as needed.

### 3. Mechanical:

- ☒ Inspect and clean all fans and filters. Replace filters if necessary
- ☒ Inspect all gas lines for leaks and/or wear. Replace if needed.
- ☒ Clean exterior of the instrument.
- ☒ Inspect the burner head, burner chamber, and nebulizer. Clean if needed as stated in the Hardware Guide.
- ☒ Check burner head dimensions with the feeler gauge as stated in the Hardware Guide in the Maintenance chapter section on cleaning the burner head and checking sloth width. Replace if out of specification
- ☒ Check the condition of the end cap, burner head, and nebulizer O-rings. Replace if necessary.
- ☒ Check the drain system for signs of wear. Replace worn or damaged parts.
- ☒ Visually check for proper flame conditions when igniting the Air-C2H2 and N2O-C2H2 flames (if applicable).

### 4. Electrical:

- ☒ Inspect PC boards. Clean if necessary.
- ☒ Carefully check all internal and external cable connections.
- ☒ Check instrument firmware revisions upgrade to current levels (if necessary)
- ☒ Run Diagnostics Test within the Advanced function of the Spectrometer page. Check the results in the service log folder in the Spectrometer BM Log Viewer.

### 5. Optics:

- ☒ Inspect and clean the sample compartment windows, if needed.
- ☒ Inspect optics. Clean or replace if necessary.

### 6. Gasses:

- ☒ Verify that the Gasses supplied to the instrument are within the pressure and purity specifications found in the PinAAcle 900 Series Pre-installation Checklist SDB.
- ☒ Verify that the acetylene filter and air filter element is dry. Replace if necessary.

#### 7. Flame Interlock Check:

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

Parameter	Specification	Test Results	Pass/Fail
Flame Sensor	Air/C <sub>2</sub> H <sub>2</sub> Flame correctly shuts down	Active	Pass
Drain Sensor	Air/C <sub>2</sub> H <sub>2</sub> Flame correctly shuts down	Active	Pass
Nebulizer Sensor	Air/C <sub>2</sub> H <sub>2</sub> Flame correctly shuts down	Active	Pass
C <sub>2</sub> H <sub>2</sub> Pressure Sensor	Air/C <sub>2</sub> H <sub>2</sub> Flame correctly shuts down	Active	Pass
Air Pressure Sensor	Air/C <sub>2</sub> H <sub>2</sub> Flame correctly shuts down	Active	Pass
Burner Head Sensor	Choosing Nitrous Oxide as the oxidant should trigger an interlock shuts down	Active	Pass

#### 8. After PM Performance tests:

##### 8.1 Detector Linearity with Barium

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

Parameter	Specification	Certificate Value at 553.6 nm (Abs.)	Test Results	Pass/Fail
1.0 A ND Filter	±5% from Cert.	1.0531	1.0230	Pass
0.2 A ND Filter	±5% from Cert.	0.1806	0.1783	Pass

##### 8.2 Baseline Noise at 1.0 Absorbance with Barium

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

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.010	0.0015	Pass

##### 8.3 AA Baseline Noise with Copper

Description: Check baseline noise.

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

#### 8.4 D<sub>2</sub> Background Compensation with Copper

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

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.010	0.0054	Pass

##### 8.5 AA-BG Baseline Noise with Copper

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

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

##### 8.6 AA-BG Baseline Noise with Arsenic

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

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.005	0.0002	Pass

##### 8.7 Flame Sensitivity

Description: Instrument Sensitivity checked against Copper standard.

Standard Copper Sensitivity	Specification	Results (Abs.)	Pass/Fail
5 mg/L Sensitivity SS Neb (if applicable)	> 0.250 Abs.	NA	NA
2 mg/L Sensitivity HS Neb (if applicable)	> 0.250 Abs.	0.3878	Pass

#### 10. Review:

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

### Additional Comments

Additional Comments Regarding the PM

### Review

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

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

Review of Preventive Maintenance:

Authorized PerkinElmer Representative:	KL S.	Date:	24-Oct-2023 (DD-MM-YY)
Authorized Customer Representative:	001025206	Date:	24-Oct-2023 (DD-MM-YY)

