

ภาคผนวก ค : เอกสารสอบเทียบความถูกต้อง  
ของเครื่องมือเก็บตัวอย่าง

**ANALYTICAL BALANCE**

**Model : MS204TS/00**

**Serial No. : B904136539**

Mettler-Toledo (Thailand) Ltd.  
846/4 - 846/5 Lasalle Rd., Bangna Tai Sub-District  
Bangna District, Bangkok 10260  
+662 723 0382  
MT-TH.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: Sasiorn Nakin  
Zip / Postal: 20230  
State / Province: Chonburi  
Order Number: 9332430077

### Weighing Device

Manufacturer: Mettler Toledo  
Model: MS204TS100  
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

### Procedure

Calibration Guideline: EURAMET cg-18 v. 4.0 (11/2015)  
CP/W002/20  
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 Calibration Date: 06-Feb-2023  
As Left Calibration Date: N/A  
Issue Date: 07-Feb-2023  
Calibrator:   
Approved Signat:

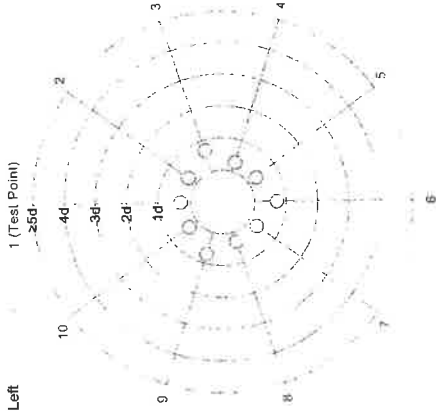
## Measurement Results

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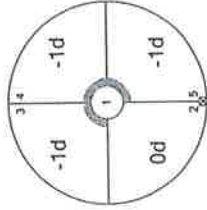
The "d" in the graph represents the readability of the range/interval in which the test was performed.  
The results of this graph are based upon the absolute values of the differences from the mean value.

### 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	0.00001 g	N/A
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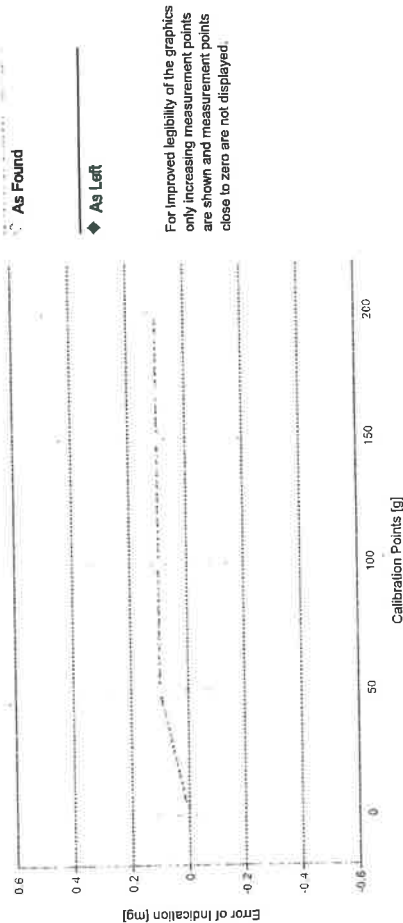
As Found

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

COPY

Error of Indication

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

Weight Set 1: OIML E2  
Weight Set No.: WS28 Date of Issue: 178498 Calibration Due Date: 23H4  
Certificate Number: 178498  
Thermo Hygrometer  
Equipment No.: IN306 Date of Issue: 23H4 Calibration Due Date: 23H4  
Certificate Number: 23H4

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

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



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:  $1.5 \cdot 10^{-5} / K$   
Temperature range on site for the evaluation of the measurement uncertainty in use: 5 K

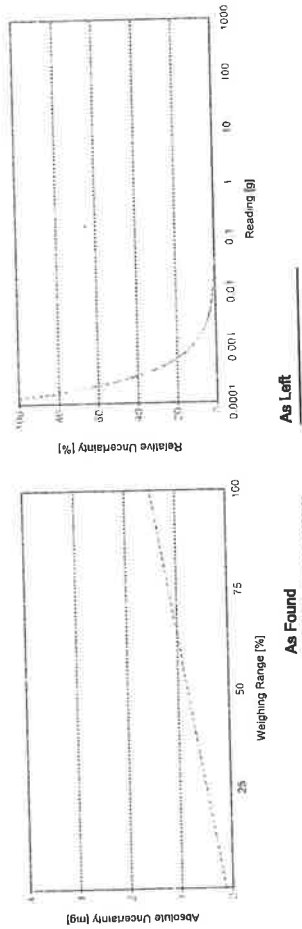
Linearization of Uncertainty Equation

Range		As Found		As Left	
d	Max				
1	0.0001 g	220 g	$U_1 = 0.13 \text{ mg} + 0.00625 \text{ mg/g} \cdot R$	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	N/A	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



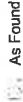
As Found

As Left

The weighing device meets the given process requirements.

The weighing device meets the given process requirements.

Tests Performed:



No adjustments/modifications made. As Left results correspond to As Found.

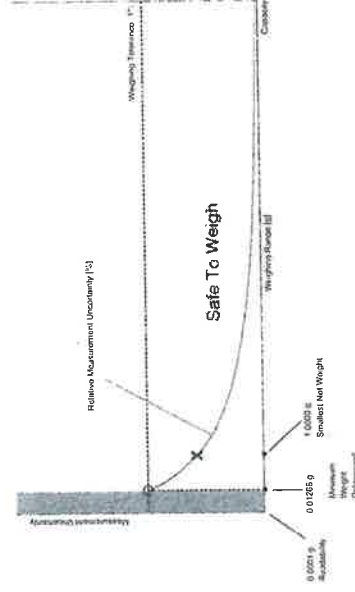
Process Requirements

Weighing 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 representation of the measurement uncertainty.

Measurement Results Results Summary

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

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

Repeatability

Test Load: 100 g

		Control Limit	As Found	As Left
Tolerance	0.1%	0.00050 g	✓	✓
	0.2%	0.00100 g	✓	✓
0.5%	0.00250 g	0.00005 g	✓	0.00005 g
	1%	0.00500 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	0.1%	0.0500 g	✓	✓
	0.2%	0.1000 g	✓	✓
0.5%	0.2500 g	0.0001 g	✓	0.0001 g
	1%	0.5000 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.

Minimum Weight As Found Minimum Weight Table

		Safety Factor			
		1	2	3	5
Tolerance	0.1%	0.12729 g	0.25618 g	0.38672 g	0.65284 g
	0.2%	0.06344 g	0.12729 g	0.19153 g	0.32124 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
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

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

As Left Minimum Weight Table

		Safety Factor			
		1	2	3	5
Tolerance	0.1%	0.12729 g	0.25618 g	0.38672 g	0.65284 g
	0.2%	0.06344 g	0.12729 g	0.19153 g	0.32124 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
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

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.

Error of Indication

As Found

Reference Value		Control limits for various weighing tolerances						
		Error	0.1%	0.2%	0.5%	1%	2%	5%
0.0000 g	0.0000 g		N/A	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	0.5000 g	1.2500 g
100.0001 g	0.0001 g		0.0500 g	0.1000 g	0.2500 g	0.5000 g	1.0000 g	2.5000 g
150.0001 g	0.0001 g		0.0750 g	0.1500 g	0.3750 g	0.7500 g	1.5000 g	3.7500 g
200.0001 g	0.0001 g		0.1000 g	0.2000 g	0.5000 g	1.0000 g	2.0000 g	5.0000 g
Result			✓	✓	✓	✓	✓	✓

As Left

Reference Value		Control limits for various weighing tolerances						
		Error	0.1%	0.2%	0.5%	1%	2%	5%
0.0000 g	0.0000 g		N/A	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	0.5000 g	1.2500 g
100.0001 g	0.0001 g		0.0500 g	0.1000 g	0.2500 g	0.5000 g	1.0000 g	2.5000 g
150.0001 g	0.0001 g		0.0750 g	0.1500 g	0.3750 g	0.7500 g	1.5000 g	3.7500 g
200.0001 g	0.0001 g		0.1000 g	0.2000 g	0.5000 g	1.0000 g	2.0000 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.

## **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. : AD2205-163-0001  
Date Issued : 20-May-22

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

**Equipment** : Analog Barometer

**Manufacturer** : Barigo  
**Model** : -  
**Serial No.** : -  
**ID No./Tag No.** : BM001/41  
**Date Received** : 12-May-22  
**Date Calibrated** : 20-May-22

**Calibrated by** : Mr. Saruth Srichutikul

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: K. Nathong  
(Mr. Nathapong Krudaum)



Certificate No : AD2205-163-0001

Environment : Ambient Temperature : (25 ± 2)°C

Relative Humidity : (50 ± 15)%RH

STD Reading hPa	UUC Reading (hPa) Before Adjusted	UUC Reading (hPa) After Adjusted	UUC Error hPa	Uncertainty ± hPa
990.00	990.0	-	0.00	0.59
1000.00	1000.0	-	0.00	0.59
1010.00	1010.0	-	0.00	0.59
1020.00	1020.0	-	0.00	0.59
1030.00	1030.0	-	0.00	0.59

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

Description of UUC :

Range : 955 - 1075 hPa Absolute  
Calibration Range : 990 - 1030 hPa Absolute  
Scale Interval : 1 hPa

Resolution

0.5 hPa 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. CLJ-P210086 for Reference Pressure Monitor Serial No. 1598, Due 08-Nov-22

End of Certificate



(Mr. Nathapong Krudaum)

**Hot Air Oven**

**Model : UFE 500**

**Serial No. : G511.0182**



REPORT OF CALIBRATION

Results of Calibration  
Resolution : 0.5 °C  
1. Reporting of Temperature

Calibration point (°C)	UUC* setting (°C)	UUC* reading (°C)	Measured temperature at each positions (°C)									Uncertainty ± (°C)	Coverage factor k
			# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	# 9 <sup>Ref</sup>		
104	103.5	103.5	104.10	104.08	103.87	103.99	104.08	104.08	103.96	104.01	103.84	0.47	2.00

2. Characterization results														
Calibration point (°C)			Stability ± (°C)			Uniformity (°C)			Overall variation (°C)					
104.0			0.08			0.32			0.39					

Notes  
UUC\* = Unit Under Calibration

CERTIFICATE OF CALIBRATION

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

Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.  
(Hot Lab)  
Equipment : Temperature controlled enclosures (Hot air oven)  
Model : UFE 500  
Manufacturer : Memmert  
ID No. : LABE 17/4  
Serial No. : G511-0182  
Date of Receipt : 20 January 2023  
Date of Calibration : 20 January 2023

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

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

3. Reference standard instrument			
Instrument	ID No.	Certificate No.	Due Date
Data Acquisition With Sensor (RTD-P100)	LB-DA-11 (RTD-138 to RTD-146)	22-040309	21 April 2023

4. This certificate is traceable to the international system of unit (SI Unit).  
The measurement is traceable to Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.
5. This result of calibration was found accurate as shown on date and place of calibration only.
6. Condition of calibration item : Normal

Calibrated by : Mr. Sarawoot Thammo  
Scientist  
Issue date : 24 January 2023  
Approved by :  
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 laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory (AMARC) 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).  
Effective Date 15/10,



## REPORT OF CALIBRATION

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

### 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 = 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.

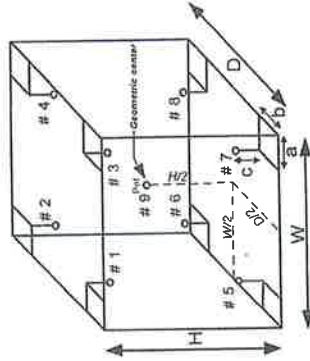


Figure. Example of sensor installation Positions

The result expanded uncertainty of measurement,  $U$  is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k$  to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M001.

- End of Report -



**INDUCTIBELY COUPLED PLASMA SPECTROMETER**

**Model : Prodigy 7**

**Serial No. : P70177**



บริษัท แอปพลิเคชัน ดีฟายน์ จำกัด  
Application Define Company Limited  
133218 ถนนพหลโยธิน แขวงจตุจักร เขตจตุจักร กรุงเทพมหานคร 10510  
133218 Hatairath Road, Minburi Sub-district Minburi District, Bangkok 10510  
Tel: (66)6456-5191 E-mail: support@apdefine.co.th Website: http://www.apdefine.co.th  
(เลขประจำตัวผู้เสียภาษี 010556032491)

## CERTIFICATE OF INSTRUMENT PERFORMANCE






<b>INSTRUMENT:</b>	INDUCTIVELY COUPLED PLASMA SPECTROMETER
<b>BRAND:</b>	Teladyne Leeman Labs
<b>MODEL:</b>	Prodigy 7
<b>SERIAL NO.</b>	P70177
<b>CUSTOMER:</b>	บริษัท อีทีทีอิน โท คอนสตรัคชั่น 1992 จำกัด
<b>CHECKING:</b>	<b>SPECTROMETER</b> Wavelength Accuracy check by use emission line of Hg Lamp Mercury line 253.652 nm. Plasma View (Dual View) CMOS Detector check Align View by Mn line 257.610 nm. <b>RF GENERATOR</b> Incident Power 1,200 ±10 Watt Reading = 1200 Watt <b>SAMPLE INTRODUCTION</b> Plasma Torch, Injector, Spray chamber, Nebulizer Peristaltic pump & Tubing <b>EXHAUSTING &amp; COOLING SYSTEM</b> Safety Interlock Switch (Door, Argon pressure, Water pressure) Cooling System, water flowrate & low pressure switch Flowrate of Air blower <b>COMPUTER &amp; SOFTWARE</b> Plasma Ignition software & Analytical Software <b>ANALYTICAL TEST</b> Spectrum & Echellogram check Qualitative & QC Test

DATE

## PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

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

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

<b>Gas system:</b> ตรวจสอบแรงดันแก๊สและภาควัสดุ Argon Pressure: 5-5 psi Leak inspected (✓) No leak Nitrogen Pressure: - psi Leak inspected (✓) No leak Oxygen Pressure: - psi Leak inspected (✓) No leak	
( ) Change camera purge gas Dehydrator (1 times /years) Next time replacement 12/24/23 เปลี่ยนตัวดูดความชื้นดีไฮเดรต ทุก 1 ปี	
<b>Water Chiller:</b> RF generator flow rate 4.44 LPM Temperature 26.0 °C ตรวจสอบอุณหภูมิ Leak inspected (✓) No leak ตรวจสอบการรั่วซึม	
<b>Water Chiller:</b> Camera (✓) check water level and refill ตรวจสอบระดับน้ำและเติมน้ำ (✓) change water เปลี่ยนถ่ายน้ำ Temperature -3.1 °C ตรวจสอบอุณหภูมิ	
<b>Exhaust Hood</b> Flow rate 240 CFM (system request > 150)	

Signature: [Redacted]

Signature: [Redacted]

## PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท อีสเทิร์น โทท คอมมูนิคัล 1992 จำกัด	Date: Dec 12, 2022
Instrument: ICP-OES	Model: Prodigy 7

### 2. Computer & Software Check

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

## PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท อีสเทิร์น โทท คอมมูนิคัล 1992 จำกัด	Date: Dec 12, 2022
Instrument: ICP-OES	Model: Prodigy 7

### 3. Instrument Control

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

PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

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

4. Cleaning & Replacement

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

5. Safety Interlock

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

PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

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

6. Hardware Check with SALS.EXE Diagnostics

Power Supply	Value	Status
-12 VDC (11 - 14.5 VDC)	-13.75 V	OK
+12 VDC (11 - 14.5 VDC)	+12.01 V	OK
+3.3 VDC	3.28 V	OK
+5.0 VDC	4.99 V	OK
+13.5 VDC	13.48 V	OK

Plasma Generator	Value	Status
ICP Current 0.500 A = 1 kW	0.504 A	OK
ICP Ref 5.0 Vdc = 1 kW	5.46 V	OK
ICP Current 0.00 Vdc = 0 kW	0	OK
ICP Ref 0.00 Vdc = 0 kW	0	OK
RF Water (Hz) OFF	0	OK
RF Water (Hz) ON	23	OK
Air Knife Pres. (0.00 V) OFF	0	OK
Air Knife Pres. (3.0 - 7.0 V) ON	4.03 V	OK
Neb 25 @ setting of 25 PSI	25	OK
Cool 18 @ setting of 18 LPM	18	OK
Aux 0.6 @ setting of 6 LPM	0.6	OK
Pump Current (0.000 A) OFF	0	OK
Pump Voltage (0.000 V) OFF	0	OK
Pump Current (0.8 to 4.0 A) ON	1.0 A	OK
Pump Voltage (8 to 13 V) ON	12.52 V	OK



Set Points	Value	Status
Air In Set Point 32°C	31	OK
Cam Tec Temperature -32°C	-52	OK
Op Purge Low 0.77 LPM	0.7	OK
Op Purge High 15.50 LPM	15.5	OK
Cam Wtr T 28°C	28	OK

# PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

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

## 7. Mu Check for performance Test

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

Engineer Sign	12 Dec 2022
 Somchai Chumyaung	 <b>TELEDYNE LEE MAN LABS</b> Everywhere you look

**IC-THERMO**

**Serial No. : 20053176**



## Certificate of Calibration

### Integration : Anion and Cation (ID#960)

This certificate is to verify that instrument below are calibrated

by Archemica Lab Co.,Ltd.

Integration

S/N : 20053176

AS-DV

S/N : 2008880131

For

Easternthai Consulting 1992 Co., Ltd.