**COPY**

**ANALYTICAL BALANCE**

**Model : SECURA224-1S**

**Serial No. : 0036707137**



Certificate No. : 23-148800

Sample Code : 23-56200-002

## CERTIFICATE OF CALIBRATION

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

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

Equipment : ELECTRONIC BALANCE

Manufacturer : SARTORIUS

Model : SECURA224-1S

Serial No. : 0036707137

ID No. : LABE 05/2

Date of Receipt : 22 December 2023

Date of Calibration : 22 December 2023

Calibrated by Mr. Somwang Sangdee  
Scientist

Issue date : 25 December 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. : 23-148800

Sample Code : 23-56200-002

## REPORT OF CALIBRATION

Equipment : ELECTRONIC BALANCE  
Manufacturer : SARTORIUS  
Model : SECURA224-1S  
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	Before adjustment	After adjustment
<input type="checkbox"/> No adjustment	Nominal value	100 200 100	200
<input checked="" type="checkbox"/> Adjustment	Standard weight	100.000042 200.000041 100.000042	200.000041
	Average reading of indicator	99.9998 199.9998	200.0000
	Standard deviation	0.00006 0.00007	0.00003

Unit :	Range :	Before adjustment	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. : 23-148800

Sample Code : 23-56200-002

## 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 : 220

Test Point	Sensitivity, S	Test Point	Sensitivity, S
0	0.7980	-	-
100	0.8978	-	-
200	0.8978	-	-

## 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	0.000086	2.00
0.01	0.0100025	0.0100	0.0000	0.000086	2.00
0.1	0.1000019	0.1000	0.0000	0.000087	2.00
1	1.0000125	1.0000	0.0000	0.000087	2.00
2	2.0000089	2.0000	0.0000	0.000087	2.00
5	5.0000208	5.0001	-0.0001	0.000088	2.00
10	10.000004	10.0000	0.0000	0.000090	2.00
20	20.000030	20.0000	0.0000	0.000093	2.00
50	50.000014	50.0000	0.0000	0.00011	2.00
100	100.000042	100.0000	0.0000	0.00016	2.00
200	200.000041	200.0000	0.0000	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. : 23-148800

Sample Code : 23-56200-002

## REPORT OF CALIBRATION

## Result of Calibration :

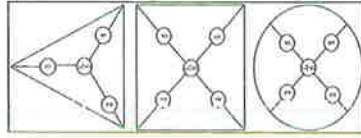
## 4. Eccentric or off-centre loading

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.

Range	Position	Reading of Indicator	Reading of Indicator
1	100.0000	-	-
2	100.0000	-	-
3	100.0000	-	-
4	99.9999	-	-
5	100.0000	-	-
6	100.0000	-	-
Maximum difference	0.0001	-	-

Weighing pan : ☒ Circle  
☐ Triangular  
☐ Rectangular

Test weight : 100  
Unit : g



## Condition of Calibration

- Calibration Method : WI-CL-004 base on UKAS LAB 14: 2019
- This result of calibration was found accurate as shown on date and place of calibration only.
- Condition of Calibration item: Norma
- 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-WF-79

Certificate No. : 23-105642

Due Date : 10 September 2024

End of Report

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**AUTOCLAVE**

**Model : FLS-1000**

**Serial No. : 55169083**



## CERTIFICATE OF CALIBRATION

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 2648 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%.

This calibration result is applied only to the above calibrated item and was issued 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).

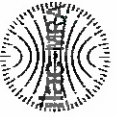
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Phlabphla, Wang Thonglang, Bangkok 10310

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WWW.AMARC.CO.TH

Rev 01 Effective Date 15/10/21



## REPORT OF CALIBRATION

Certificate No. : 23-082126  
Sample Code : 23-30826-004

## 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	121.78	121.76	0.63
				121.78	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

1. UUC\* = Unit Under Calibration
2. The quoted uncertainty includes "Stability of chamber and leading effect in chamber at 20% of uniformity".
3. 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.
4. Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.
5. Overall variation - the difference of the maximum and the minimum measured temperatures throughout observation time.
6. UUC\* reading - the average reading of indicating device that forms the integral part of the autoclave.
7. Calibration results without adjustment.

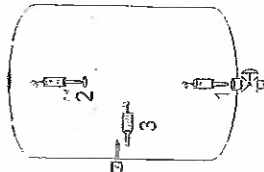


Figure: Example of sensor installation Positions

- Location 1 : 100 mm from top of the UUC\* main
- Location 2 : In the upper half of the UUC\* main
- Location 3 : Attached to the load temperature probe, within 20 mm

The above expressed result of measurement is issued as the standard uncertainty of measurement under a which is a normal distribution of measurement 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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WWW.AMARC.CO.TH  
Effective Date 15/10/21

## **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. : L202405022-0013  
Date Issued : 08-May-24

**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** : 03-May-24

**Date Calibrated** : 06-May-24

**Calibrated by** : Mr. Saruth Srichulikul

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.

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Approved by:   
(Mr. Sarayuth Tochua)



Page 1 of 2

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Certificate No. : L202405022-0013

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	MPE ± mbar	Pass with Gua
990.00	990	-	0.00	0.59	10.3	Pa
1000.00	1000	-	0.00	0.59	10.3	Pa
1010.00	1010	-	0.00	0.59	10.3	Pa
1020.00	1020	-	0.00	0.59	10.3	Pa
1030.00	1030	-	0.00	0.59	10.3	Pa

STD = Standard Pass =  $|\text{error}| + |\text{uncertainty}| \leq |\text{MPE}|$

UUC = Unit Under Calibration Fail =  $|\text{error}| + |\text{uncertainty}| > |\text{MPE}|$

MPE = Maximum Permissible Error

Calibrated condition :

Pressure Medium

Mounting Position

Reference Level

Conversion Factor

Air : Density = 1.19 kg/m<sup>3</sup> @ 20°C. 1 bar

Vertical

at center of its dial

Multiply by 1.0 E+02 - Pa unit

Description of UUC :

Range

950 - 1080 mbar Absolute

Calibration Range

990 - 1030 mbar Absolute

Scale Interval

1 mbar

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-P230097 for Reference Pressure Monitor Serial No. 1598, Due 09-Nov-24

End of Certificate

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**BOD INCUBATOR**

**Model : TC445S**

**Serial No. : 0223/007275**

**SK**

S K SALES AND SERVICE CO.,LTD.  
194/56, 194/57 Thakham Rd. Samsae Dam  
Bang Khun Thien Bangkok 10150  
Tel : 02-417-2144 Fax : 02-417-2155



## Certificate of Calibration

Reference No. : C03190/2309-025  
Customer : Eastern Thai Consulting 1992 Co.,Ltd.  
683 Moo 11, Sukhaphiban 8, Tambol Nongkham,  
Siracha District, Chonburi 20230, Thailand

Equipment : Incubator  
Manufacturer : Lovibond  
Model : TC445S  
Serial No. : 0223/007275  
ID No. :  
Received Date : 15 September 2023  
Calibrated Date : 15 September 2023  
Issued Date : 18 September 2023  
Environment :

	Minimum Value	Maximum Value
Ambient Temperature ( °C )	27.5	28.1
Relative Humidity ( % RH )	57	58
AC Line Voltage ( VAC )	224	226

Place Of Calibration : Production Line  
Calibrated by : Mr. Teerasak Chalyaporn

### Calibration Method

In-house method : SK-WI-23 base on Thai Laboratory Accreditation Scheme Publication Reference G-20

### Condition of this result of calibration

- Reference standard instrument
 

Instrument	Serial No.	Certificate No.	Due Date
1) Data acquisition/Switch unit	MY44047397	L2305-268	4 November 2023
2) Multiplexer Module	MY41105123	L2305-268	4 November 2023
- This result of calibration was found accurate as shown on date and place of calibration only
- This certificate can be traceable to International System of Unit :
  - Through Thailand Institute of Scientific And Technological Research (TISTR)

Approved by

☒ Mr. Suphachai Saksi ☐ Mr. Phayak Toolit ☐ Miss Tantaraporn Petpong

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor  $k = 2.0$ , providing a level of confidence level of approximately 95 %

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Certificate No. : S2309-3014