**ORIFICE TRANSFER STANDARD CERTIFICATION**

**WORKSHEET TE-5025A**

**ROOTSMETER S/N 0438320**



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



ORIFICE TRANSFER STANDARD CERTIFICATION WORKSHEET TE-5025A

Date - Mar 24, 2016 Rootmeter S/N 0438320 Ta (K) - 295  
Operator Tisch 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)]			y axis = SQRT [H2O(Ta/Pa)]		

CALCULATIONS

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

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

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

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

For subsequent flow rate calculations:

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

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

**Primary Flow Calibrator**

**Serial No. : 110619 , 207510**

Certificate of Calibration

Certificate No : 23-AFM-022  
Request No : Req-2023-0128

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

Unit Under Calibration Details  
Measurement Item : Primary Flow Calibrator  
Manufacturer : BIOS  
Model : Defender 510-L  
Serial Number : 110619  
ID :  
Location of Calibration : LAB 4 AIR VELOCITY METER

Calibration Environment and Details  
Temperature : 23 °C ± 3 °C  
Humidity : 55 %RH ± 20 %RH  
Barometric Pressure : 1013 hPa ± 10 hPa  
Received Date : 20 January 2023  
Calibration Date : 6 February 2023  
Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	18501010006	Sensidyne	15 June 2023
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	15 June 2023

Traceability :  
This certificate provides traceability of measurement to recognized national standard, and to the realization of the international System of Units (SI)  
Note :  
The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor k=2, providing a level of confidence approximately 95 %

Certificate No : 23-AFM-022  
Request No : Req-2023-0128

Result of Calibration :				
Flow Setting (L/min)	STD Flow Reading (L/min)	UUC Flow Reading (L/min)	Correction Flow (L/min)	Uncertainty (L/min)
0.02	0.02018	0.020259	-0.00008	0.00032
0.05	0.05041	0.050541	-0.00013	0.00083
0.1	0.1025	0.10153	0.0010	0.0015
0.25	0.2519	0.25043	0.0015	0.0036
0.5	0.5023	0.50069	0.0016	0.0072

Note  
STD : Standard  
UUC : Unit Under Calibration

End of Certificate

**Certificate of Calibration**

**Customer**  
Name : Eastern Thai Consulting 1992 Co., Ltd.  
Address : 683 Moo 11, Sukhaphibarn 8 Rd., Nongkham, Sriracha, Chonburi 20250

Certificate No : 23-AFM-024  
Request No : Req-2023-0196

**Unit Under Calibration Details**  
Measurement Item : Primary Flow Calibrator  
Manufacturer : Mesa Labs  
Model : Defender 510-M  
Serial Number : 207510  
ID : -  
Sensor Model : -  
Sensor Serial Number : -

Location of Calibration : LAB 4 AIR VELOCITY METER

**Calibration Environment and Details**

Temperature : 23 °C ± 3 °C  
Humidity : 55 %RH ± 20 %RH  
Barometric Pressure : 1013 hPa ± 10 hPa  
Received Date : 25 January 2023  
Calibration Date : 6 February 2023

Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Air Flow Meter	Glitterator 3 Standard flow	19031011003	Sensidyne	15 June 2023

**Traceability :**

This certificate provides traceability of measurement to recognized national standard, and to the realization of the international System of

Units (SI)

**Note :**

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor  $k=2$ , providing a level of confidence approximately 95 %.

Certificate No : 23-AFM-024  
Request No : Req-2023-0196

Result of Calibration :

Calibration Point (cc/min)	STD Flow Reading (cc/min)	UUC Flow Reading (cc/min)	Correction Flow (cc/min)	Uncertainty (±) (cc/min)
500	501.1	506.43	-5.3	7.2
1000	1019	1032.2	-13	15
2000	2003	2017.8	-15	29
3000	3007	3023.8	-17	43
4000	4013	4027.2	-15	57

Note

STD Standard

UUC : Unit Under Calibration

End of Certificate

COPY

**THERMO-HYGROMETER**

**Model : 608-H1**

**Serial No. : 45106737**



## CERTIFICATE OF CALIBRATION

Page 1 of 2

NSC-TISI-TS17025  
CALIBRATION 0152

Certificate No. :

22-068062

Sample Code :

22-24591-002

Customer

: EASTERN THAI CONSULTING 1992 CO., LTD.

683 Moo 11, Sukhapiban 8 Rd., Nongkharn,

Siracha, Chonburi 20230

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

Equipment : Digital thermo-hygrometer

Manufacturer : testo Model : 608-H1

Serial No. : 45106737 ID No. : LA8E 09/7

Date of Receipt : 22 June 2022 Date of Calibration : 24 June 2022

## Condition of Calibration

1. Environment  
1.1 Ambient temperature :  $23.0\text{ }^{\circ}\text{C} \pm 3.0\text{ }^{\circ}\text{C}$   
1.2 Relative humidity :  $55.0\text{ \%} \pm 15.0\text{ \%}$

## 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-01 & LB-DP-01 (DP)	TH-0014-22	16 February 2023
3.2 Digital Thermometer	Optidew Vision	LB-DP-01 & LB-DP-01 (Temp.)	22-029549	14 March 2023
3.3 Digital Thermometer	34972A	LB-DA-07 with RTD-89	21-072473	13 September 2022

## 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 Lohabhal

Approved by

Scientist

27 June 2022

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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Effective Date 15/07/21



## REPORT OF CALIBRATION

Page 2 of 2

NSC-TISI-TS17025  
CALIBRATION 0152

Certificate No. :

22-068062

Sample Code :

22-24591-002

## Results of Calibration

## Temperature measurement

Resolution :  $0.1\text{ }^{\circ}\text{C}$   
Range :  $0\text{ }^{\circ}\text{C}$  to  $50\text{ }^{\circ}\text{C}$ 

Calibration point $^{\circ}\text{C}$	Average of standard reading		Unit under calibration		Expanded uncertainty $^{\circ}\text{C}$
	Controlled humidity %RH	Temperature $^{\circ}\text{C}$	Average reading $^{\circ}\text{C}$	Correction value $^{\circ}\text{C}$	
20	50	20.00	20.2	- 0.20	$\pm 0.39$
25	50	25.00	24.9	+ 0.10	$\pm 0.39$
30	50	30.00	29.8	+ 0.20	$\pm 0.39$

## Humidity measurement

Resolution :  $0.1\text{ \%RH}$   
Range :  $10\text{ \%RH}$  to  $95\text{ \%RH}$ 

Calibration point %RH	Average of standard reading		Unit under calibration		Expanded uncertainty %RH
	Air temperature $^{\circ}\text{C}$	Calculated humidity %RH	Average reading %RH	Correction value %RH	
45	25.00	45.13	51.4	+ 6.27	$\pm 1.3$
60	25.00	60.03	66.5	+ 6.47	$\pm 1.5$
75	25.00	75.20	81.5	+ 6.30	$\pm 1.7$

## 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

- End of Report -

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Rev 09

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Effective Date 15/07/21

**CERTIFICATE OF ANALYSIS**

**EPA PROTOCOL GAS**

**Cylinder No. : EB0062815**

## CERTIFICATE OF ANALYSIS

### Grade of Product: EPA Protocol

Part Number: E04N199E15ACX9C Reference Number: 82-401135335-1  
Cylinder Number: EB0062815 Cylinder Volume: 144.4 CF  
Laboratory: 124 - Riverton (SAP) - NJ Cylinder Pressure: 2015 PSIG  
PGVP Number: B52018 Valve Outlet: 660  
Gas Code: CO,NO,NOX,SO2,BALN Certification Date: Mar 13, 2018  
Expiration Date: Mar 13, 2026

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

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	50.00 PPM	50.55 PPM	G1	+/- 1.4% NIST Traceable	03/06/2018, 03/13/2018
NITRIC OXIDE	50.00 PPM	50.50 PPM	G1	+/- 1.4% NIST Traceable	03/06/2018, 03/13/2018
SULFUR DIOXIDE	50.00 PPM	51.01 PPM	G1	+/- 1.0% NIST Traceable	03/06/2018, 03/13/2018
CARBON MONOXIDE	2000 PPM	1977 PPM	G1	+/- 1.0% NIST Traceable	03/06/2018
NITROGEN	Balance				
CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	15060607	CC442564	50.42 PPM NITRIC OXIDE/NITROGEN	+/- 0.8%	Jun 27, 2020
PRM	12367	APEX1099237	9.82 PPM NITROGEN DIOXIDE/AIR	+/- 2.0%	Jun 02, 2017
GNIS	0315201604	CC503388	4.975 PPM NITROGEN DIOXIDE/NITROGEN	+/- 1.6%	Mar 15, 2019
NTRM	16011025	CC473218	49.02 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Jun 07, 2022
NTRM	12060735	CC356192	2498 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%	Dec 14, 2026
The SRM, PRM or RGM noted above is only in reference to the GMS used in the assay and not part of the analysis.					
ANALYTICAL EQUIPMENT					
Instrument/Make/Model			Last Multipoint Calibration		
Analytical Principle					
Nicolet 6700 APW1100391 CO			Feb 06, 2018		
Nicolet 6700 APW1100391 NO			Feb 15, 2018		
Nicolet 6700 APW1100391 NO2			Feb 16, 2018		
Nicolet 6700 APW1100391 SO2			Mar 01, 2018		

#### Triad Data Available Upon Request

NOTES: NET WEIGHT: 10.43lbs  
GROSS WEIGHT: 60.93lbs  
PO# 521800763

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



TESTING CERT No. 3082.05



**ANALYTICAL BALANCE (DU)**

**Model. : XS205DU**

**Serial No. : 1126323724**

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

## REPORT OF CALIBRATION

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

### Result of Calibration

#### 1. Test weight and repeatability of reading

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

Unit : g	Range : 80	<input type="checkbox"/> Before adjustment	<input type="checkbox"/> After adjustment
<input checked="" type="checkbox"/> No adjustment	Nominal value	40	80
<input type="checkbox"/> Adjustment	Standard weight	40.000042	80.000045
	Average reading of indicator	40.00015	80.00019
	Standard deviation	0.000004	0.000007
Unit : g	Range : 200	<input type="checkbox"/> Before adjustment	<input type="checkbox"/> After adjustment
<input checked="" type="checkbox"/> No adjustment	Nominal value	100	200
<input type="checkbox"/> Adjustment	Standard weight	100.000022	200.000199
	Average reading of indicator	100.00001	200.00004
	Standard deviation	0.000004	0.000004

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Rev.05

Effective Date: 15/10/21

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

## CERTIFICATE OF CALIBRATION

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

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

Equipment : ELECTRONIC BALANCE

Manufacturer : METTLER TOLEDO

Model : XS205DU

Serial No. : 1126323724

ID No. : LABE 05/1

Date of Receipt : 20 January 2023

Date of Calibration : 20 January 2023

Calibrated by : Mr. Thanadol Pholthep  
Scientist

Issue date : 25 January 2023

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

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

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.05



Certificate No. : 23-006683

Sample Code : 23-02820-006

## REPORT OF CALIBRATION

## Result of Calibration

## 2. Sensitivity or value of a scale division

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

Unit : g

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

## 3. Departure of indication from nominal value, Linearity

Unit : g

Nominal Value	Standard Value	Average Reading of indicator	Correction Value	Expanded Uncertainty	Coverage Factor (k)
Unload	0.0000000	0.00000	0.00000	0.0000090	2.01
0.01	0.0100036	0.01000	0.00000	0.0000093	2.01
0.1	0.1000062	0.10000	0.00001	0.000012	2.00
1	1.0000036	1.00001	-0.00001	0.000014	2.00
5	5.0000044	5.00003	-0.00003	0.000020	2.00
10	10.0000000	10.00007	-0.00007	0.000032	2.00
20	20.0000016	20.00011	-0.00009	0.000036	2.00
50	50.0000029	50.00013	-0.00010	0.000067	2.00
100	100.0000022	100.00001	-0.00001	0.000016	2.00
150	150.0000051	150.00001	0.00000	0.000023	2.00
200	200.0000199	200.00003	-0.00001	0.000023	2.00

The result expanded uncertainty of measurement  $U$  is stated as the standard uncertainty of measurement distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of UKAS M3003.



Certificate No. : 23-006683

Sample Code : 23-02820-006

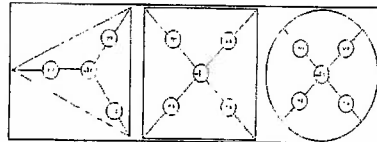
## REPORT OF CALIBRATION

## Result of Calibration :

## 4. Eccentric or off-centre loading

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

Weighing pan		Test weight : 50 and 100	
		Unit : g	
		Range	
		Position	
		Reading of indicator	
		80	
		200	
1	50.00014	100.0001	99.9998
2	50.00014	100.0000	99.9998
3	50.00006	100.0000	99.9998
4	50.00010	100.0001	99.9998
5	50.00017	100.0001	99.9998
6	50.00014	100.0001	99.9998
Maximum difference		0.00008	



## Condition of Calibration

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

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

3. Condition of Calibration item: Normal

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

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

5. Reference standard instrument :

Instrument	Class	ID.No.
1) STANDARD WEIGHT 1 mg to 1 kg	E2	LB-WE-57

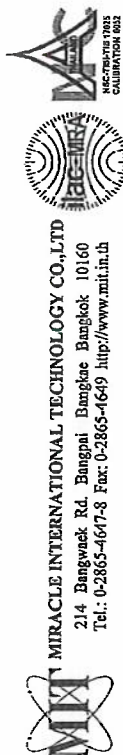
6. Ambient conditions	Min	Max
Temperature (°C)	21.3	22.4
Relative Humidity (%Rh)	38.2	40.4
Air pressure (hPa)	1008.4	1010.1

- End of Report -

## **BAROMETER**

**Equipment : Analog Barometer**

**ID No. / Tag No. : BM001/41**



MIRACLE INTERNATIONAL TECHNOLOGY CO., LTD  
214 Bangwaek Rd. Bangnai, Bangkok 10160  
Tel: 0-2865-467-8 Fax: 0-2865-4649 http://www.miti.th



## CALIBRATION CERTIFICATE

Certificate No. : AD2205-163-0001  
Date Issued : 20-May-22

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

Equipment : Analog Barometer

Manufacturer : Barigo  
Model : -  
Serial No. : -  
ID No./Tag No. : BM001/41  
Date Received : 12-May-22  
Date Calibrated : 20-May-22  
Calibrated by : Mr. Saruth Srichutikul

### 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.

Certificate No : AD2205-163-0001  
Environment : Ambient Temperature :  $(25 \pm 2)^{\circ}\text{C}$   
Relative Humidity :  $(50 \pm 15)\%\text{RH}$

STD Reading hPa	UUC Reading (hPa) Before Adjusted	UUC Reading (hPa) After Adjusted	UUC Error hPa	Uncertainty $\pm$ hPa
990.00	990.0	-	0.00	0.59
1000.00	1000.0	-	0.00	0.59
1010.00	1010.0	-	0.00	0.59
1020.00	1020.0	-	0.00	0.59
1030.00	1030.0	-	0.00	0.59

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

Description of UUC :	Range	955 - 1075	hPa Absolute
Calibration Range	990 - 1030	hPa Absolute	
Scale Interval	1	hPa	
Resolution	0.5	hPa 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-P210086 for Reference Pressure Monitor Serial No. 1598, Due 08-Nov-22

End of Certificate

COPY

**CERTIFICATE OF ANALYSIS**

**EPA PROTOCOL GAS**

**Cylinder No. : EB0145030**



Airgas Specialty Gases  
Airgas USA, LLC  
6141 Easton Road  
Bldg 2  
Plumsteadville, PA 18949  
airgas.com

# CERTIFICATE OF ANALYSIS

## Grade of Product: EPA Protocol

Part Number: E03N199E15AC0U4  
Cylinder Number: EB0145030  
Laboratory: 124 - Plumsteadville - PA  
PGVP Number: A12021  
Gas Code: CH4,PPN,BALN  
Reference Number: 160-402242242-1  
Cylinder Volume: 144.4 CF  
Cylinder Pressure: 2015 PSIG  
Valve Outlet: 350  
Certification Date: Oct 15, 2021  
Expiration Date: Oct 15, 2029

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 0005-12031, using the assay procedure listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a full analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS				
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
METHANE	180.0 PPM	177.0 PPM	G1	+/- 1.0% NIST Traceable
PROPANE	185.0 PPM	187.0 PPM	G1	+/- 1.0% NIST Traceable
NITROGEN	Balance			
CALIBRATION STANDARDS				
Type	Lot ID	Cylinder No	Concentration	Uncertainty
NSRM	08011503	K002564	246.7 PPM METHANE/AIR	+/- 0.3%
NTRM	200602-06	6162660Y	243.3 PPM PROPANE/AIR	+/- 0.5%
ANALYTICAL EQUIPMENT				
Instrument/Make/Model			Analytical Principle	Last Multipoint Calibration
Nicolet SS50 FTIR AUP2110295 CH4			FTIR	Oct 13, 2021
Nicolet SS50 FTIR AUP2110295 C3H8			FTIR	Oct 14, 2021

### Triad Data Available Upon Request

#### NOTES:

Gross Weight: 28.0 Kg  
Net Weight: 4.9 Kg  
PO# 6221004861



**DRY GAS METER MC-572-V**

**Serial No. : 0504003**



Meter Console Information	
Console Model Number	MC-572-V
Console Serial Number	0504003
DGM Model Number	SK25EX
DGM Serial Number	0005303

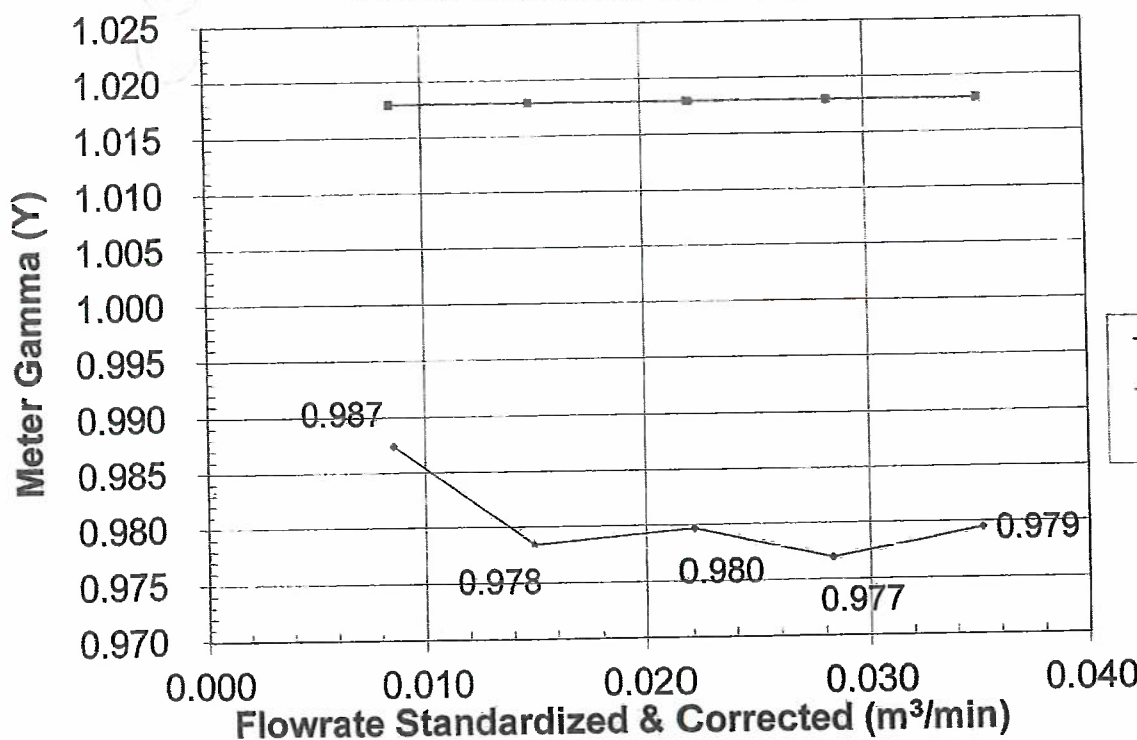
Calibration Conditions			
Date	Time	05-Apr-22	8:30 AM
Calibration Reference No.	HC65APE0026		
Barometric Pressure	761	mm Hg	
Calibration Meter Gamma	0.9980	unitless	