Page 2 of 2

Table1 General Information

Working Area ( W*L*H )	60 *56 *145 cm
Fresh Air	OFF

Table2 Chamber Performance

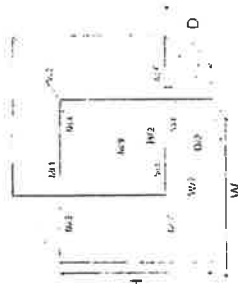
Setting Temperature ( °C )	Average Indicating Temperature ( °C )	Measured Stability ( ± °C )	Measured Uniformity ( °C )	Overall Variation ( °C )
20.0	20.0	0.37	0.64	0.98

Table3 Temperature Distribution

Setting Temperature ( °C )	Average Standard Reading ( °C )									Uncertainty ( ± °C )
	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	
20.0	19.52	19.40	19.70	19.43	19.33	19.39	19.45	19.58	19.67	0.55

Resolution : 0.1 ( °C )

\* Probe No. 9 is Reference Probe



- Notes :
- The temperature stability is the one-half of greatest maximum difference of measured temperatures at any one probe.
  - The temperature uniformity is the maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time
  - Overall variation is the difference of maximum and minimum measured temperatures throughout observation time.
  - The reported uncertainty of measurement were excluded Uniformity and Stability

\*\* End of Calibration Report \*\*

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*[Signature]*

**BOD INCUBATOR**

**ID No. : LABE 19/5**



Results of Calibration

Resolution : 0.1 °C

1. Reporting of Temperature

Calibration point (°C)	UUC* setting (°C) reading (°C)	UUC*	Measured temperature at each positions (°C)										Uncertainty ± (°C)	Coverage factor k
			# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	# 9 <sup>o-1</sup>			
20	20.5	20.0	20.28	19.86	19.90	19.91	19.82	20.10	20.01	19.89	19.75	0.59	2.00	

2. Characterization results

Calibration point (°C)	Stability ± (°C)	Uniformity (°C)	Overall variation (°C)
20	0.45	0.85	1.31

Notes

UUC\* = Unit Under Calibration



## REPORT OF CALIBRATION

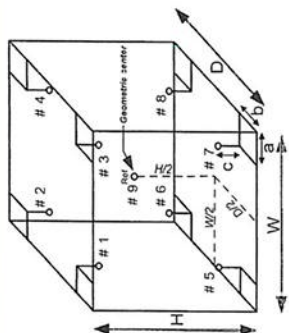
Certificate No. : 24-046203

Sample Code : 24-18906-002

## 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**

NSC-TSI-TS17025  
CALIBRATION 0152

Page 1 of 3

## CERTIFICATE OF CALIBRATION

Certificate No. : 24-001944  
Sample Code : 24-00963-001Customer : EASTERN THAI CONSULTING 1992 CO., LTD.  
683 Moo 11, Sukhapibarn 8 Rd., Nongkham,  
Sriracha, Chonburi 20230Location 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 : 09 January 2024  
Date of Calibration : 09 January 2024

## Condition of Calibration

1. Environment  
1.1 Ambient temperature : Maximum 30.6 °C ; Minimum 29.2 °C  
1.2 Relative humidity : Maximum 57.5 % ; Minimum 46.4 %  
1.3 Line voltage supplied : Maximum 229.5 VAC ; Minimum 222.5 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-10 (RTD-257 to RTD-265)	23-066256	29 June 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. Sarawoot Thammo  
Scientist

Approved by

(Mr. Somchai Neampunt)

Issue date

09 January 2024

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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Rev 01

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Effective Date: 15/10/21

NSC-TSI-TS17025  
CALIBRATION 0152

Page 2 of 3

## REPORT OF CALIBRATION

Certificate No. : 24-001944  
Sample Code : 24-00963-001

## 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 <sup>Rev</sup>	
60	60.0	60.0	60.04	59.90	59.81	59.84	59.47	59.91	60.08	59.98	59.87	2.00
85	85.0	85.0	86.07	85.75	85.58	85.62	84.69	85.83	86.28	85.94	85.77	2.00

## 2. Characterization results

Calibration point (°C)	Stability ± (°C)	Uniformity (°C)	Overall variation (°C)
60	0.11	0.49	0.80
85	0.09	1.13	1.72