Factors/Conversions		
Std Temp	293	K
Std Press	760	mm Hg
K <sub>1</sub>	0.386	

Calibration Data									
Metering Console				Calibration Meter					
Run Time	DGM Orifice	Volume	Volume	Outlet Temp	Outlet Temp	Volume	Volume	Outlet Temp	Outlet Temp
Elapsed	ΔH	Initial	Final	Initial	Final	Initial	Final	Initial	Final
(@)	(P <sub>atm</sub> )	(V <sub>in</sub> )	(V <sub>out</sub> )	(t <sub>in</sub> )	(t <sub>out</sub> )	(V <sub>in</sub> )	(V <sub>out</sub> )	(t <sub>in</sub> )	(t <sub>out</sub> )
min	mm H <sub>2</sub> O	m <sup>3</sup>	m <sup>3</sup>	°C	°C	m <sup>3</sup>	m <sup>3</sup>	°C	°C
15.00	13.0	234.9529	235.0859	27	27	276.54575	276.67750	27	27
10.00	25.0	235.1718	235.3277	27	27	276.76357	276.91678	27	27
8.00	50.0	235.3676	235.5510	27	27	276.95578	277.13668	27	27
7.00	80.0	235.5744	235.7803	27	27	277.15828	277.36140	27	27
5.00	120.0	235.8320	236.0136	27	27	277.41235	277.59265	27	27

Results								
Standardized Data				Dry Gas Meter				
Dry Gas Meter		Calibration Meter		Calibration Factor		Flowrate	ΔH @	
(V <sub>meas</sub> )	(Q <sub>meas</sub> )	(V <sub>std</sub> )	(Q <sub>std</sub> )	Value	Variation	Std & Corr	.0212 m <sup>3</sup> /min	Variation
m <sup>3</sup>	m <sup>3</sup> /min	m <sup>3</sup>	m <sup>3</sup> /min	(Y)	(ΔY)	(Q <sub>meas</sub> )	(ΔH@)	(ΔΔH@)
						m <sup>3</sup> /min	mm H <sub>2</sub> O	
0.130	0.009	0.129	0.009	0.987	0.007	0.009	78.243	25.850
0.153	0.015	0.149	0.015	0.978	-0.002	0.015	49.567	-2.826
0.180	0.023	0.176	0.022	0.990	-0.001	0.022	45.729	-6.665
0.203	0.029	0.198	0.028	0.977	-0.003	0.028	44.689	-7.705
0.180	0.026	0.176	0.035	0.979	-0.001	0.035	43.739	-8.654

**Meter Gamma vs Flowrate**



THERMOCOUPLES SYSTEM CALIBRATION

SITHIPORN ASSOCIATES CO., LTD.

Environmental / Hygiene Products Division (EPD)

Web site : www.sithiporn.com # Email: service-epd@sithiporn.com

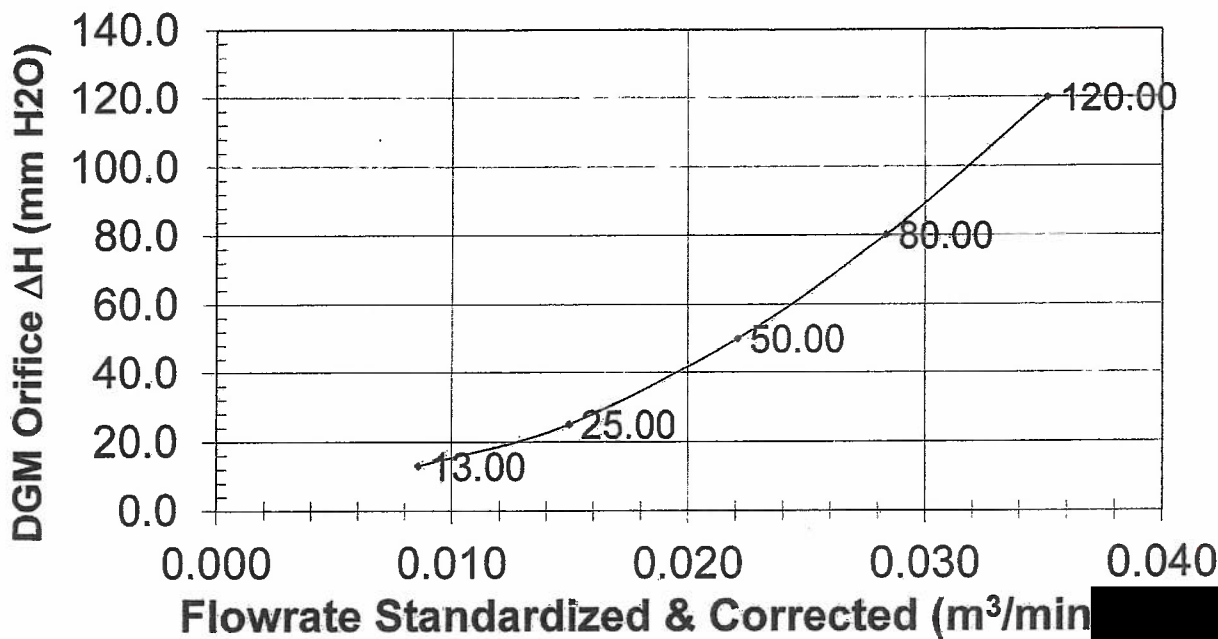
Sampling System Equipment Information		Calibration Conditions	
Console Model Number	MC-572-V	Date	05-Apr-22
Console Serial Number	0504003	Calibration Reference No.	HC55APE0026
DGM Model Number	SK25EX	Barometric Pressure	761 mm Hg
DGM Serial Number	0005303	Reference Thermometer	FLUKE 714
Meter Box Model Number	JENCO 765	Serial Number	9038005
Meter Box Serial Number	JC02484		

Results									
Console Thermocouple Simulator									
Channel and test point		Meter Box Channel Temperature Reading (°C)							
		-18.0	25.0	38.0	93.0	149.0	260.0	371.0	482.0
Stack		-18	25	38	94	151	262	373	485
Probe		-18	25	38	94	151			595
Filter		-18	25	38	94	151			818
Aux		-18	25	38	94	151			1041
Exit		-18	25	38					

	Tolerance Range	Meter Exit
Stack	± 1.50% Absolute	± 3.0 °C
Probe	± 3.0 °C	± 2.0 °C
Filter	± 3.0 °C	

บริษัท สกทิพรแอสโซซิเอต จำกัด  
SITHIPORN ASSOCIATES COMPANY LIMITED

Meter Pressure vs Flowrate



Console Serial:

0504003

บริษัท สกทิพรแอสโซซิเอต จำกัด  
SITHIPORN ASSOCIATES COMPANY LIMITED

Console Model:

**DRY GASMETER XC-572V**

**Serial No. : 1110070**

## Meter Console Information

Console Model #: XC-572V  
 Console Serial #: 1110070  
 DGM Model #: SK25EX  
 DGM Serial #: 0005413

## Calibration Conditions

Calibration Reference No.: WCS-SV930004  
 Ambient Temp (°C): 25.4  
 Barometric Pressure (mm Hg): 756  
 Relative Humidity (%): 55

## Factors/Conversions

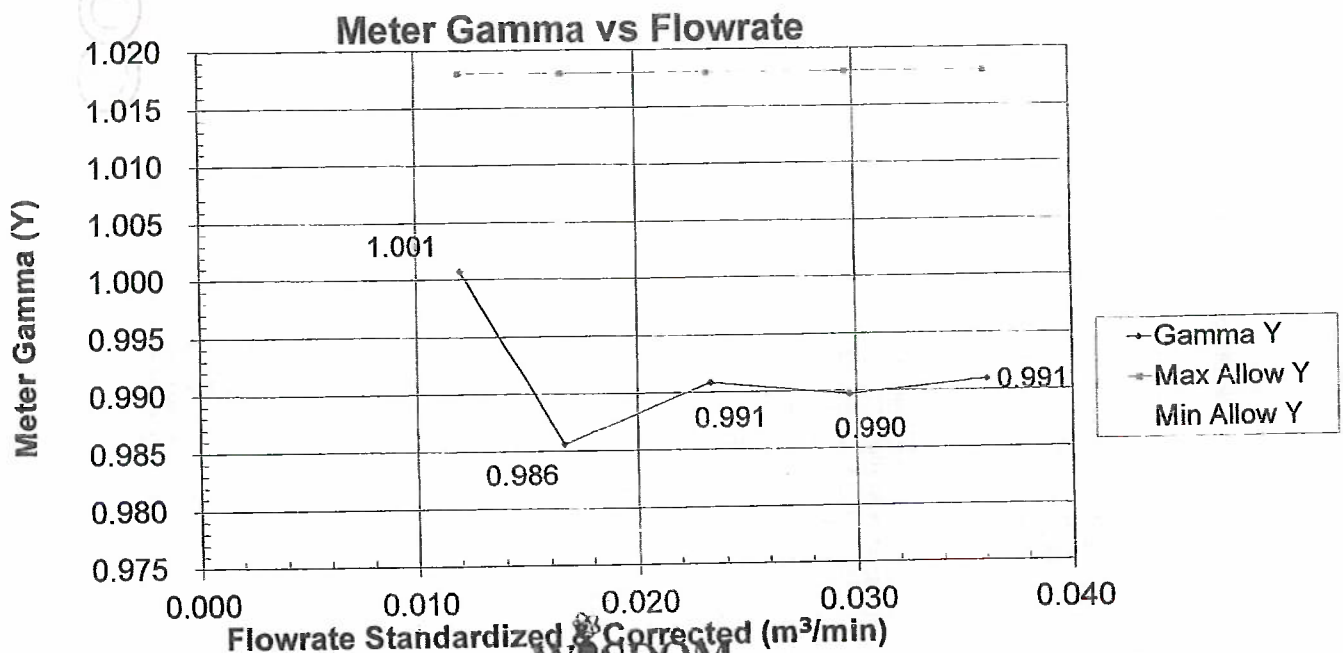
Std Temp (°K): 298  
 Std Press. (mm Hg): 760  
 K<sub>s</sub>: 0.392

## Reference Equipment

WTM Model: W-360Da-6B  
 WTM Serial: 546321  
 WTM Cal. Due: Mar-23  
 Gamma: 1.0000  
 WTM Thermometer: Internal

Metering Console				Calibration Meter				Outlet Temp	
Run Time (minutes)	Orifice, ΔH (mm H <sub>2</sub> O)	Volume (m³)		Outlet Temperature (°C)		Volume (m³)		Initial	Final
(t <sub>0</sub> )	(P <sub>0</sub> )	(V <sub>0</sub> )	(V <sub>1</sub> )	(t <sub>0</sub> )	(t <sub>1</sub> )	(V <sub>0</sub> )	(V <sub>1</sub> )	(t <sub>0</sub> )	(t <sub>1</sub> )
min	mm H <sub>2</sub> O	m³	m³	°C	°C	m³	m³	°C	°C
15.00	13.0	397.7244	397.9056	25	25	289.58787	289.76942	25	25
10.00	25.0	397.9285	398.0384	25	26	289.79207	289.95964	25	25
8.00	50.0	398.1162	398.3058	26	26	289.97735	290.18549	25	25
7.00	80.0	398.3366	398.5469	26	26	290.19612	290.40517	25	25
5.00	120.0	398.5693	398.7513	26	27	290.42762	290.60906	25	25

Standardized Data				Calibration Results			
Test Meter		Reference Meter		Calibration Factor		Flowrate	ΔH @ (mm H <sub>2</sub> O)
(V <sub>test</sub> )	(Q <sub>test</sub> )	(V <sub>ref</sub> )	(Q <sub>ref</sub> )	Value	Variation	Std & Corr	.0212 SCMM
m³	m³/min	m³	m³/min	(Y)	(ΔY)	(Q <sub>corrected</sub> )	(ΔH@)
0.180	0.012	0.181	0.012	1.001	0.009	0.012	41.038
0.169	0.017	0.167	0.017	0.986	-0.006	0.017	41.198
0.189	0.024	0.187	0.023	0.991	-0.001	0.023	41.966
0.210	0.030	0.208	0.030	0.990	-0.002	0.030	41.881
0.182	0.036	0.180	0.036	0.991	-0.001	0.036	42.759
				0.992			41.768
							= ΔH@ Average



Console Serial: 1110070

Console Model: XC-572V

WISDOM SCIENCE  
 บริษัท วิสโดม ไซนซ์ แอนด์ เซอร์วิส กรุ๊ป จำกัด  
 WISDOM SCIENCE SALE AND SERVICE GROUP COMPANY LIMITED

# WSDOM THERMOCOUPLES SYSTEM CALIBRATION

155, Nonthaburi Road, Nonthaburi 11130, Thailand  
WISDOM SCIENCE SALE AND SERVICE GROUP COMPANY LIMITED

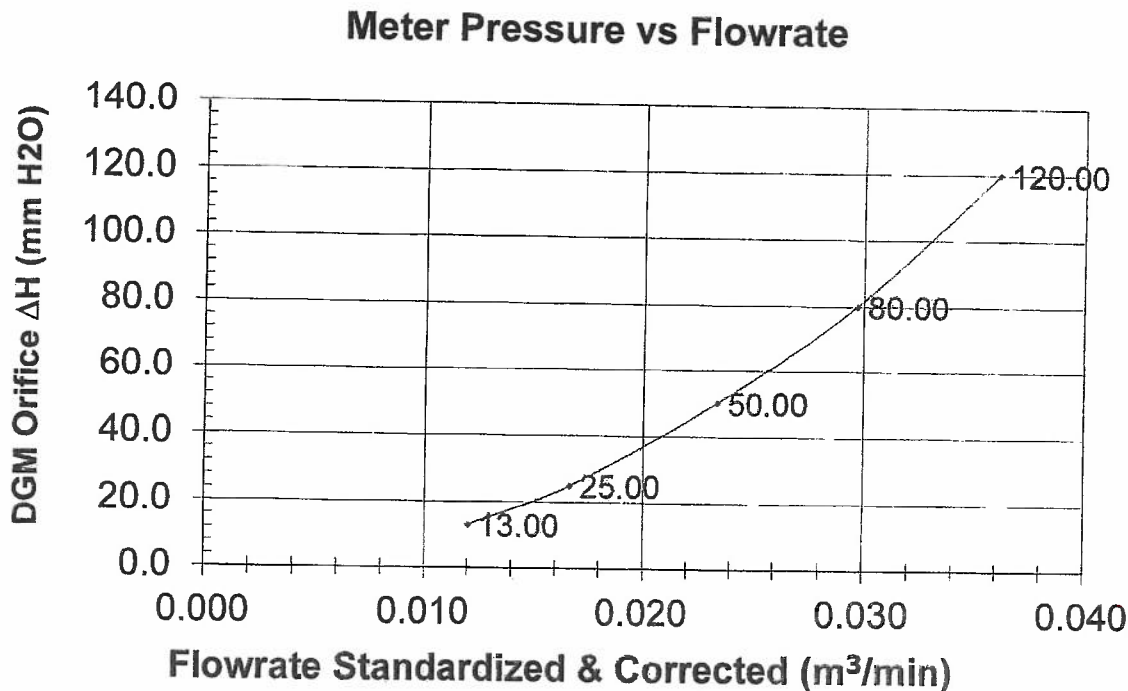
Sampling System Equipment Information	
Console Model Number	XC-572V
Console Serial Number	1110070
Meter Box Model Number	JENCO 765
Meter Box Serial Number	JC02484

Calibration Conditions	
Calibration Reference No.	WDS-SV650004
Ambient Temp	25.4 °C
Barometric Pressure	756 mm Hg
Relative Humidity	55 %
Reference Thermometer	FLUKE 714
Serial Number	9038005

Results												
Console Thermocouple Simulator												
Channel and test point		Temperature Reading (°C)										
		-18.0	25.0	38.0	93.0	149.0	260.0	371.0	482.0	593.0	816.0	1038.0
Stack		-18	24	37	92	150	261	373	485	596	821	1045
Probe		-18	24	37	92	150						
Filter		-18	24	37	92	150						
Aux		-18	24	37	92	150						
Exit		-18	24	37								

Tolerance Range  
Stack ± 1.50% Absolute  
Probe ± 3.0 °C  
Filter ± 3.0 °C

Meter ± 3.0 °C  
Exit ± 2.0 °C



Console Serial: 1110070



Console Model: XC-572V

**DRY GAS METER MC-572V**

**Serial No. : 1007055**

W SDOM

WISDOM SCIENCE SALE AND SERVICE GROUP COMPANY LIMITED

## Certificate Of Calibration

Method 5 Pre-Test Console Calibration - Cubic meter (m<sup>3</sup>)

## Meter Console Information

Model #: MC-572V  
 Serial #: 1007055  
 DGM Model #: SK25EX  
 DGM Serial #: 00006432

## Calibration Condition

Calibration Date: 27/07/2022  
 Calibration Ref.: WDS-SV650005  
 Ambient Temp (°C): 23.5  
 Pressure (mm Hg): 755  
 Relative Humidity (%): 60

## Factors/Conversion

Std. Temp. (°C): 298  
 Std. Pressure (mm Hg): 760  
 K<sub>1</sub> (K/mm Hg): 0.3857

## Reference Equipment

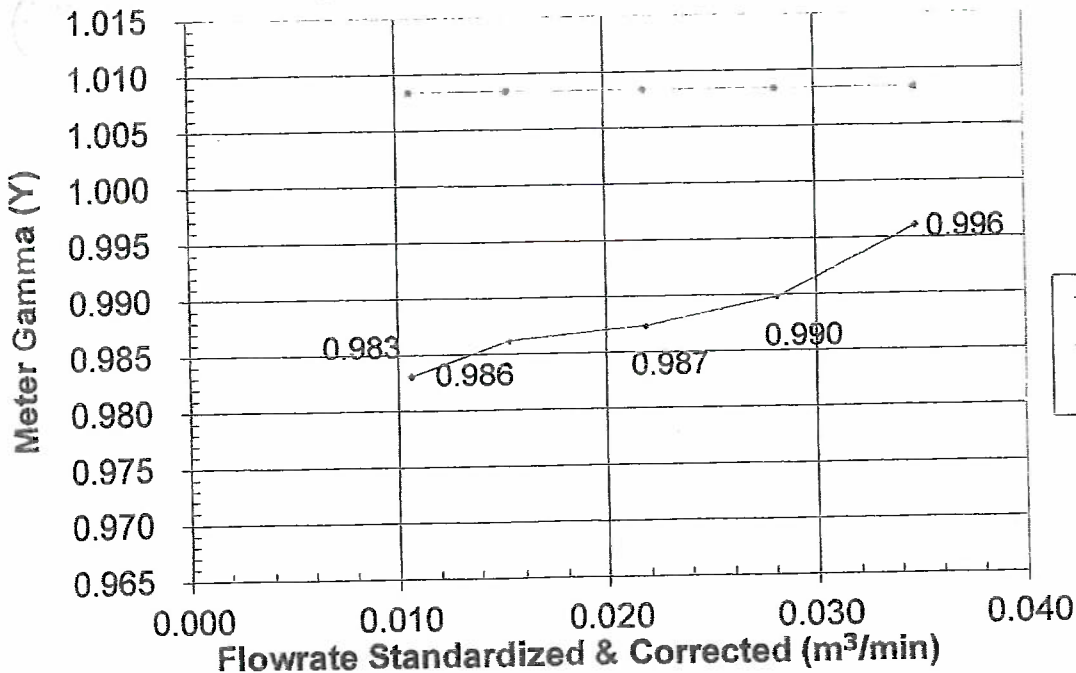
WTM Model: W-NKoDa-5B  
 WTM Serial: 546258  
 TM Cal. Due Date: Feb. 2022  
 Gamma: 0.9980

Run Time (minutes)	DGM Orifice (mm H <sub>2</sub> O)	Volume		Outlet Temp		Volume		Outlet Temp	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final
a	P <sub>avg</sub>	V <sub>int</sub>	V <sub>ext</sub>	t <sub>int</sub>	t <sub>ext</sub>	V <sub>int</sub>	V <sub>ext</sub>	t <sub>int</sub>	t <sub>ext</sub>
15.00	13.0	0.0025	0.1685	25	25	307.83244	307.99616	25	25
10.00	25.0	0.1910	0.3499	25	25	308.00127	308.15867	25	25
8.00	50.0	0.3711	0.5509	25	25	308.16244	308.34119	25	25
7.00	80.0	0.5844	0.7861	25	25	308.34877	308.55037	25	25
5.00	120.0	0.8310	1.0074	25	25	308.59261	308.77072	25	25

Standardized Data				Calibration Results				
Test Meter		Reference Meter		Correction Factor		Flow Rate	ΔH <sub>g</sub> (mm H <sub>2</sub> O)	
Std. Volume V <sub>std</sub> (m <sup>3</sup> )	Std. Flow Rate Q <sub>std</sub> (m <sup>3</sup> /min)	Std. Volume V <sub>ref</sub> (m <sup>3</sup> )	Std. Flow Rate Q <sub>ref</sub> (m <sup>3</sup> /min)	"Gamma" (Y)	Variation (ΔY)	Std & Corr Q <sub>corrected</sub>	0.0212 SCMM ΔH <sub>g</sub>	Variation ΔΔH <sub>g</sub>
0.163	0.011	0.160	0.011	0.983	-0.005	0.011	50.665	3.735
0.158	0.016	0.154	0.015	0.986	-0.002	0.015	46.960	0.030
0.177	0.022	0.174	0.022	0.987	-0.001	0.022	46.834	-0.096
0.199	0.028	0.197	0.028	0.990	0.001	0.028	45.366	-1.564
0.175	0.035	0.174	0.035	0.996	0.008	0.035	44.824	-2.106
				0.988	= Y Avg.		46.930	= ΔH <sub>g</sub> Avg

Pass/Fail Result: Pass

Meter Gamma vs Flowrate





W/ SDOM

THERMOCOUPLES SYSTEM CALIBRATION

1450 Lewis & Clark Road, Suite 200, St. Louis, MO 63103  
WEIGH, MEASURE, ANALYZE AND SERVICE YOUR CALIBRATION

Sampling System Equipment Information	
Console Model Number	MC-572V
Console Serial Number	1007055
Meter Box Model Number	DIGICON
Meter Box Serial Number	N/A

Calibration Conditions	
Date	27/07/2022
Time	9:30 AM
Calibration Reference No.	WDS-SV650005
Barometric Pressure	756
Reference Thermometer	FLUKE 714
Serial Number	9038005

Results												
Console Thermocouple Simulator												
Channel and test point		Meter Box Channel Temperature Reading ( °C )										
Stack	-18.0	25.0	38.0	93.0	149.0	260.0	371.0	482.0	593.0	816.0	1038.0	
	-18	25	38	93	150	261	373	485	596	821	1045	
Probe	-18.0	25	38	92	150							
	-18	25	38	92	150							
Filter	-18.0	25	38	92	150							
	-18	25	38	92	150							
Aux	-18.0	25	38	92	150							
	-18	25	38	92	150							
Exit	-18.0	25	38									
	-18	25	38									

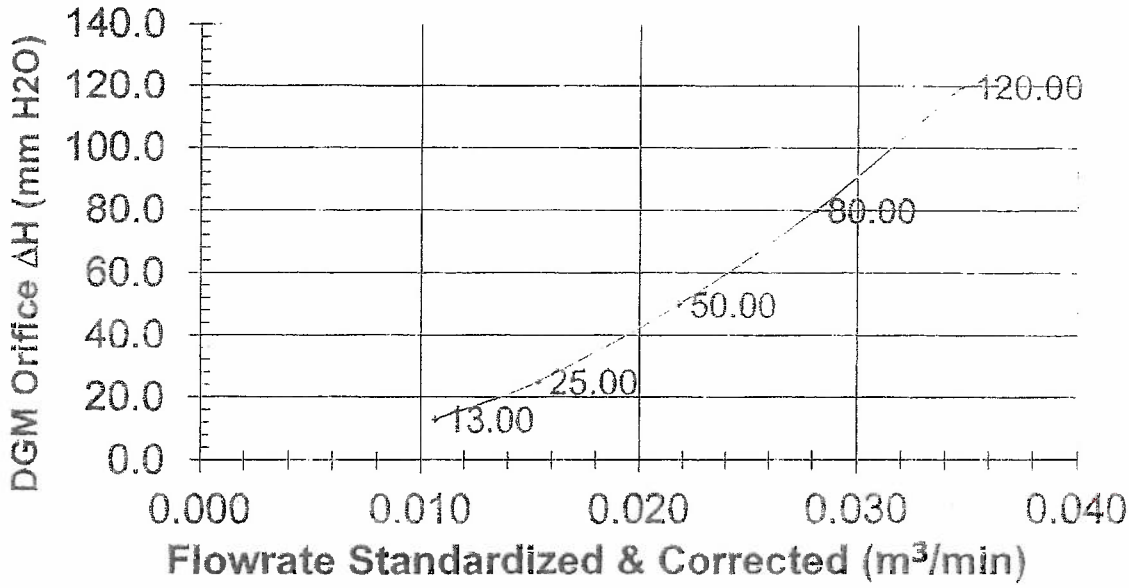
ance Range  
Stack  
Probe  
Filter

± 1.50% °K  
± 3.0 °C  
± 3.0 °C

Meter  
Exit

± 3.0 °C  
± 2.0 °C

Meter Pressure vs Flowrate



Console Serial: 1007055

Console Model: MC-572V



**Flue gas Analyzer**  
**Testo 350XL**  
**Serial No. 01807527**



# Calibration Certificate

Certificate No.: G 650383

ENTECH

Where  
Signature



# Calibration Certificate

Certificate No: G 650383

Date of issue : 15-Jun-22

ENTECH

Where  
Signature

Instrument description : Flue gas Analyzer  
Instrument model : Testo 350XL  
Instrument serial no. : 01807527  
ID no. or control no. : -  
Manufacturer : Testo SE & Co. KGaA  
Probe description : -  
Probe model : -  
Probe serial : -  
Customer name : Eastam Thai Consulting 1992 Company Limited  
Customer address : 683 Moo 11, Sukhapibarn 8 Road, Nongkham, Si Racha, Chon Buri 20280  
Total pages of certificate : 3 Pages  
Receiving no. : L-222062  
Receiving date. : 09-Jun-22  
Parameter of calibration : Gas Calibration(Oxygen 2.498,10.00,21.00 %Vol, Carbon Monoxide 80.97,309.9,1003 ppm, Nitrogen Dioxide 10.19,80.62,202.2 ppm, Nitric Oxide 10.08,150.9,320.6 ppm, Sulphur Dioxide 50.04,100.9,601.1 ppm)  
Condition of UUC. : Used  
Ambient condition : All of the Measurement were carried out the stabilized laboratory  
Calibration place : Temperature : 23 ±5 °C  
Humidity : 55 ± 15 %RH  
17/121 Soi Ngamwongwan 47 Yaek 48, Trongsonghong, Lakki, Bangkok 10210  
Calibration procedure no. : WI-CL-28-C

The calibration certificate expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by coverage factor  $k=2$ , which for a normal distribution corresponds to a coverage probability of approximately 95%.  
This certificate is applied only to item under test Environmental condition.  
This Calibration Certificate may not be reproduced other than in full except with the permission of the issuing laboratory.  
Calibration certificates without signature and seal not valid.  
This calibration certificate documents are traceability to national standards, which realize measurement according to the International System of Units (SI).

Date of calibration : 15-Jun-22

Standard References (Table 1)

Standard	Certificate No.	Vendor	Due date
Oxygen ( O2 ) 2.498 % Vol	4219/21	Linde	30-Sep-25
Oxygen ( O2 ) 10.00 % Vol	2453/19	Linde	18-Jul-23
Oxygen ( O2 ) 21.00 % Vol	2426/19	Linde	16-Jul-23
Carbon monoxide ( CO ) 80.97 ppm	2842/21	Linde	24-Jun-23
Carbon monoxide ( CO ) 309.9 ppm	2803/21	Linde	22-Jun-23
Carbon monoxide ( CO ) 1003 ppm	2829/21	Linde	23-Apr-23
Nitrogen Dioxide ( NO2 ) 10.19 ppm	3372/21	Linde	02-Aug-23
Nitrogen Dioxide ( NO2 ) 80.62 ppm	3240/21	Linde	25-Jul-23
Nitrogen Dioxide ( NO2 ) 202.2 ppm	3239/21	Linde	20-Jul-23
Nitric Oxide ( NO ) 10.08 ppm	3241/21	Linde	25-Jul-23
Nitric Oxide ( NO ) 150.9 ppm	2857/21	Linde	27-Jun-23
Nitric Oxide ( NO ) 320.6 ppm	2944/21	Linde	02-Jul-23
Sulphur Dioxide ( SO2 ) 50.04 ppm	3205/21	Linde	25-Jul-23
Sulphur Dioxide ( SO2 ) 100.9 ppm	4942/20	Linde	20-Nov-22
Sulphur Dioxide ( SO2 ) 601.1 ppm	3204/21	Linde	20-Jul-23

## Measured room conditions

Temperature : 25.1 °C Humidity : 51.8 %RH Pressure : 1011.5 mbar

## Calibration conditions

Gas Temperature : 23 °C Flow rate : 1,000 ml/min Gas pressure : 1021.9 mbar

## Calibration Results Before Adjustment (Table 2)

Parameter of Standard	Standard Values	Mean of UUC	Error	Uncertainty ( ± )
O2 (%Vol)	2.498	2.53	0.032	0.20
O2 (%Vol)	10.00	10.01	0.01	0.40
O2 (%Vol)	21.00	21.14	0.14	0.80
CO (ppm)	80.97	83	2.03	2.8
CO (ppm)	309.9	323	13.1	11
CO (ppm)	1003	1050	47	34
NO2 (ppm)	10.19	9.2	-0.99	1.5
NO2 (ppm)	80.62	77.5	-3.12	5.0
NO2 (ppm)	202.2	194.6	-7.6	5.0
NO (ppm)	10.08	8	-2.08	6.0
NO (ppm)	150.9	148	-2.9	5.0
NO (ppm)	320.6	312	-8.6	10
SO2 (ppm)	50.04	46	-4.04	5.0
SO2 (ppm)	100.9	98	-2.9	5.0
SO2 (ppm)	601.1	598	-3.1	14

Calibration Results After Adjustment (Table 3)

Parameter of Standard	Standard Values	Mean of UUC	Error	Uncertainty (±)
O <sub>2</sub> (%Vol)	2.498	2.53	0.032	0.20
O <sub>2</sub> (%Vol)	10.00	10.01	0.01	0.40
O <sub>2</sub> (%Vol)	21.00	21.14	0.14	0.80
CO (ppm)	80.97	81	0.03	2.8
CO (ppm)	309.9	310	0.1	11
CO (ppm)	1003	1005	2	34
NO <sub>2</sub> (ppm)	10.19	9.2	-0.99	1.5
NO <sub>2</sub> (ppm)	80.62	77.5	-3.12	5.0
NO <sub>2</sub> (ppm)	202.2	194.6	-7.6	5.0
NO (ppm)	10.08	8	-2.08	6.0
NO (ppm)	150.9	148	-2.9	5.0
NO (ppm)	320.6	312	-8.6	10
SO <sub>2</sub> (ppm)	50.04	46	-4.04	5.0
SO <sub>2</sub> (ppm)	100.9	98	-2.9	5.0
SO <sub>2</sub> (ppm)	601.1	598	-3.1	14

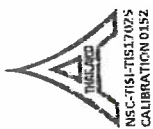
Remark : 1 cmol/mol = 1 %vol , 1 μmol/mol = 1 ppm.

End of Report

**Hot Air Oven**

**Model : UFE 500**

**Serial No. : G511.0182**



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Customer : EASTERN THAI CONSULTING 1992 CO., LTD.

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

Equipment : Temperature controlled enclosures (Hot air oven)

Manufacturer : Mermert

Serial No. : G571.0182

Date of Receipt : 20 January 2023

Condition of Calibration

1. Environment

1.1 Ambient temperature

Resolution : 0.5 °C

1. Reporting of Temperature

Results of Calibration

Resolution : 0.5 °C

1. Reporting of Temperature

Results of Calibration

Resolution : 0.5 °C

1. Reporting of Temperature

Results of Calibration

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		
104	103.5	103.5	104.10	104.08	103.87	103.99	104.08	104.08	103.96	104.01	0.47	2.00

2. Characterization results

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

Notes

UUC\* = Unit Under Calibration

# CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.

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

Equipment : Temperature controlled enclosures (Hot air oven)

Manufacturer : Mermert

Serial No. : G571.0182

Date of Receipt : 20 January 2023

Condition of Calibration

1. Environment

1.1 Ambient temperature

1.2 Relative humidity

1.3 Line voltage supplied

1.1 Ambient temperature

27.9 °C : Minimum

50.9 % : Minimum

221.9 VAC : Minimum

25.3 °C : Minimum

38.5 % : Minimum

218.5 VAC : Minimum

25.3 °C : Minimum

38.5 % : Minimum

218.5 VAC : Minimum

25.3 °C : Minimum

38.5 % : Minimum

218.5 VAC : Minimum

25.3 °C : Minimum

38.5 % : Minimum

218.5 VAC : Minimum

25.3 °C : Minimum

38.5 % : Minimum

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218.5 VAC : Minimum

25.3 °C : Minimum

38.5 % : Minimum

218.5 VAC : Minimum

25.3 °C : Minimum

38.5 % : Minimum

218.5 VAC : Minimum

25.3 °C : Minimum

38.5 % : Minimum

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25.3 °C : Minimum

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25.3 °C : Minimum

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25.3 °C : Minimum

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38.5 % : Minimum

218.5 VAC : Minimum

25.3 °C : Minimum

38.5 % : Minimum

218.5 VAC : Minimum

25.3 °C : Minimum

38.5 % : Minimum

218.5 VAC : Minimum

25.3 °C : Minimum

38.5 % : Minimum

218.5 VAC : Minimum

25.3 °C : Minimum

38.5 % : Minimum

218.5 VAC : Minimum

25.3 °C : Minimum



REPORT OF CALIBRATION

Page 3 of 3

Certificate No. : 23-006679

Sample Code : 23-02820-002

Results of Calibration

Notes

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

The result expanded uncertainty of measurement  $U$  is stated as the standard uncertainty of measurement multiplied by the coverage factor to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M

tribution corresponds

- End of Report -

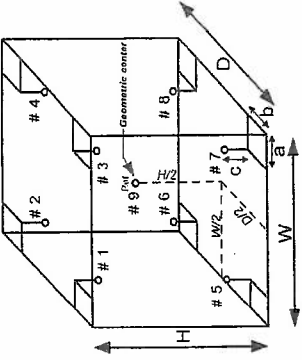


Figure: Example of sensor installation Positions

**INDUCTIBELY COUPLED PLASMA SPECTROMETER**

**Model : Prodigy 7**

**Serial No. : P70177**



บริษัท แอปพลิเคชัน ดีฟายน์ จำกัด  
Application Define Company Limited  
133/218 ถนนห้วยขวาง แขวงสามยุค เขตห้วยขวาง กรุงเทพมหานคร 10510  
133/218 Huaiyong Road, Minburi Sub-district, Minburi District, Bangkok 10510  
Tel: (08)64458 8191 E-mail: support@apdefine.co.th Website: http://www.apdefine.co.th  
เลขประจำตัวผู้เสียภาษี 0105558032491

## CERTIFICATE OF INSTRUMENT PERFORMANCE

### INSTRUMENT:

BRAND: Inductively Coupled Plasma Spectrometer

MODEL: Teledyne Leeman Labs

SERIAL NO. Prodigy 7

CUSTOMER: บริษัท อีทีทีเอ็นไทย คอนซัลติง 1992 จำกัด

### CHECKING:

#### SPECTROMETER

Wavelength Accuracy check by use emission line of Hg Lamp

Mercury line 253.652 nm.

Plasma View (Dual View)

CMOS Detector check

Align View by Mn line 257.610 nm.