## Notes

UUC\* = Unit Under Calibration

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## REPORT OF CALIBRATION

Page 3 of 3

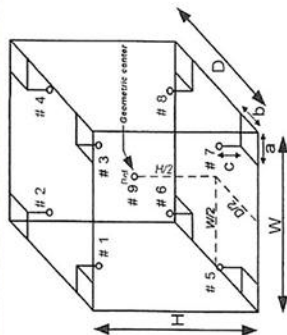
Certificate No. : 24-001944

Sample Code : 24-00963-001

## 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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**ICP-OES/Avio550**

**Serial No. : M81S2210101**



## ICP-OES/Avio550 Preventive Maintenance (PM)

<b>Company Name:</b> Eastern Thai Consulting 1992 Co., Ltd.	
<b>Address</b> (Instrument Location): 683 Moo 11 Sukhapibarn 8 Rd., Siracha, Chon Buri 20230	
<b>Serial Number:</b>	<b>PM Number:</b> 1 OF 2 W
<b>Customer Name</b> (if applicable):	<b>Telephone Number:</b> 038 481 197
<b>Service Engineer Name:</b>	<b>Service Order Number:</b> WO-02754304
<b>Date PM Performed:</b> (DD-MMM-YYYY)	<b>Next PM Due Date:</b> (DD-MMM-YYYY) 25-Oct-2024
<b>Standard Labor Hours to Complete PM :</b> 4 hours	

<b>Part Number</b>	<b>Release</b>	<b>Publication Date</b>	 <b>PerkinElmer</b> <sup>®</sup>
TH09370188 Rev.2	B	July 2020	

### Scope

The purpose of this PM is to ensure the continued functionality of the PerkinElmer / Avio550 by inspecting and replacing any worn or damaged parts. This service should only be performed by a trained representative of PerkinElmer. The customer should save their method before the PM begins.

### General Instructions:

The customer must provide the engineer operational data to demonstrate recent instrument performance prior to starting the PM.

Always check with the customer before making any changes that may affect the customer's analysis or calibration, including a current back-up of system software and/or data files. The completed document should be signed by an authorized PerkinElmer and customer representative and left with the customer. Update the PM sticker and instrument logbook as required.

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## Component List

Component / Specific Model	Serial #	Configuration Notes
Avio550Max	M8152210101	Syngistix 5.1.0.0293

## Parts Lists

Parts Included with the PM		
Part Number (if applicable)	Description	Quantity
09995098	Air Filter-Spectrometer	N/A
N077520	Air Filter-RF Generator	N/A
09992731	Axial Window	N/A
B0810377	Radial Window	N/A
N0770438	O-ring kit, injector support adapter	N/A
N0780437	O-ring kit, torch	N/A

## Additional Reagents and Standards Required for PM

Part Number (if applicable)	Description	Quality	Batch/Lot #	Expired Date (MM/YY)
N0691579	Muti-Element Standard	AR	61-176CRX1	30-JUN-2025
N9300221	DL Standard diluted 100 X	AR	59-091CRY1	30-JUN-2024
N0582152	Wave Cal Solution	AR	59-150CRX1	30-SEP-2024
N9302946	VIS Wavecal Solution	AR	59-113CRT1	28-FEB-2025

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## Procedure Checklist

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

- General:**
  - ✓ Ask customer about unit's performance since last visit.
  - ✓ Check incoming AC line voltage under load for proper levels and grounding.
  - ✓ Is the instrument operational? If not, please comment.
- Mechanical:**
  - ✓ Inspect and clean all fans and filters.
  - ✓ Inspect and replace torch components and necessary.  
Torch Components Replaced: ☐ Yes ☒ No
  - ✓ Inspect all tubing for signs of cracking or leaking and replace as necessary.  
Tubing Replaced: ☒ Yes ☐ No
  - ✓ Inspect the peristaltic pump for proper operation.
  - ✓ Check and adjust if necessary, the external nitrogen, argon shear gas and water supply pressures.
  - ✓ Check and adjust if necessary, the internal nitrogen, main argon, torch argon and shear gas pressures.