#### RF GENERATOR

Incident Power 1,200 ±10 Watt Reading = 1,000 Watt

#### SAMPLE INTRODUCTION

Plasma Torch, Injector, Spray chamber, Nebulizer

Peristaltic pump & Tubing

#### EXHAUSTING & COOLING SYSTEM

Safety Interlock Switch (Door, Argon pressure, Water pressure)

Cooling System, water flowrate & low pressure switch

Flowrate of Air blower

#### COMPUTER & SOFTWARE

Plasma Ignition software & Analytical Software

#### ANALYTICAL TEST

Full Frame Capture & Echelogram check

Cuve & QC Test



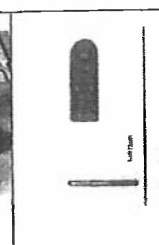
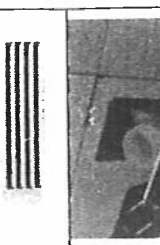

DATE

## PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY 7

Customer: บริษัท อีทีทีเอ็นไทย คอนซัลติง 1992 จำกัด Date: Dec 12, 2022

Instrument: ICP-OES Model: Prodigy 7 SN: P70177

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

<b>Gas system:</b> ตรวจสอบแรงดันแก๊สและอากาศรั่วซึม Argon Pressure: 5-5 psi Leak inspected (✓) No leak Nitrogen Pressure: - psi Leak inspected (✓) No leak Oxygen Pressure: - psi Leak inspected (✓) No leak	
( ) Change camera purge gas Dehydrator ( 1 times /years ) Next time replacement 5-6 เดือน 27-01-23 เปลี่ยนตัวดูดความชื้นในตู้กล้อง ทุก 1 ปี	
<b>Water Chiller: RF generator</b> flow rate 1.94 LPM Temperature 25 °C ตรวจสอบอุณหภูมิ Leak inspected (✓) No leak ตรวจสอบการรั่วซึม	
<b>Water Chiller: Camera</b> (✓) check water level and refill ตรวจสอบระดับน้ำและเติมน้ำ (✓) change water เปลี่ยนน้ำ Temperature -31 °C ตรวจสอบอุณหภูมิ	
<b>Exhaust Hood</b> Flow rate 2700 CFM ( system request > 150 )	

TELEDYNE LEEEMAN LABS



# PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

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

## 2. Computer & Software Check

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

# PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

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

## 3. Instrument Control

Description	Status
Optical view position: ตรวจสอบตำแหน่งที่ติดตั้งหลอดไฟในตำแหน่ง	
Hg Lamp Deltas	
X 2 Y -4	OK
XUV 0	OK
Axial peak positions X 3325 Y 1225	OK
Radial peak positions X 4151 Y 1225	OK
Hg lamp peak positions X 2220 Y 2630	OK
Plasma Control ตรวจสอบสภาพการทำงานของพลาสมา	
(✓) Auto Start	OK
(✓) Extinguish	OK
(✓) RF power setting	OK
(✓) Igniter	OK
(✓) Air Knife	OK
Torch Gas ตรวจสอบการทำงานของแก๊สที่ใช้ในพลาสมา	
(✓) Coolant /Plasma Flow control	OK
(✓) Aux Flow	OK
(✓) Nebulizer Flow	OK
(✓) Optimize sample introduction function	OK
(✓) Peristaltic pump control	OK
(✓) Auto sampler Control	OK
(✓) Camera Support Module	OK
(✓) Diagnostic	OK

PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

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

4. Cleaning & Replacement

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

5. Safety Interlock

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

PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

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

6. Hardware Check with SALSAXE Diagnostics

Power Supply	Value	Status
-12 VDC (11 - 14.5 VDC)	-13.15%	OK
+12 VDC (11 - 14.5 VDC)	+12.01%	OK
+3.3VDC	3.24%	OK
+5.0 VDC	4.44%	OK
+13.5 VDC	13.48%	OK

Plasma Generator	Value	Status
ICP Current 0.500A = 1kW	0.544	OK
ICP Ref 50Vdc = 1kW	5.464	OK
ICP Current 0.00 Vdc = 0kW	0	OK
ICP Ref 0.00Vdc = 0kW	0	OK
RF Water (Hz) OFF	0	OK
RF Water (Hz) ON	2.3	OK
Air Knife Pres. (0.00V ) OFF	0	OK
Air Knife Pres. (3.0 - 7.0 V) ON	4.074	OK
Neb 25 @ setting of 25 PSI	2.5	OK
Cool 18 @ setting of 18 LPM	1.4	OK
Aux 0.6 @ setting of 6 LPM	0.6	OK

Camera Water pump	Value	Status
Pump Current (0.000 A) OFF	0	OK
Pump Voltage (0.000 V) OFF	0	OK
Pump Current (0.8 to 4.0A) ON	1.04	OK
Pump Voltage (8 to 13 V) ON	12.52	OK



Set Points	Value	Status
Air In Set Point 32°C	31	OK
Can Tec Temperature -32°C	-32	OK
Op Purge Low 0.77 LPM	0.71	OK
Op Purge High 15.50 LPM	15.5	OK
Can Wtr T 28°C	28	OK

# PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

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

## 7. Ma Check for performance Test

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

Engineer Sign	12 Dec 2022
 Somchai Chunyaung	 <b>TELEDYNE LEEMAN LABS</b> Everywhere you look

**IC-THERMO**

**Serial No. : 20053176**



## Certificate of Calibration

### Integration : Anion and Cation (ID#960)

This certificate is to verify that instrument below are calibrated

by Archemica Lab Co.,Ltd.

Integration	S/N : 20053176
AS-DV	S/N : 2008880131

For

Easternthai Consulting 1992 Co., Ltd.



**UV/VIS SPECTROPHOTOMETER**

**Model : UV – 1800**

**Serial No. : A11635101643CD**



Bara Scientific Co., Ltd.  
988 U Chu Liang Building Floor7 Rama4 Road  
Sliom Bangkok Bangkok Thailand 10500  
Tel : 02-63754300 Fax : 02-6375496-7  
www.bara-scientific.com



## Certificate of Calibration

Number of Page(s) 1 of 3

Certificate No. BSCC-UV-167/22  
Equipment UV/Vis Spectrophotometer  
Model UV-1800  
Manufacturer Shimadzu  
Serial No. A11635101643 CD  
ID No. LABE 03/2  
Date of receipt 18 May 2022  
Date of calibration 18 May 2022  
Date of issue 25 May 2022

Customer name Eastern Thal Consulting 1992 Co., Ltd.  
Address 883 Moo 11, Sukkhophibarn 8 Rd., Nongkham, Sriracha, Chonburi 20230.

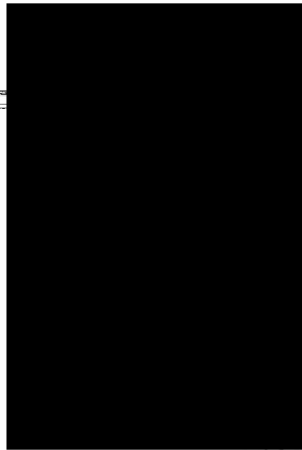
Temperature (23.8-24.5) °C (On site)  
Humidity (47.6-48.3) %RH (On site)

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. 96367 and 96366  
Photometric Accuracy is traceable to certificate No. 99925 and 100147  
Stray Light is traceable to certificate No. 96346  
The above certificate are traceable to SI unit through Starna Scientific Ltd.  
(UKAS accredited calibration laboratory NO. 0659)

Calibrated by Mr.Kanchit Choothep



The above results are valid exclusively for the calibrated item(s) as mentioned in the report. Certificate and publicity of the results are prohibited except in full, without written approval of the Bara Scientific Co., Ltd.



Bara Scientific Co., Ltd.  
988 U Chu Liang Building Floor7 Rama4 Road  
Sliom Bangkok Bangkok Thailand 10500  
Tel : 02-63754300 Fax : 02-6375496-7  
www.bara-scientific.com



## Certificate of Calibration

Number of Page(s) 2 of 3

Certificate No. BSCC-UV-167/22

Calibration Results:  
1.Wavelength Accuracy

Wavelength (nm)	UUC (nm)	Error (nm)	Uncertainty (nm)
287.71	287.80	0.09	0.18
445.82	445.95	0.13	0.18
536.52	536.60	0.08	0.18
741.02	741.00	-0.02	0.18
879.41	879.40	-0.01	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	0.7321	0.0010	0.0075
257	CNR	CNR	CNR	CNR
313	CNR	CNR	CNR	CNR
350	CNR	CNR	CNR	CNR
	0.0000	0.0000	0.0000	0.0075
	0.6306	0.6314	0.0008	0.0075

\*CNR = Customer not request

The above results are valid exclusively for the calibrated item(s) as mentioned in the report. Certificate and publicity of the results are prohibited except in full, without written approval of the Bara Scientific Co., Ltd.





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



# Certificate of Calibration

Number of Page(s) 3 of 3

Certificate No. BSCC-UV-167/22

Calibration Results:

## 3. Photometric Accuracy (Visible)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (±A)
420.0	0.0000	0.0000	0.0000	0.0042
	0.5472	0.5481	0.0009	0.0042
	0.7637	0.7636	-0.0001	0.0042
	1.0480	1.0487	0.0017	0.0042
440.0	0.0000	0.0000	0.0000	0.0042
	0.5371	0.5377	0.0006	0.0042
	0.7457	0.7451	-0.0006	0.0042
	1.0233	1.0240	0.0016	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
	0.5006	0.5006	0.0000	0.0042
	0.6961	0.6944	-0.0017	0.0042
	0.9563	0.9550	-0.0013	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
	0.5137	0.5137	0.0000	0.0042
	0.6907	0.6891	-0.0016	0.0042
	0.9533	0.9519	-0.0014	0.0042

\*CNR = Customer not request

## 4. Stray Light\*

Unit Under Calibration(UUC)	
Standard cut-off wavelength (nm)	Absorbance (A)
200.9±0.1nm	2.0204

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

The measurement uncertainty is base on a standard uncertainty multiplied by a coverage factor k=2, provided  
\*\*\* End of Certificate \*\*\*

The above results are valid exclusively for the calibrated item(s) as mention in  
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.  
FMUV-708-02 Rev.01 (23/01/63)



**SOUND LEVEL CALIBRATOR**

**MODEL : NC-75**

**SERIAL No. : 34802645**

**Request No.** 21-66/0021 **MTC No. EEL. BP.** 35/1065

## CALIBRATION CERTIFICATE

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

**Instrument Calibrated :**  
**Description** : Sound Calibrator  
**Manufacturer** : Rion  
**Model** : NC-75  
**Serial No.** : 34802645  
**Ambient Environment**  
**Temperature** : (23 ± 3) °C  
**Relative Humidity** : (50 ± 15) %  
**Ambient Pressure** : (101.325 ± 1.500) kPa

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

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

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

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

**Date of Receipt** : 10 Oct. 2022

**Date of Calibration** : 18 Oct. 2022

The results relate only to the items tested/calibrated or  
Advising the Report/Certificate and publicity of the results except in full are prohibited unless with TISTR.

**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 : rnmua@tistr.or.th Website:www.tistr.or.th

**Office/Laboratory** Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road, Amphoe Muang, Changwat Samutprakan 10280, Thailand  
Tel. (66) 0 2577 9000  
Fax. (66) 0 2323 9165  
E-mail : mtctr@tistr.or.th

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

FM.BLMTC.002 Rev

**Request No.** 21-66/0021 **MTC No. EEL. BP.** 35/1065  
The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95%.

**Nominal Output of Unit Under Test** = 94 dB re 20µPa at 1000 Hz  
**Acoustic Output in dB re 20µPa, Corrected to Reference Conditions** : 101.325 kPa, 23.0°C and 50 %RH

### 1. Sound Pressure Level

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

### 2. Frequency

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

### 3. Total distortion

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

**Note :** 1. No adjustment.

2. The calibrator pressure correction was not included.

Calibrated by

**Date of Calibration** : 18 Oct. 2022 **Industrial Metrology and Testing Service Centre**

**Date of Issue** : 19 Oct. 2022

**End of Certificate**

The results relate only to the items tested/calibrated or  
Advising the Report/Certificate and publicity of the results except in full are prohibited unless with TISTR.

**Head Office** 35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang, Changwat Pathumthani 12120, Thailand  
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**Office/Laboratory** Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road, Amphoe Muang, Changwat Samutprakan 10280, Thailand  
Tel. (66) 0 2577 9000  
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E-mail : mtctr@tistr.or.th

**Office** 196 Phahonyothin Road, Chatuchak, Bangkok 10900  
Thailand  
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Fax. (66) 0 2579 8592  
E-mail : sumalee@tistr.or.th

FM.BLMTC.002 Rev

**SOUND LEVEL METER**

**MODEL : NL-52A**

**SERIAL No. : 01120945**

SITHIPORN ASSOCIATES CO.,LTD.  
CALIBRATION LABORATORY

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



NSC-TS1-TS 17025  
CALIBRATION 0394

Cert No. : ACL23096  
Pages : 1 of 8

Calibration Certificate

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

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

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

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

Calibrated by : Nathakorn Pisutpaisan

Approved by :

This certificate is issued in accordance with the requirements of  
other than in full, except with the prior written approval of the

SITHIPORN ASSOCIATES CO.,LTD.  
CALIBRATION LABORATORY

Continuation of Calibration Certificate

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

Calibration Procedure : CP-AC-01

Calibration Method :

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

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

Condition of this result of calibration :

1. Reference Standard Instruments :

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

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

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

Continuation of Calibration Certificate

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

Summary of Measurement Result :

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

Continuation of Calibration Certificate

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

Result of calibration :

1. Absolute sensitivity

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

2. Self-generated noise

2.1 Normal test

Measured Value (dB )
13.8

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

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

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz )	Deviation from various frequency weighting response curve (dB)		
	Flat	C-weight	A-weight
125	0.2	0.2	0.2
1000	0.1	0.1	0.1
8000	0.0	0.0	0.0

Continuation of Calibration Certificate

Cert. No. : ACL23096  
Job No. : VC66AC0035  
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighing network response with relative to 1 kHz.

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

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long - term stability

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

Continuation of Calibration Certificate

Cert. No. : ACL23096  
Job No. : VC66AC0035  
Pages : 6 of 8

7. Level linearity on the reference level range

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

Continuation of Calibration Certificate

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

8. Level linearity including the level range control

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

9. Tone burst response

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

10. Peak C sound level

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

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

Continuation of Calibration Certificate

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

11. Overload indication

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

12. High level stability

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

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

End of Calibration Certificate

**SOUND LEVEL METER**

**MODEL : NL-52A**

**SERIAL No. : 01120944**



# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY



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

NSC-TIS-17025  
CALIBRATION 0394

Cert. No. : ACL23095  
Pages : 1 of 8

## Calibration Certificate

**Equipment :** SOUND LEVEL METER  
**Manufacturer :** RION  
**Model :** NL-52A / Microphone UC-59 / Preamplifier NH-25  
**Serial No.:** 01120944 / 21950 / 22333  
**ID No.:**

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

**Location :**  
**Ambient Temperature :** ( 23.0 ± 3 ) °C  
**Pressure :** ( 101.3 ± 3 ) kPa  
**Relative Humidity :** ( 50.0 ± 20 ) %  
**Received Date :** 24 JANUARY 2023  
**Calibration Date :** 26-30 JANUARY 2023  
**Date of Issue :** 01 FEBRUARY 2023

Calibrated by :

Approved by :

This certificate is issued in accordance with the requirements of the ISO 9001:2015 standard, and is valid only for the purpose of calibration. It is not valid for other than in full, except with the prior written approval of the issuing authority.

# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

## Continuation of Calibration Certificate

Cert. No. : ACL23095  
Job No. : VC66AC0035  
Pages : 2 of 8

**Calibration Procedure :** CP-AC-01

### Calibration Method :

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

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

### Condition of this result of calibration :

1. Reference Standard Instruments :

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

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

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

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

Summary of Measurement Result :

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

Result of calibration :

1. Absolute sensitivity

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

2. Self-generated noise

2.1 Normal test

Measured Value (dB )
13.8

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

Frequency Weighting	Measured value (dB )
A - weight	9.9
C - weight	15.2
Flat	20.9

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz )	Deviation from various frequency weighting response curve (dB)		
	Flat	C-weight	A-weight
125	0.2	0.2	0.2
1000	0.1	0.1	0.1
8000	-0.4	-0.3	-0.3
			Acceptance Limits
			± 1.0
			± 0.7
			+ 1.5, - 2.5

Continuation of Calibration Certificate

Cert. No. : ACL23095  
Job No. : VC66AC0035  
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

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

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long - term stability

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

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±0.8
136.0	136.0	0.0	±0.8
135.0	135.0	0.0	±0.8
134.0	134.0	0.0	±0.8
133.0	133.0	0.0	±0.8
132.0	132.0	0.0	±0.8
131.0	131.0	0.0	±0.8
129.0	129.0	0.0	±0.8
124.0	124.0	0.0	±0.8
119.0	119.0	0.0	±0.8
114.0	114.0	0.0	±0.8
109.0	109.0	0.0	±0.8
104.0	104.0	0.0	±0.8
99.0	99.0	0.0	±0.8
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	53.9	-0.1	±0.8
49.0	48.9	-0.1	±0.8
44.0	43.9	-0.1	±0.8
39.0	38.9	-0.1	±0.8
34.0	33.9	-0.1	±0.8
30.0	29.9	-0.1	±0.8
29.0	28.9	-0.1	±0.8
28.0	27.9	-0.1	±0.8
27.0	26.8	-0.2	±0.8
26.0	25.8	-0.2	±0.8
25.0	24.8	-0.2	±0.8

8. Level linearity including the level range control

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

9. Tone burst response

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

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lcpeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	136.3	-0.1	±2.0

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

11. Overload indication

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

12. High level stability

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

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

End of Calibration Certificate

**ANALYTICAL BALANCE (DU)**

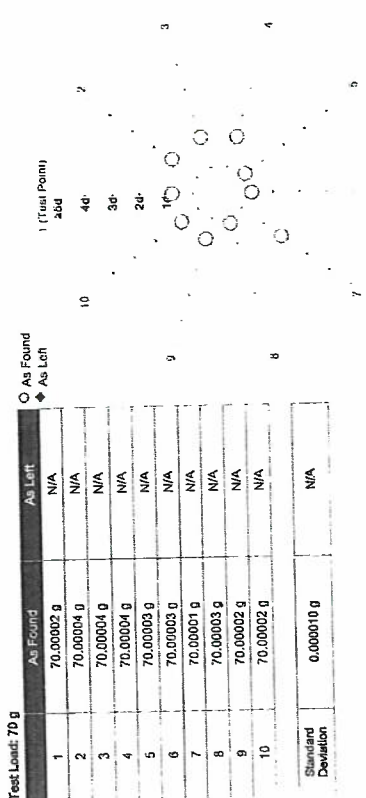
**Model : XS205 DU**

**Serial No. : 1126323724**

Calibration Certificate ID  
TH4004-018-020722-ACC-TH

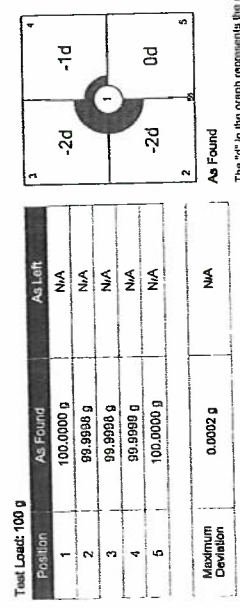
Measurement Results

Repeatability



The "g" 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 value of the difference from the mean value.

Eccentricity



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

Calibration Certificate ID  
TH4004-018-020722-ACC-TH

Mettler-Toledo (Thailand) Ltd.  
846/4 - 846/5 Lualaba Rd., Bangna Tai Sub-District  
Bangna District, Bangkok 10260  
+66 2723 0382  
MT-TH.ServiceSupport@mtl.com



Accuracy Calibration Certificate

Customer

Company: EASTERN THAI CONSULTING 1992 CO., LTD.  
Address: 683 Moo 11, Sukhaphiban 8 Rd., Nong Kluen  
City: Sriracha  
Zip / Postal: 20230  
State / Province: Chonburi  
Order Number: 4033333333333

Contact: Saiporn Nakin

Weighing Device

Manufacturer: Mettler Toledo  
Model: XS205DU  
Serial No.: 1128323724  
Building: Laboratory  
Floor: 1  
Room: Laboratory

Instrument Type: LABE 05/1  
Asset Number: SAT  
Terminal Model: 1128323724  
Terminal Serial No.: N/A  
Terminal Asset No.: N/A

Range	Max. Capacity	Readability (g)
1	81 g	0.00001 g
2	220 g	0.0001 g

Procedure

Calibration Guideline: EURAMET cp-18 v. 4.0 (11/2015)  
CPW003270

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.

This sensitivity/span of the weighing instrument was adjusted before calibration with a built-in weight.

In accordance with EURAMET cp-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: 24.9 °C	End: 25.7 °C	Start: 54.0 %

As Found Calibration Date: 07-Feb-2022  
As Left Calibration Date: N/A  
Issue Date: 08-Feb-2022

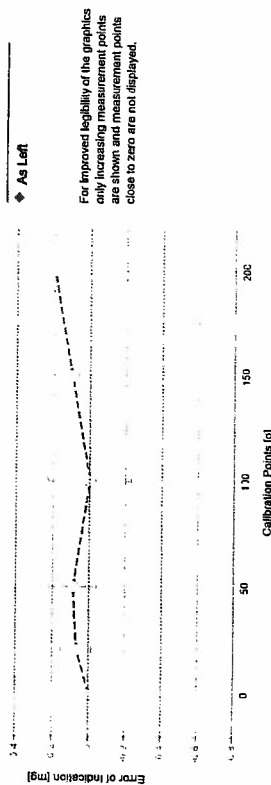
Calibrator: Approved Sign



Error of Indication

As Found	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.00000 g	0.00000 g	0.00000 g	0.021 mg	2
2	0.01000 g	0.01002 g	0.00002 g	0.023 mg	2
3	0.10000 g	0.10002 g	0.00002 g	0.026 mg	2
4	1.00000 g	1.00000 g	0.00000 g	0.035 mg	2
5	4.99999 g	4.99999 g	0.00000 g	0.050 mg	2
6	10.00002 g	10.00005 g	0.00003 g	0.063 mg	2
7	19.99994 g	20.00001 g	0.00007 g	0.085 mg	2
8	49.99987 g	50.00006 g	0.00009 g	0.13 mg	2
9	100.00000 g	100.00000 g	0.00000 g	0.23 mg	2
10	149.99998 g	150.00000 g	0.00001 g	0.35 mg	2
11	200.00000 g	200.00002 g	0.00002 g	0.42 mg	2

○ As Found  
◆ As Left



For improved legibility of the graphics only increasing measurement points are shown and measurement points close to zero are not displayed.

The uncertainty stated is the expanded uncertainty at calibration obtained by multiplying the standard combined uncertainty by the coverage factor  $k = 2$  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 F2			
Weight Set No.:	W632	Date of Issue:	15-Sep-2020
Certificate Number:	169521	Calibration Due Date:	13-Mar-2022
Thermo Baro Hygrometer			
Equipment No.:	INT4	Date of Issue:	09-Jul-2021
Certificate Number:	2111470	Calibration Due Date:	26-Jun-2022

Remarks

FACT adjustment functionality activated  
Equipment condition: Good  
Next calibration according to customer's procedure

End of Accredited Section

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

# 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.

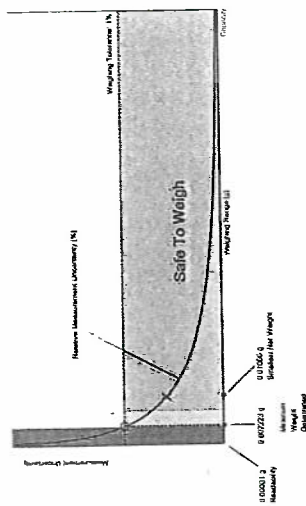
## Process Requirements

Weighing Tolerance: 1%

Smallest Net Weight: 0.01000 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. The graph reflects As Left loading, unless only As Found was performed.

## 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:  $1.5 \cdot 10^{-5} / K$   
Temperature range on site for the evaluation of the measurement uncertainty in use:  $5 K$

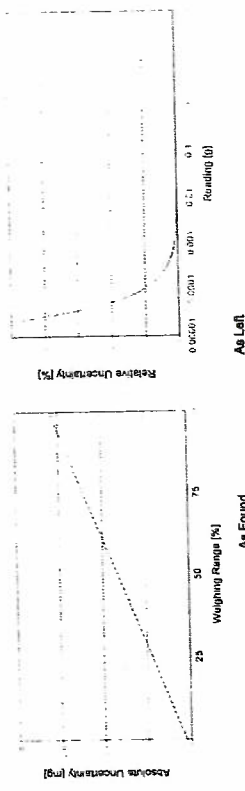
### Linearization of Uncertainty Equation

Range	g	Max	As Found	As Left
1	0.00001 g	81 g	$U_1 = 0.022 \text{ mg} + 0.00783 \text{ mg/g} \cdot R$	N/A
2	0.0001 g	220 g	$U_2 = 0.00 \text{ mg} + 0.00782 \text{ mg/g} \cdot R$	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 (Example)

Net Indication	As Found	As Left
0.00220 g	0.022 mg	1.0%
0.02200 g	0.22 mg	1.0%
0.22000 g	0.224 mg	0.011%
2.20000 g	0.038 mg	0.0018%
22.0000 g	1.7 mg	0.0075%



The weighing range shown in the absolute uncertainty graph refers to the first interval/range of the device.



## Minimum Weight As Found Minimum Weight Table

Range 1

Tolerance	Minimum weights for different weighing tolerances and safety factors				
	1	2	3	5	10
0.1%	0.022382 g	0.045110 g	0.068193 g	0.115457 g	0.240445 g
0.2%	0.011148 g	0.022382 g	0.033702 g	0.056607 g	0.115457 g
0.5%	0.004449 g	0.008912 g	0.013388 g	0.022382 g	0.045110 g
1%	0.002223 g	0.004449 g	0.006679 g	0.011148 g	0.022382 g
2%	0.001111 g	0.002223 g	0.003335 g	0.005563 g	0.011148 g
5%	0.000444 g	0.000889 g	0.001333 g	0.002223 g	0.004449 g

The minimum weight table applies to the fine range of the weighing device.

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

## As Left Minimum Weight Table

Range 1

Tolerance	Minimum weights for different weighing tolerances and safety factors				
	1	2	3	5	10
0.1%	0.022382 g	0.045110 g	0.068193 g	0.115457 g	0.240445 g
0.2%	0.011148 g	0.022382 g	0.033702 g	0.056607 g	0.115457 g
0.5%	0.004449 g	0.008912 g	0.013388 g	0.022382 g	0.045110 g
1%	0.002223 g	0.004449 g	0.006679 g	0.011148 g	0.022382 g
2%	0.001111 g	0.002223 g	0.003335 g	0.005563 g	0.011148 g
5%	0.000444 g	0.000889 g	0.001333 g	0.002223 g	0.004449 g

The minimum weight table applies to the fine range of the weighing device.

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

### Repeatability

Test Load: 70 g

Tolerance	Control Limit	As Found		As Left		Result
		Std. Deviation	Result	Std. Deviation	Result	
0.1%	0.00005 g		✗			✗
0.2%	0.00010 g		Δ			Δ
0.5%	0.00025 g		✓			✓
1%	0.00050 g	0.000010 g	✓	0.000010 g		✓
2%	0.00100 g		✓			✓
5%	0.00250 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

Tolerance	Control Limit	As Found		As Left		Result
		Deviation	Result	Deviation	Result	
0.1%	0.0500 g		✓			✓
0.2%	0.1000 g		✓			✓
0.5%	0.2500 g	0.0002 g	✓	0.0002 g		✓
1%	0.5000 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.

## METTLER TOLEDO Service

As Found

Reference Value	Error	Control limits for various weighing tolerances				
		0.1%	0.2%	0.5%	1%	5%
0.00000 g	0.00000 g	N/A	N/A	N/A	N/A	N/A
10.00004 g	0.00007 g	0.01000 g	0.02000 g	0.05000 g	0.10000 g	0.50000 g
49.99997 g	0.00009 g	0.02500 g	0.05000 g	0.12500 g	0.25000 g	1.25000 g
100.00000 g	0.00000 g	0.05000 g	0.10000 g	0.25000 g	0.50000 g	2.50000 g
149.99999 g	0.00001 g	0.07500 g	0.15000 g	0.37500 g	0.75000 g	3.75000 g
200.00000 g	0.00002 g	0.10000 g	0.20000 g	0.50000 g	1.00000 g	5.00000 g
Result		✓	✓	✓	✓	✓

As Left

Reference Value	Error	Control limits for various weighing tolerances				
		0.1%	0.2%	0.5%	1%	5%
0.00000 g	0.00000 g	N/A	N/A	N/A	N/A	N/A
10.00004 g	0.00007 g	0.01000 g	0.02000 g	0.05000 g	0.10000 g	0.50000 g
49.99997 g	0.00009 g	0.02500 g	0.05000 g	0.12500 g	0.25000 g	1.25000 g
100.00000 g	0.00000 g	0.05000 g	0.10000 g	0.25000 g	0.50000 g	2.50000 g
140.00000 g	0.00001 g	0.07500 g	0.15000 g	0.37500 g	0.75000 g	3.75000 g
200.00000 g	0.00002 g	0.10000 g	0.20000 g	0.50000 g	1.00000 g	5.00000 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.

Service Date: 2022-02-07  
Document Number: TH4004-020-020722-LAB/Manual/HR  
EASTERN THAI CONSULTING 1992 CO., LTD.  
893 Moo 11, Suthephibha 9 Rd., Nong Kham, Sriracha, Chonburi 20230  
Khun Sasiporn Nakhin

METTLER TOLEDO

## Balance Health Report

Device Details		System Details	
Manufacturer:	Mettler Toledo	Accessory 1:	Other
Model:	XS205DU	Accessory 2:	
Serial number:	1128323724	Weight set for routine testing:	No
Firmware:	4.0		
History		Service History	
Instrument in use:	Yes	Last preventive maintenance:	< 1 year
Instrument age:	3.10 years	Last instrument calibration:	< 1 year
Spare parts available:	Yes	Last minimum weight determination:	Never
Regulations:	ISO	Routine testing performed:	Don't know
Process tolerance in %:	1 %		
Smallest sample net weight:	0.0100 g		
Check List			
Environmental Conditions		General & Functional Checks	
Room temperature fluctuation	✓	Leveling	✓
Exposure to direct sun	✓	Checklist	✓
Vibrations	✓	Completeness - missing parts and additional remarks	✓
Drift	✓	Settings optimized for operating environment	✓
Drift or bias	✓	Other - objections noted as additional remarks	—
Static	✓	Electrical Component Checks	
Mechanical Component Checks		Power supply	✓
Drift shield	✓	Sliding door drive	—
Weighting pan position	✓	Internal weight drive	✓
Housing	✓	Display	✓
Other - objections noted as additional remarks	—	Other - objections noted as additional remarks	—
Recommendations			
Maintenance / Field Quality		Problem / Priority	
Instrument calibration	Update instrument		
Identify safe weighing range	Replace instrument		
GWP verification / risk assessment	Yes	Replace / add parts (see additional remarks)	
Preventive maintenance		On-site repair	
Perform routine testing with test weights		Depot repair	
User training		Use of accessories (see additional remarks)	
Contact	Name: Khun Sasiporn Nakhin	Position: Document Control	Phone: 066-061-3303
		Email: ss.jub@wct192.com	
Additional Remarks & Recommendations			
Engineer Details			Date: 07-Feb-2022
			Name: Sasiporn Taksan
			Signature:

This is not a certificate.

It should not be used to interpret final results for the testing of these devices.

Legend: ✓ Good/Pass

⚠ Needs Attention

✗ Bad/Fail

— Not Applicable

Bdpr - 0465 Leale Rd, Udon Thani Sub-District, Udon Thani District, Bangkok 10260, +66 2725 0392

METTLER TOLEDO SERVICE

www.mt.com

METTLER TOLEDO Service

Certificate No. : 23-006683

Sample Code : 23-02820-006

## CERTIFICATE OF CALIBRATION

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

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

Equipment : ELECTRONIC BALANCE

Manufacturer : METTLER TOLEDO

Model : XS205DU

Serial No. : 1126323724

ID No. : LABE 05/1

Date of Receipt : 20 January 2023

Date of Calibration : 20 January 2023

Calibrated by Mr. Thanadol Pholthep  
Scientist

Approved by

Issue date 25 January 2023

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

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

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC)

Certificate No. : 23-006683

Sample Code : 23-02820-006

## REPORT OF CALIBRATION

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

## Result of Calibration

## 1. Test weight and repeatability of reading

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

Unit : g	Range : 80	<input type="checkbox"/> Before adjustment	<input type="checkbox"/> After adjustment
<input checked="" type="checkbox"/> No adjustment	Nominal value	40	90
<input type="checkbox"/> Adjustment	Standard weight	40.000042	60.000045
	Average reading of indicator	40.000015	90.000019
	Standard deviation	0.000004	0.000007
Unit : g	Range : 200	<input type="checkbox"/> Before adjustment	<input type="checkbox"/> After adjustment
<input checked="" type="checkbox"/> No adjustment	Nominal value	100	200
<input type="checkbox"/> Adjustment	Standard weight	100.000022	200.000199
	Average reading of indicator	100.00001	200.0004
	Standard deviation	0.000004	0.000007

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

## REPORT OF CALIBRATION

## Result of Calibration

## 2. Sensitivity or value of a scale division

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

Unit : g

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

## 3. Departure of indication from nominal value, Linearity

Unit : g

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

The result expanded uncertainty of measurement  $U$  is stated as the standard uncertainty distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty is stated as  $U/k$ .  
UKAS M3003.Certificate No. : 23-006683  
Sample Code : 23-02820-006

## REPORT OF CALIBRATION

## Result of Calibration :

## 4. Eccentric or off-centre loading

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

Weighing pan ☐ Circle ☐ Triangular ☒ Rectangular  
Test weight : 50 and 100  
Unit : g

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

## Condition of Calibration

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

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

3. Condition of Calibration item: Normal

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

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

5. Reference standard instrument :

Instrument

1) STANDARD WEIGHT 1 mg to 1 kg

Class

E2

Certificate No.

Due Date

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

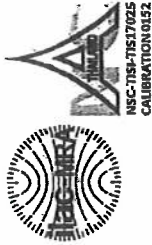
End of Report -

**ANALYTICAL BALANCE**

**Model : SECURA224-1S**

**Serial No. : 0036707137**





Certificate No. : 22-011768  
Sample Code : 22-04498-005

Page 2 of 4

## 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	<input checked="" type="checkbox"/> Before adjustment	<input checked="" type="checkbox"/> After adjustment
<input type="checkbox"/> No adjustment	Nominal value	100	200
<input checked="" type="checkbox"/> Adjustment	Standard weight	100.000022	200.000141
	Average reading of indicator	99.9998	199.9998
	Standard deviation	0.00009	0.00005
Unit : -	Range : -	<input type="checkbox"/> Before adjustment	<input type="checkbox"/> After adjustment
<input type="checkbox"/> No adjustment	Nominal value	-	-
<input checked="" type="checkbox"/> Adjustment	Standard weight	-	-
	Average reading of indicator	-	-
	Standard deviation	-	-

361 Soi Ladprao 122, Ladprao Road,  
Phialapha, Wang Thonglang, Bangkok 10310  
Rev.03

TEL 02-516-2422  
FAX 02-516-6848

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



Certificate No. : 22-011768  
Sample Code : 22-04498-005

Page 1 of 4

## 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.  
(Analytical Balance Room)

Equipment : ELECTRONIC BALANCE

Manufacturer : SARTORIUS

Model : SECURA224-1S

Serial No. : 0036707137

ID No. : LABE 05/2

Date of Receipt : 03 February 2022

Date of Calibration : 03 February 2022

Calibrated by : Mr. Thanadol Pholthep  
Scientist

Issue date : 07 February 2022

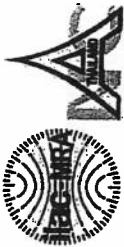
The uncertainties are for a confidence probability of approximately 95%.

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

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,  
Phialapha, Wang Thonglang, Bangkok 10310  
Rev.05

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



Certificate No. : 22-011768

Sample Code : 22-04498-005

## REPORT OF CALIBRATION

## Result of Calibration

## 2. Sensitivity or value of a scale division

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

Unit : g

Range : 220		Range :	
Test Point	Sensitivity, S	Test Point	Sensitivity, S
0	0.7981		
100	0.9876		
200	0.9876		

## 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	0.000084	2.01
0.01	0.0100045	0.0100	0.0000	0.000084	2.01
0.1	0.1000102	0.1000	0.0000	0.000084	2.01
1	1.0000055	1.0000	0.0000	0.000085	2.01
2	2.0000144	1.9999	0.0001	0.000085	2.01
5	5.0000060	5.0000	0.0000	0.000086	2.01
10	10.000017	9.9999	0.0001	0.000097	2.01
20	20.000022	20.0000	0.0000	0.00010	2.01
50	50.000038	50.0000	0.0000	0.00012	2.01
100	100.000022	99.9999	0.0001	0.00016	2.00
200	200.000141	200.0000	0.0001	0.00027	2.00

The result expanded uncertainty is stated as the standard uncertainty of measurement multiplied by a coverage factor of approximately 95%. The standard uncertainty of measurement is stated in accordance with UKAS

The result expanded uncertainty is stated as the standard uncertainty of measurement multiplied by a coverage factor of approximately 95%. The standard uncertainty of measurement is stated in accordance with UKAS



Certificate No. : 22-011768

Sample Code : 22-04498-005

## REPORT OF CALIBRATION

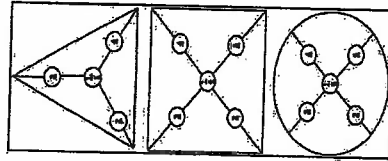
## Result of Calibration

## 4. Eccentric or off-centre loading

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

Weighing pan		Test weight : 100	
		Unit : g	
		Range 220	
Position	Reading of Indicator	Reading of Indicator	
1	99.9999		
2	100.0000		
3	99.9999		
4	99.9997		
5	100.0000		
6	99.9999		
Maximum difference		0.0002	

☒ Circle  
☐ Triangular  
☐ Rectangular



## 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: 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).
- Reference standard Instrument :

Instrument

1) STANDARD WEIGHT 1 mg to 1 kg

Class

E2

ID.No.