Regulator	Measured Pressure	Set Pressure
Nitrogen		NA (calibrated in Factory)
Main Argon	76 psig	76 psig
Torch Argon	67 psig	67 psig
Shear Gas	65 psig	65 psig
Water	35 psig	35 psig

- ✓ Check shear gas nozzle for blockages and proper, uniform flow.
- ✓ Inspect nitrogen HI/Low purge and shear gas solenoids for proper function.
- ✓ Inspect the function of all spectrometer motors. Drive the motors from the Spectrometer DCM. (slits, XY motor)
- ✓ Inspect the function of the pneumatic shutter for proper operation.
- ✓ Perform preventative maintenance on the chiller as required. Make the customer aware of the importance of maintaining the chiller fluid level and filter replacement.
- ✓ Drain air compressor surge tank.
- ✓ Clean exterior of instrument.
- ✓ Visually inspect all PC boards for cleanliness and signs of corrosion.

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### 3. Electrical

- ✓ Check all RF generator and spectrometer power supply voltages.
- ✓ Run instrument diagnostic checks from the appropriate Device Control Module.

#### RF Generator:

- ✓ Check the RF generator status screens.
- ✓ Check the function of all interlocks.

#### Spectrometer:

- ✓ Check the spectrometer status screens. Ensure Ready mode with no fetal errors.
- ✓ Check the spectrometer optical tub temperatures (top, bottom, fin, optical base).
- ✓ Check detector temperatures.
- ✓ Check TEC voltages (6.5VDC)

### 4. Optical:

- ✓ Clean or replace the axial and radial view windows as necessary.  
Axial Window Replaced: ☐ Yes ☒ No  
Radial Window Replaced: ☐ Yes ☒ No

### 5. PM Performance Tests:

- ✓ Perform View Align.

#### Test Spectral Resolution:

- ✓ Measure the spectrometers ability to separate two adjacent wavelengths.

Parameter	Specification	Test Result	Pass/Fail
As 193.696 - Resolution	≤0.007	0.00534	Passed
Ni 231.604 - Resolution	≤0.008	0.00725	Passed
Ni 341.476 - Resolution	≤0.012	0.00891	Passed
La 408.672 - Resolution	≤0.020	0.01603	Passed
Ba 455.403 - Resolution	≤0.025	0.02190	Passed

#### Test Precision:

- ✓ Test for reproducibility of a set of measurement.

Parameter	Specification	Test Result	Pass/Fail
As 193.696	%RSD ≤ 1 %	0.65%	Passed
Zn 213.856	%RSD ≤ 1 %	0.66%	Passed
Mn 257.610	%RSD ≤ 1 %	0.41%	Passed
La 379.478	%RSD ≤ 1 %	0.51%	Passed
Ba 455.403	%RSD ≤ 1 %	0.32%	Passed
Ba 493.408	%RSD ≤ 1 %	0.30%	Passed

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☑ Run an Axial & Radial BEC according to the A&T spec.

**Test Axial BEC Cd:**

Method "BEC-XL" For Samples "IB (2% $\text{HNO}_3$ )" and "IS (N930-0221/100)", record intensities.

Calculated BEC:  $\text{BEC} = (\text{IB} * \text{Conc of Std}) / (\text{IS} - \text{IB})$ . Where Conc of Std = 500 PPB

Element	Conc.	IB	IS	Pass/Fail
Cd 226	500	2,028.9	162,248.4	
IB*Conc	IS-IB	BEC	Spec	
1,014,450	160,219.5	6.33	<150 PPB	Passed

**Test Radial BEC Mn:**

Method "BEC-RL" For Samples "IB (2% $\text{HNO}_3$ )" and "IS (N069-1579)", record intensities.

Calculated BEC:  $\text{BEC} = (\text{IB} * \text{Conc of Std}) / (\text{IS} - \text{IB})$ . Where Conc of Std = 1,000 PPB

Element	Conc.	IB	IS	Pass/Fail
Mn 257	1,000	2,166.8	91,410.0	
IB*Conc	IS-IB	BEC	Spec	
2,166,800	89,243.2	24.28	<45 PPB	Passed

**6. Review:**

- ☑ Review with the customer PM work performed.
- ☑ Discuss recommended customer supplied materials to have on hand.
- ☑ Attach PM sticker.

**Additional Comments**

Additional Comments Regarding the PM

**Review**

The preventive maintenance checks and if applicable performance tests for ICP-OES/Avio550 have been completed.

This ICP-OES/Avio550 Passes ☒ Fails ☐ the preventive maintenance.