LB-WE-57

- End of Report -

TEL 02-516-2422  
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Rev.03

FM-CL-064

361 Soi Ladprao 122, Lk  
Phlabphla, Wang Thong

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Effective Date: 15/10/21

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

## REPORT OF CALIBRATION

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

### Result of Calibration

#### 1. Test weight and repeatability of reading

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

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

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

## CERTIFICATE OF CALIBRATION

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

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

Equipment : ELECTRONIC BALANCE

Manufacturer : SARTORIUS

Model : SECURA224-IS

Serial No. : 0036707137

ID No. : LABE 05/2

Date of Receipt : 20 January 2023

Date of Calibration : 20 January 2023

Calibrated by : [REDACTED] Approved by

Issue date

The uncertainties are for a confidence level of 95%  
The calibration result is applied to the balance as shown on date and time of calibration

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).



Certificate No. : 23-006682

Sample Code : 23-02820-005

Page 3 of 4

## REPORT OF CALIBRATION

## Result of Calibration

## 2. Sensitivity or value of a scale division

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

Unit : g

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

## 3. Departure of indication from nominal value, Linearity

Unit : g

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

The result expanded uncertainty of measurement  $U$  is stated as the standard uncertainty of distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty is determined by the method of least squares.

Certificate No. : 23-006682

Sample Code : 23-02820-005

## REPORT OF CALIBRATION

## Result of Calibration :

## 4. Eccentric or off-centre loading

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

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

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

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

3. Condition of Calibration item: Normal

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

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

5. Reference standard instrument :

Instrument

Class

ID No.

1) STANDARD WEIGHT 1 mg to 1 kg

E2

LB-WE-57

Ambient conditions	Min	Max
Temperature (°C)	21.2	22.5
Relative Humidity (%Rh)	37.1	44.3
Air pressure (hPa)	1072.1	1013.0

Certificate No.

Due Date

- End of Report -

## **BAROMETER**

**Equipment : Analog Barometer**

**ID No. / Tag No. : BM001/41**



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



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## CALIBRATION CERTIFICATE

Certificate No. : AD2205-163-0001  
Date Issued : 20-May-22

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

Equipment : Analog Barometer

Manufacturer : Berigo  
Model : -  
Serial No. : -  
ID No./Tag No. : BM001/41  
Date Received : 12-May-22  
Date Calibrated : 20-May-22

Calibrated by : Mr. Saruth Srichutikul

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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Certificate No : AD2205-163-0001

Environment : Ambient Temperature :  $(25 \pm 2)^{\circ}\text{C}$

Relative Humidity :  $(50 \pm 15)\%\text{RH}$

STD Reading hPa	UUC Reading (hPa) Before Adjusted	UUC Reading (hPa) After Adjusted	UUC Error hPa	Uncertainty $\pm$ hPa
990.00	990.0	-	0.00	0.59
1000.00	1000.0	-	0.00	0.59
1010.00	1010.0	-	0.00	0.59
1020.00	1020.0	-	0.00	0.59
1030.00	1030.0	-	0.00	0.59

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

Description of UUC :

Range : 955 - 1075 hPa Absolute  
Calibration Range : 990 - 1030 hPa Absolute  
Scale Interval : 1 hPa

Resolution

0.5 hPa Absolute

Condition As-Received : Used Item

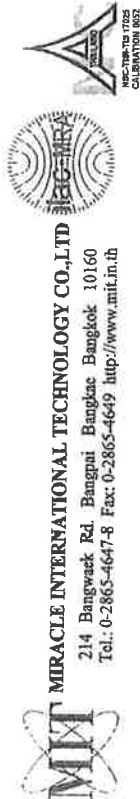
The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

iRPC Certificate No. CL1-P210086 for Reference Pressure Monitor Serial No. 1598, Due 08-Nov-22

End of Certificate



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



## CALIBRATION CERTIFICATE

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

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

**Equipment** : Analog Barometer

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

**Calibration Method or Calibration Procedure Used**

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

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

### Result of Calibration

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

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

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 :

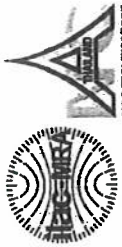
The International System of Units (SI) through

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

End of Certificate

**BOD INCUBATOR**

**ID No. : LABE 19/1**



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		
20	20.0	20.0	20.01	20.09	19.46	20.22	20.37	20.12	20.19	20.28	0.29	2.00

2. Characterization results

Calibration point (°C)	Stability ± (°C)	Uniformity (°C)	Overall variation (°C)
20	0.09	0.88	1.28

Notes

\* UUC\* = Unit Under Calibration



CERTIFICATE OF CALIBRATION

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

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

(Laboratory)

Equipment : Temperature controlled enclosures (Incubator)  
Manufacturer : N/A  
Model : E811.0306  
Serial No. : N/A  
ID No. : LABE 19/1  
Date of Receipt : 03 February 2022  
Date of Calibration : 03 February 2022

Condition of Calibration

- 1. Environment  
1.1 Ambient temperature : Maximum 30.5 °C ; Minimum 29.5 °C  
1.2 Relative humidity : Maximum 50.8 % ; Minimum 48.4 %  
1.3 Line voltage supplied : Maximum 224.3 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
Date Acquisition With Sensor (RTD-P1000)	LB-DA-11 (RTD-138 to RTD-146)	21-036792	18 May 2022

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. Pettrakorn Penklong

Scientist

Approved by

Issue date : 11 February 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.  
This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Board (TLAB).  
The laboratory and its traceability to recognized national standards and to the unit of measurement realized at the calibration are not reproduced other than in full except with the prior written approval of the Asia Medical and Agricultural Laboratory.



NIST-TS-17517025  
CALIBRATION 0152

Page 3 of 3

## REPORT OF CALIBRATION

Certificate No. : 22-011764

Sample Code : 22-04498-001

### 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 :  
 $W = 70 \text{ cm}$ ;  $D = 60 \text{ cm}$ ;  $H = 124 \text{ cm}$
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.

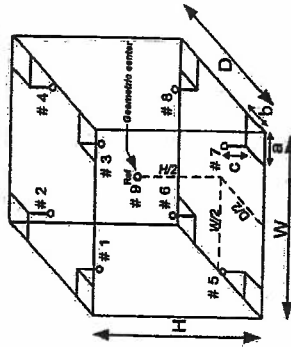


Figure: Example of sensor  
Installation Positions

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.

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

- End of Report -

**BOD INCUBATOR**

**ID No. : LABE 19/2**



## 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		
20	20.0	20.0	19.81	19.35	19.81	19.37	20.15	20.34	20.14	20.45	19.61	2.00

#### 2. Characterization results

Calibration point (°C)	Stability ± (°C)	Uniformity (°C)	Overall variation (°C)
20		0.94	1.22

#### Notes

- UUC\* = Unit Under Cal

## CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.

683 Moo 11, Sukhapiban 8 Rd., Nongkham,

Sriacha, Chonburi 20230

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

(Laboratory)

Equipment : Temperature controlled enclosures (incubator)

Manufacturer : N/A Model : N/A

Serial No. : S540040277 ID No. : LABE 19/2

Date of Receipt : 24 January 2022 Date of Calibration : 24 January 2022

#### Condition of Calibration

- Environment
  - 1.1 Ambient temperature : Maximum 30.4 °C ; Minimum 30.0 °C
  - 1.2 Relative humidity : Maximum 51.2 % ; Minimum 46.2 %
  - 1.3 Line voltage supplied : Maximum 225.3 VAC ; Minimum 224.1 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
Date acquisition with sensor (RTD-P100)	LB-DA-12 (RTD-158 to RTD-166)	21-038920	10 May 2022

#### 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

Approved by

#### Issue date

The uncertainties are for a confidence interval of 95%.  
This calibration result is applied on the laboratory and its traceability is not 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

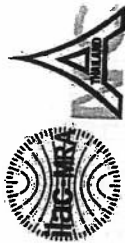
Effective Date: 15/7/21

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Phisapha, Wang Thonglang, Bangkok 10310

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FAX 02-516-8949

Rev.06

Effective Date: 15/7/21



NSC-TS-7517025  
CALIBRATION0152

Page 3 of 3

## REPORT OF CALIBRATION

Certificate No. : 22-007487

Sample Code : 22-02978-006

### Result 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 at the geometric center of the chamber.
2. Interior dimensions approx of chamber :  
W = 60 cm; D = 70 cm; H = 124 cm
3. Air valve or fresh air level : Off
4. Fan level : Open
5. The quoted uncertainty includes "Stability of chamber and loading effect in chamber at 20% of uniformity".
6. Uniformity - the maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time.
7. Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.
8. Overall variation - the difference of the maximum and the minimum measured temperatures throughout observation time.
9. UUC\* reading - the average reading of indicating device that forms the integral part of the enclosure.
10. Calibration results without adjustment.

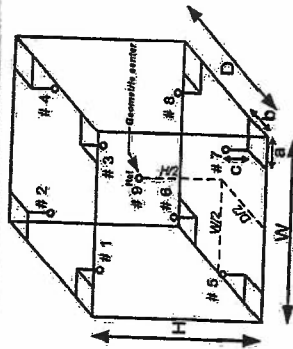


Figure: Example of sensor  
Installation Positions

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

- End of Report -

NSC-TS17025  
CALIBRATION 0352

Page 1 of 3

Certificate No. : 22-136844

Sample Code : 22-51164-006

## CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.

683 Moo 11, Sukhepiban 8 Rd., Nongkham,

Sirachra, Chonburi 20230

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

(Laboratory)

Equipment : Temperature controlled enclosures (Incubator)

Manufacturer : N/A Model : N/A

Serial No. : S540040277 ID No. : LABE 19/2

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

## Condition of Calibration

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

## 2. Calibration method

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

## 3. Reference standard instrument

Instrument	ID No.	Certificate No.	Due Date
Data Acquisition With Sensor (RTD-PT100)	LB-DA-T1	RTD-148 to RTD-155, RTD-227	22-040308
			24 April 2023

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

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

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

## 6. Condition of calibration item : Normal

Calibrated by

Issue date

The uncertainties are for a confidence probability of 95%. The calibration result is applied only to the item calibrated.

The Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which is a part of the international system of unit (SI Unit). The calibration is traceable to the international system of unit (SI Unit) and its traceability is recognized by the national standards laboratory. This certificate may not be reproduced or used for any other purpose without 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 15/10/21

Approved by

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FM-CL

## REPORT OF CALIBRATION

Certificate No. : 22-136844

Sample Code : 22-5T164-006

### Results of Calibration

#### Notes

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

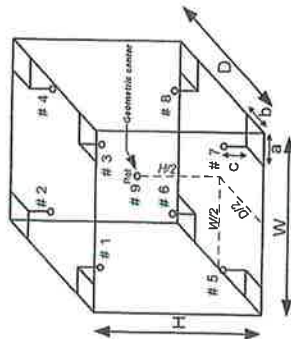


Figure: Example of sensor  
Installation Positions

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 ISO

- End of Report -

**BOD INCUBATOR**

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



ASIA MEDICAL AND  
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## REPORT OF CALIBRATION

Certificate No. : 22-053227  
Sample Code : 22-19571-002  
Page 2 of 3

Results of Calibration  
Resolution : 0.1 °C

### 1. Reporting of Temperature

Calibration point (°C)	UUC* setting (°C) reading (°C)	Measured temperature at each positions (°C)								Uncertainty ± (°C)	Coverage factor k
		# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8		
20	20.6	20.09	19.99	20.00	20.03	19.95	19.98	20.00	19.81	19.90	2.00

### 2. Characterization results

Calibration point (°C)	Stability ± (°C)	Uniformity (°C)	Overall variation (°C)
20	0.17	0.32	0.57

#### Notes

UUC\* = Unit Under Calibration



ASIA MEDICAL AND  
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AND RESEARCH CENTER

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## CERTIFICATE OF CALIBRATION

Certificate No. : 22-053227  
Sample Code : 22-19571-002  
Page 1 of 3

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.  
683 Moo 11, Sukhapiban 8 Rd., Nongkhham,  
Sriacha, 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 : 23 May 2022  
Date of Calibration : 23 May 2022

#### Condition of Calibration

1. Environment	1.1 Ambient temperature	± Maximum 34.6 °C	± Minimum 34.0 °C
	1.2 Relative humidity	± Maximum 50.7 %	± Minimum 43.1 %
	1.3 Line voltage supplied	± Maximum 225.9 VAC	± Minimum 220.4 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-10 (RTD-257 to RTD-265)	21-056687	05 July 2022

### 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

Approved by

Issue date

The uncertainties are for a confidence probability of 95% as shown on date and place of calibration only.  
The calibration result is applied only 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. : 22-053227  
Sample Code : 22-19571-002

### 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 : (Working space)  
W = 65 cm ; D = 55 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.

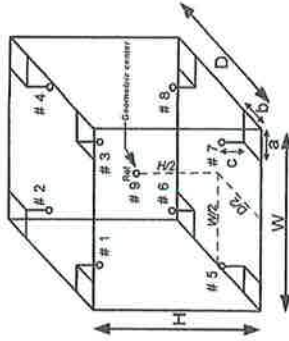


Figure: Example of sensor installation Positions

The result expanded uncertainty of measurement  $U$  is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k$  to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with the Guide to the Expression of Uncertainty in Measurement (GUM) and the distribution corresponds to the normal distribution.

- End of Report -



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

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

Approved by

Issue date

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

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme (TLAS-G-20) and its traceability to recognized national standards and to the unit of measurement realized at the corresponding laboratory and its traceability to recognized international standards and to the unit of measurement realized at the corresponding laboratory.

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Effective Date: 15/11/21

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## REPORT OF CALIBRATION

Page 3 of 3

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.

The result expanded uncertainty of measurement  $U$  is stated as the standard uncertainty of measurement multiplied by the coverage factor to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS

in corresponds

- End of Report -

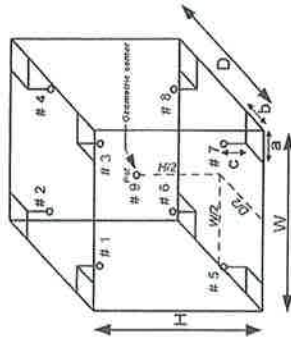


Figure:-Example of sensor  
Installation Positions

## **CONDUCTIVITY METER**

**Type : SevenCompact<sup>TM</sup> Conductivity meter S230**

**Serial No. : B744909989**

Certificate Number CCP-1419-22

Certificate Number CCP-1419-22

Calibration Certificate  
SevenCompact™ Conductivity meter S230


Certification Tools

Certified Conductivity  
Resistors

Manufacturer: METTLER TOLEDO / ME-S1  
Control No: IN88  
Due date: May 25, 2023

Serial number: S105  
Certificate number: 90317

Customer

Company EASTERN THAI CONSULTING 1992 CO., LTD.  
Address 883 Moo 11, Sukhaphiban 8 Rd., Nong Kham  
Sriacha  
Chonburi 20230  
Customer ID number 301008441  
Customer representative Sarporn Nakhin  
Assignment ID 

Instrument

Type SevenCompact™ S230 Instrument Serial Number 0744009009  
Internal identification LABE 132 Firmware version 2.01.03

Technical specifications

Measuring Range 0.001 µS/cm ... 1000 mS/cm  
Resolution Auto range  
Limit of Error 0.5%

Temperature range MTC -30.0 ... 130.0 °C  
Temperature range ATC -5.0 ... 130.0 °C  
Resolution 0.1 °C  
Limit of Error ± 0.1 °C

Procedure Statement

METTLER TOLEDO Certification SOP (Doc. No. 30027577) will be used as referring documentation to adjust and certify the instrument indicated in the "Type" and "Serial number" section. The measurement results of this certification were obtained at ambient conditions.

Certificate Number CCP-1419-22

## Certification Measurements

Designation	Certified value	Measured value	Max. Tolerance	Passed / Failed
Conductivity Sensor Input (Resistance)				
10 Ω	10.00896 Ω	10.01 Ω	0.5 %	Passed
150 Ω	149.9864 Ω	150.0 Ω	0.5 %	Passed
1.5 kΩ	1.499579 kΩ	1.500 kΩ	0.5 %	Passed
15 kΩ	14.99595 kΩ	14.99 kΩ	0.5 %	Passed
150 kΩ	149.9609 kΩ	149.9 kΩ	0.5 %	Passed
1 MΩ	0.999575 MΩ	0.999 MΩ	0.5 %	Passed

Designation	Nominal value	Measured value	Max. Tolerance	Passed / Failed
Conductivity Sensor Input (Temperature)				
NTC 30 kΩ, 0 °C	0.0 °C	0.1 °C	0.1 °C	Passed
NTC 30 kΩ, 25 °C	25.0 °C	25.0 °C	0.1 °C	Passed
NTC 30 kΩ, 50 °C	50.0 °C	50.0 °C	0.1 °C	Passed
NTC 30 kΩ, 75 °C	75.0 °C	75.1 °C	0.1 °C	Passed
NTC 30 kΩ, 100 °C	100.0 °C	100.1 °C	0.1 °C	Passed

## Summary of Certification

## Certification of Instrument

The instrument referred to in this certificate has fulfilled the criteria of the certification. This is indicated by the notation Passed in the column above.

Remarks

Certification of the instrument was performed by

Name Pilapat Sweatpanuwat Function Service Engineer  
Place Laboratory room

Calibration Date: February 7, 2022 Signature ELECTRONIC SIGNATURE

Mettler-Toledo (Thailand) Limited

METTLER TOLEDO

## Performance Test

Control No. CCE-1419-22/1

Company:

EASTERN THAI CONSULTING 1992 CO., LTD.