**Review of Preventive Maintenance:**

Authorized PerkinElmer Representative:

*Pigawit S.*

Date:

25-Apr-2024  
(DD-MM-YYYY)

Authorized Customer Representative:

Date:

25-Apr-2024  
(DD-MM-YYYY)

**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**

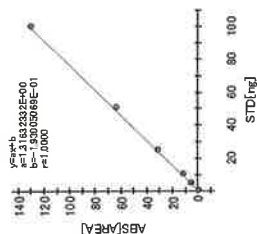
Inspection result

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  C.V. ≤ 5%	PASS
4. Blank	Below 1.0(AREA)	0.386	OK

**COPY**

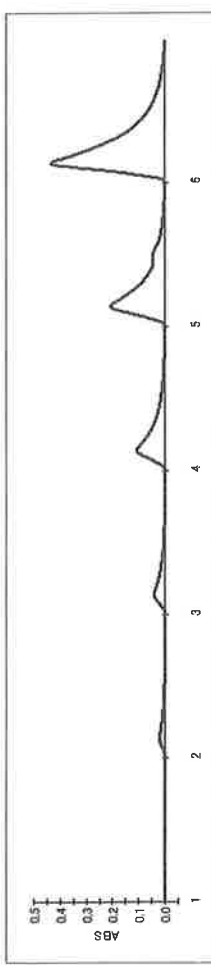
Title : RA-4500 Preventive Maintenance  
 Date : 9/8/2566  
 Name : Coax Group  
 Memo : Calibration curve (No Pretreatment)

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	

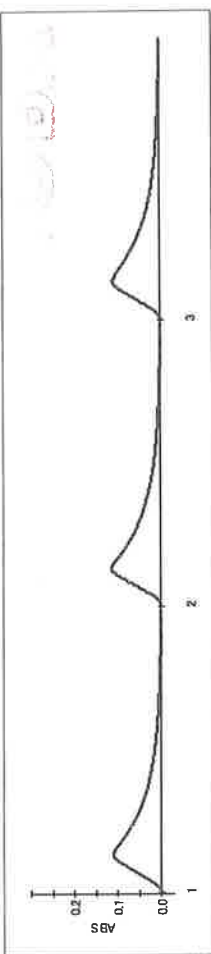


SMP

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)

COPY

COPY



**pH Meter**

**Model : SevenCompact S220**

**Serial No. : B448305208**

NSC-TIS-1517025  
CALIBRATION0152

## CERTIFICATE OF CALIBRATION

Page 1 of 3

Supersedes to Calibration Certificate No. 24-001949

Certificate No. : 24-001949/1

Sample Code : 24-00963-006

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

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

Equipment : pH Meter  
Manufacturer : METTLER TOLEDO  
Serial No. : B448305208  
Model : SevenCompact S220  
ID No. : LABE 11/4  
Date of Receipt : 09 January 2024  
Date of Calibration : 09 January 2024

## Condition of Calibration

1. Environment  
1.1 Ambient temperature : 22.4 ± 0.2 °C 1.2 Relative humidity : 56.4 % ± 2.1 %
2. Calibration method  
In house method WI-CL-019; based on direct measurement by using standard voltage calibrator and using certified reference material (CRM).

## 3. Reference standard / Certified reference material

Instrument	ID No.	Certificate No.	Due Date
3.1 Voltage Calibrator	LB-AMC-01	23E3244	03 October 2024
3.2 Digital Thermometer	LB-TH-33	23-098974	25 August 2024
Certified Reference Material		Lot No.	Expire Date
3.3 Buffer Solution pH 4.008	919273	PH216.L5	24 September 2025
3.4 Buffer Solution pH 6.886	941727	PH107.L5	06 November 2024
3.5 Buffer Solution pH 9.997	919278	PH220.L5	24 September 2024

## 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 (CPA ReIN HARNED CELL LoIN 61275737; CPA ReIN HARNED CELL LoIN 61273986 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. Nuttaput Timula  
Scientist

Approved by

(Mr. Somchai Neampunt)

Issue date 31 January 2024

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 this 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-TIS-1517025  
CALIBRATION0152

## REPORT OF CALIBRATION

Page 2 of 3

Supersedes to Calibration Certificate No. 24-001949

Certificate No. : 24-001949/1

Sample Code : 24-00963-006

Equipment : pH Meter  
Manufacturer : METTLER TOLEDO  
Serial No. : B448305208  
Model : SevenCompact S220  
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 mV	Average indicator reading		Uncertainty mV	Coverage factor k
		mV	pH		
0	414.113	413.9	0.00	± 0.083	2.00
4	177.477	177.4	4.00	± 0.083	2.00
7	0.000	0.1	7.00	± 0.083	2.00
10	-177.477	-177.3	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 : InLab Expert Pro-ISM

Electrode Serial No. : 2453982

Three-Point Calibration at pH4, pH7 and pH10 Percent Slope : 98.3

Standard Buffer Solution pH (@ 25 °C)	Average indicator reading		Error Value pH	Uncertainty pH	Coverage factor k
	pH	mV			
4.008	4.01	182.1	0.002	± 0.010	2.00
6.886	7.00	7.8	0.014	± 0.011	2.00
9.997	10.01	-167.2	0.013	± 0.011	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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## REPORT OF CALIBRATION

Page 3 of 3

Supersede to Calibration Certificate No. 24-001949

Certificate No. : 24-001949/1

Sample Code : 24-00963-006

Equipment : pH Meter (Digital Thermometer with sensor)

Thermometer readout

Manufacturer : METTLER TOLEDO Model : SevenCompact S220

Serial No. : B44B305208 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. : 2453982 ID No. : N/A

## Condition of Calibration

1. Environment
- 1.1 Ambient temperature : 22.6 °C ± 0.1 °C
- 1.2 Relative humidity : 55.1 % ± 3.3 %

## 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 Resistance Thermometer	PT-100	RTD-90	23-098974	25 August 2024
3.2 Thermometer Readout	GT-11	LB-TH-33	23-098974	25 August 2024

## 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	25.000	120	25.0	± 0.14	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 UKAS M0003

- 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 ( $\rho_{ref}$ ) of 8000 kg.m<sup>-3</sup> which it balances in air of a reference density ( $\rho_0$ ) of 1.2 kg.m<sup>-3</sup>

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

**COPY**

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  $1.20 \text{ kg/m}^3$
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,  
Phlabphla, Wang Thonglang, Bangkok 10310  
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CONTACT@AMARC.CO.TH  
WWW.AMARC.CO.TH  
Effective Date: 15/10/21



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 ( $\rho_{ref}$ ) of 8000 kg.m<sup>-3</sup> which it balances in air of a reference density ( $\rho_a$ ) of 1.2 kg.m<sup>-3</sup>

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

**COPY**



Certificate No. : 22-052239

Sample Code : 22-19150-004

## 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/m<sup>3</sup>

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 ( $\rho_{ref}$ ) of 8000 kg.m<sup>-3</sup> which it balances in air of a reference density ( $\rho_0$ ) of 1.2 kg.m<sup>-3</sup>

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

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

( Mr. Somchai Neampunt )

Signed for Director

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/m<sup>3</sup>
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. : 24-062442  
Sample Code : 24-25546-002

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.

683 Moo 11, Sukhapibarn 8 Rd., Nongkham,  
Sriracha, 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  
Date of Receipt : 23 May 2024  
Model : 608-H1  
ID No. : LABE 09/7  
Date of Calibration : 27-28 May 2024

## 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 401	LB-DP-03 & LB-DP-03 (DP)	TH-0064-23	07 August 2024
3.2 Digital Thermometer	Optidew 401	LB-DP-03 & LB-DP-03 (Temp.)	23-103423	03 September 2024
3.3 Digital Thermometer	34972A	LB-DA-07 with RTD-89	23-101374	03 September 2024

## 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

Approved by

(Mr. Sornchai Neampunt)

Issue date

30 May 2024

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 15/07/21



## REPORT OF CALIBRATION

Page 2 of 2

Certificate No. : 24-062442  
Sample Code : 24-25546-002

## 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	20.1	- 0.10	± 0.39
25	50	25.00	25.0	0.00	± 0.39
30	50	30.00	29.9	+ 0.10	± 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	25.02	45.10	48.4	- 3.30	± 1.3
60	25.01	60.07	63.4	- 3.33	± 1.5
75	25.01	75.15	78.5	- 3.35	± 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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