Address:

893 Moo 11, Sukhaphiban 8 Rd., Nong Kham

Sriracha

Chonburi 20230

Assignment ID 032202848

## Conductivity Electrode

Type:

Inlab 731-ISM

S/N:

5819430128

## Certified standards used

Standard 1: Type: Conductivity Buffer Manufacturer: METTLER TOLEDO Exp. date: Jan-23  
Nominal value: ( 25.00 °C): 1413 µS/cm Lot No. 1G009A

Standard 2: Type: Conductivity Buffer Manufacturer: METTLER TOLEDO Exp. date: Jan-23  
Nominal value: ( 25.00 °C): 12.88 mS/cm Lot No. 1G004I

Test equipment:

Type: Conductivity Meter Manufacturer: METTLER TOLEDO Cal date: 07-Feb-22  
S/N: B822801194 No. of certificate: CCP-1419-22 Model: S230

## Cell Constant

Nominal	Old (cm <sup>-1</sup> )	New (cm <sup>-1</sup> )
1413 µS/cm	0.577987	0.548374

Measurements (Reference Temperature: 25 °C and Temperature correction is 2.00 % / °C)

Before adjustment				After adjustment			
Buffer Values		Measured		Buffer Values		Measured	
1410	1410	26.0	1471	1410	26.1	1415	5
µS/cm	°C			µS/cm	°C		
12.88	12.88	25.9	13.51	12.88	24.4	12.58	-0.33
mS/cm	°C			mS/cm	°C		

Remarks: The difference result of calibrated electrode should be within +/- 2.5%

Place:

Laboratory room

Calibration Date: February 7, 2022

Service Specialist:

Pilapat Sweatpanuwat

Signature:

Electronic Signature

Certificate Number CCP-2407-23

Certificate Number CCP-2407-23

Calibration Certificate  
SevenCompact™ Conductivity Meter S230

Certification Tools

Customer

Company EASTERN THAI CONSULTING 1992 CO., LTD.  
Address 683 Moo 11, Sukhaphiban 8 Rd., Nong Kham, Sriracha  
Chonburi 20230  
Customer ID number 301608441  
Customer representative Sasiporn Nakin

Certified conductivity  
resistors

Manufacturer METTLER TOLEDO  
Type 51302861

Serial number S260  
Certificate number 62619  
Date of certification February 15, 2022

Instrument

Type SevenCompact™ S230  
Instrument serial number B744909889  
Internal identification LABE 132  
Firmware version 2.01.03

Certified temperature  
resistors

Manufacturer METTLER-TOLEDO  
Type 51302410

Serial number A275  
Certificate number 62591  
Date of certification February 14, 2022

Technical Specifications

Measuring range 0.001 µS/cm ... 1000 mS/cm  
Resolution Auto range  
Limit of error ±0.5%  
Temperature range MTC -30.0 ... 130.0 °C  
Temperature range ATC -5.0 ... 130.0 °C  
Resolution 0.1 °C  
Limit of error ±0.1 °C

Designation	Nominal value	Certified value
NTC 30 kΩ, 0 °C	94.980 kΩ	95.049 kΩ
NTC 30 kΩ, 25 °C	30.000 kΩ	29.994 kΩ
NTC 30 kΩ, 50 °C	10.969 kΩ	10.965 kΩ
NTC 30 kΩ, 75 °C	4.528 kΩ	4.529 kΩ
NTC 30 kΩ, 100 °C	2.070 kΩ	2.070 kΩ

Designation	Nominal value	Certified value
Conductivity 10 Ω	10.000 Ω	10.013 Ω
Conductivity 150 Ω	150.00 Ω	150.05 Ω
Conductivity 1.5 kΩ	1.5000 kΩ	1.5000 kΩ
Conductivity 15 kΩ	15.000 kΩ	15.001 kΩ
Conductivity 150 kΩ	150.00 kΩ	149.92 kΩ
Conductivity 1 MΩ	1.0000 MΩ	1.0004 MΩ

Procedure Statement

METTLER TOLEDO Certification SOP (Doc. No. 30027577) is used as referring documentation to adjust and certify the instrument indicated in the "Type" and "Serial number" section. The measurement results of this certification were obtained at ambient conditions.

Certificate Number CCP-2407-23

Certification Measurements

Designation	Certified value	Measured value	Max. tolerance	Passed / Failed
Conductivity sensor input (resistance)				
10 Ω	10.013 Ω	10.010 Ω	0.5 %	Passed
150 Ω	150.050 Ω	150.100 Ω	0.5 %	Passed
1.5 kΩ	1.500 kΩ	1500.00 Ω	0.5 %	Passed
15 kΩ	15.001 kΩ	15000 Ω	0.5 %	Passed
150 kΩ	149.920 kΩ	149900 Ω	0.5 %	Passed
1 MΩ	1.000 MΩ	1000000 Ω	0.5 %	Passed

Designation	Nominal value	Measured value	Max. tolerance	Passed / Failed
Conductivity sensor input (temperature)				
NTC 30 kΩ, 0 °C	0.0 °C	0.0 °C	0.1 °C	Passed
NTC 30 kΩ, 25 °C	25.0 °C	25.0 °C	0.1 °C	Passed
NTC 30 kΩ, 50 °C	50.0 °C	50.0 °C	0.1 °C	Passed
NTC 30 kΩ, 75 °C	75.0 °C	75.0 °C	0.1 °C	Passed
NTC 30 kΩ, 100 °C	100.0 °C	100.0 °C	0.1 °C	Passed

Resistor designation	Certified value	Measured value	Max. tolerance	Passed / Failed
Verification according to USP <645> cell constant = 0.100 /cm				
1 MΩ	0.100 μS/cm	0.100 μS/cm	0.1 μS/cm	Passed
150 kΩ	0.667 μS/cm	0.667 μS/cm	0.1 μS/cm	Passed
15 kΩ	6.666 μS/cm	6.667 μS/cm	0.1 μS/cm	Passed

Digital sensor input with conductivity sensor	The sensor was recognized correctly by the meter	Passed
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Summary of Certification

Certification of instrument

Passed

The instrument referred to in this certificate has fulfilled the criteria of the certification. This is indicated by the notation Passed above.

Remarks

Service Assignment ID : 0332630077

Certification of the instrument was performed by

Name	Thiraphong Salanoi	Function	Service Engineer
Company	Mettler-Toledo (Thailand) Ltd.		
Date	February 6, 2023	Signature	

Performance Test

Attachment to Certificate No. CCP-2407-23

Conductivity Sensor

Type:	InLab 731-ISM	S/N:	5821041078
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Certified standards used

Standard 1:	Type:	Cond. Standard	Manufacturer: METTLER TOLEDO	Exp. date: 18-Mar-23
		Nominal value: ( 25.00 °C):	1413 μS/cm	Lot No.: 1G077C

Standard 2:	Type:	Cond. Standard	Manufacturer: METTLER TOLEDO	Exp. date: 31-Mar-23
		Nominal value: ( 25.00 °C):	12.88 mS/cm	Lot No.: 1G090B

Cell Constant Adjustment

Nominal	Old (cm <sup>-1</sup> )	New (cm <sup>-1</sup> )
1413 μS/cm	0.504069	0.550105

Measurements

(Reference Temperature: 25 °C and Temperature correction is 2.00 % / °C)

Before adjustment			After adjustment		
Buffer Values	Measured	Difference	Buffer Values	Measured	Difference
1413 μS/cm	26.5 °C	1316	1413 μS/cm	27.5 °C	1405
		-97			-8
12.88 mS/cm	26.9 °C	12.14	12.88 mS/cm	27.4 °C	12.88
		-0.74			-0.20

Note: The difference result of calibrated electrode should be within +/- 2.5%

Remarks:

Place:

Laboratory Room

Performance Date:

February 6, 2023

Service Specialist:

Thiraphong Salanoi

Signature:

**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) 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>	# 10		
85	85.0	85.05	84.99	84.86	84.71	84.85	84.92	84.98	84.86	84.98	84.98	0.25	2.00

#### 2. Characterization results

Calibration point (°C)	Stability ± (°C)	Uniformity (°C)	Overall variation (°C)
85	0.08	0.35	0.54

#### Notes

- UUC\* = Unit Under Calibration

## CERTIFICATE OF CALIBRATION

**Customer** : EASTERN THAI CONSULTING 1992 CO., LTD.  
683 Moo 11, Sukhepiban 8 Rd., Nongkham,  
Sriracha, 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.** : 900882

**ID No.** : LABE 17/1

**Date of Receipt** : 11 March 2022

**Date of Calibration** : 11 March 2022

**Condition of Calibration**

1.1 Ambient temperature : Maximum 28.7 °C ; Minimum 27.4 °C

1.2 Relative humidity : Maximum 61.5 % ; Minimum 55.8 %

1.3 Line voltage supplied : Maximum 228.5 VAC ; Minimum 224.7 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-11 (RTD-138 to RTD-146)	21-035792	18 May 2022

#### 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

#### Approved by

#### Issue date

The uncertainties are for a confidence interval of 95%.

This calibration result is applied only to the above calibration item and is not to be used for any other purpose.

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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Phlabphla, Wang Thonglang, Bangkok 10310

TEL 02-516-2422  
FAX 02-516-6049  
Rev.01

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



NSC-TIS-17025  
CALIBRATION 0152

## REPORT OF CALIBRATION

Page 3 of 3

Certificate No. : 22-025399

Sample Code : 22-09604-002

### 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 = 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".

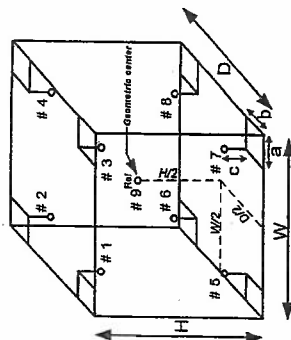


Figure. Example of sensor  
Installation Positions

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.

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

- End of Report -

## 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 Calib

## 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**

**Issue date** : 24 February 2023

**Approved by**

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 is a member of the International Laboratory Accreditation Cooperation (ILAC) and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory.

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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.

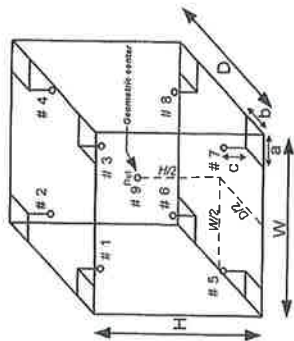


Figure: Example of sensor installation Positions

The result expanded uncertainty of measurement  $U$  is stated as the standard uncertainty of measurement multiplied by the coverage factor to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M



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- End of Report -

**INDUCTIBELY COUPLED PLASMA SPECTROMETER**

**Model : Prodigy 7**

**Serial No. : P70177**



บริษัท แอปพลิเคชัน ดีฟายน์ จำกัด  
Application Define Company Limited  
133/318 ถนนพหลโยธิน แขวงมีนบุรี เขตมีนบุรี กรุงเทพมหานคร 10510  
133/318 Haeulath Road, Minburi Sub-district Minburi District, Bangkok 10510  
Tel: (66)64456-5191 E-mail: support@apdefine.co.th Website: http://www.apdefine.co.th  
เลขประจำตัวนิติบุคคล 010556032491

## CERTIFICATE OF INSTRUMENT PERFORMANCE

### INSTRUMENT:

BRAND:

MODEL:

SERIAL NO.

CUSTOMER:

INDUCTIVELY COUPLED PLASMA SPECTROMETER

Teladyne Leeman Labs

Prodigy 7

P70177

บริษัท อีทีทีเอ็นไทย คอนสตรัคชั่น 1992 จำกัด

### CHECKING:

#### SPECTROMETER

Wavelength Accuracy check by use emission line of Hg Lamp

Mercury line 253.652 nm.

Plasma View (Dual View)

CMOS Detector check

Align View by Mn line 257.610 nm.

#### RF GENERATOR

Incident Power 1,200  $\pm$  10 Watt Reading = 1200 Watt

#### SAMPLE INTRODUCTION

Plasma Torch, Injector, Spray chamber, Nebulizer

Peristaltic pump & Tubing

#### EXHAUSTING & COOLING SYSTEM

Safety Interlock Switch (Door, Argon pressure, Water pressure)

Cooling System, water flowrate & low pressure switch

Flowrate of Air blower

#### COMPUTER & SOFTWARE

Plasma Ignition software & Analytical Software

#### ANALYTICAL TEST

Full Frame Capture & Echellogram check

Calibration Curve & QC Test

DATE:

### STATUS

OK

OK

OK

OK

OK

OK

OK

OK

OK

OK

OK

OK

OK

## PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท อีทีทีเอ็นไทย คอนสตรัคชั่น 1992 จำกัด

Date: Dec 12, 2022

Instrument: ICP-OES Model: Prodigy 7

S/N: P70177

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

<b>Gas system:</b> ตรวจสอบแรงดันแก๊สและแก๊สที่รั่วซึม Argon Pressure: 5-5 psi Leak inspected (✓) No leak Nitrogen Pressure: - psi Leak inspected (✓) No leak Oxygen Pressure: - psi Leak inspected (✓) No leak	
( ) Change camera purge gas Dehydrator (1 times /years) Next time replacement <u>check</u> เปลี่ยนตัวถักความชื้นที่ไดไฮเดรต ทุก 1 ปี	
<b>Water Chiller:</b> RF generator flow rate 4.44 LPM Temperature 24°C ตรวจอุณหภูมิ Leak inspected (✓) No leak ตรวจความทึบที่รั่วซึม	
<b>Water Chiller:</b> Camera (✓) check water level and refill ตรวจระดับน้ำและเติมน้ำ (✓) change water เปลี่ยนถ่ายน้ำ Temperature -31°C ตรวจอุณหภูมิ	
<b>Exhaust Hood</b> Flow rate 470 CFM (system request > 150)	



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**PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7**

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

**2. Computer & Software Check**

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

**PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7**

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

**3. Instrument Control**

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



PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

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

4. Cleaning & Replacement

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

5. Safety Interlock

Description	Status
(1) Door switch	OK
(2) RF Water Re-circulator	OK
(3) Camera Water Re-circulator	OK
(4) Camera purge gas	OK
(5) Argon pressure	OK
(6) Nitrogen pressure	OK

PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

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

6. Hardware Check with SALSA-EXE Diagnostics

Power Supply	Value	Status
-12 VDC (11 - 14.5 VDC)	-13.15%	OK
+12 VDC (11 - 14.5 VDC)	+12.01%	OK
+3.3VDC	3.26%	OK
+5.0 VDC	4.44%	OK
+13.5 VDC	13.46%	OK

Plasma Generator	Value	Status
ICP Current 0.500A = 1kW	0.544	OK
ICP Ref 5.0Vdc = 1kW	5.464	OK
ICP Current 0.00 Vdc = 0kW	0	OK
ICP Ref 0.00Vdc = 0kW	0	OK
RF Water (Hz) OFF	0	OK
RF Water (Hz) ON	2.3	OK
Air Knife Pres. (0.00V) OFF	0	OK
Air Knife Pres. (3.0 - 7.0 V) ON	4.054	OK
Neb 25 @ setting of 25 PSI	2.5	OK
Cool 18 @ setting of 18 LPM	1.4	OK
Aux 0.6 @ setting of 0.6 LPM	0.6	OK
Pump Current (0.000 A) OFF	0	OK
Pump Voltage (0.000 V) OFF	0	OK
Pump Current (0.8 to 4.0A) ON	1.04	OK
Pump Voltage (8 to 13 V) ON	12.52	OK



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

# PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGN7

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

## 7. Mn Check for performance Test

	Condition for performance Test	Condition Test	Status
Standard	1 ppm, 5 ppm, 10 ppm	10 ppm	ok
Power plasma	1.20 kw	1.2	ok
Plasma gas	16.0 LPM	16	ok
Auxiliary Gas	0.8 LPM	0.8	ok
Nebulizer	1.2 LPM	25 L/min	ok
Pump Speed	25 RPM	25	ok
Integration time	15 s Axial, 5 s Radial	10 s, 5 s	ok
Nebulizer Type	Seaspray, Conical, Meinhard	Seaspray	ok
Intensity first performance	1 ppm ≥ 4,000,000 5 ppm ≥ 15,000,000 10 ppm ≥ 50,000,000	~ 65,000,000	ok

Engineer Sign	12 Dec 2022
	
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**LIQUID IN GLASS THERMOMETER**

**Model : Total immersion**

**Serial No. : 43560**



## Calibration Certificate

**Certificate No.:** 2300368-001-01  
**Client name:** EASTERN THAI CONSULTING 1992 CO., LTD.  
**Address:** 6883 Moo 11, Sukhapibam 8 Rd.,  
 Nongkham, Sriracha, Chonburi 20230

Page 1 of 3

**Equipment:** Liquid-in-Glass Thermometer

**Manufacturer:** Precision

**Model / Type:** Total Immersion

**Serial No.:** 43560

**ID No.:** LABE 16/1

**Order No.:** 2300368

**Operation No.:** 2300368-001

**Date of Receipt:** 7 November 2022

**Date of Calibration:** 15 November 2022

**Calibrated by** Mr.Nuttapoi Niyomchat  
 Specialist

**Date of Issue:** 18 November 2022

The uncertainties are for a confidence probability of approval.  
 This Certificate is issued in accordance with the conditions of accreditation granted by the Thai  
 which has assessed the measurement capability of the laboratory and its traceability to recog  
 units of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced or  
 in full except with the prior written approval of the National Food Institute.

F-CS-009 Revision: 01 Date: 20-04-55



## Calibration Report

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

Page 2 of 3

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

### Condition of this results of Calibration:

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

Instrument	Model	Serial No.	Certificate No.	Due Date	Through
BLACK STACK THERMOMETER	1560/2560	A39258/A39719	PSL-T 0674/65	7-Jun-23	T1STR
Platinum Resistance Thermometer (PRT)	5615	808926			

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

- Low Temperature Bath (Deep Well Compact Bath), Model: 7381, S/N: B53A96.
- Low Temperature Bath (Deep Well Compact Bath), Model: 7341, S/N: AS4084.
- High Temperature Bath (Deep Well Compact Bath), Model: 6331, S/N: AS4087.

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

6. Condition of Calibrated Item : Good

7. Result of Calibration :

☒ Without adjustment

☐ After adjustment

F-CS-012 Revision: 01 Date: 20-04-55



## Calibration Report

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

Page 3 of 3

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

### Reporting of ice-point or reference point

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

### Reporting of temperature calibration point

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

### Note

- UUC\* : Unit Under Calibration

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

----- End -----

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



**pH Meter**

**Model : SevenCompact<sup>TM</sup> pH/Ion Meter S220**

**Serial No. : B448305208**

Certificate Number CCP-1416-22

Calibration Certificate  
SevenCompact™ pH/Ion Meter S220

## Customer

Company EASTERN THAI CONSULTING 1992 CO., LTD.  
Address 883 Moo 11, Sukhephaban 8 Rd., Nong Kham  
Sriracha  
Chonburi 20230  
Customer ID number 301608441  
Customer representative Saaporn Nakhin  
Assignment ID 00000000000000000000

## Instrument

Type SevenCompact™ S220 Instrument Serial Number B44303209  
Internal Identification LABE 11/4 Firmware version 1.20.06

## Technical specifications

Measuring Range -1999.9 ... 1999.9 mV  
Resolution 0.1 mV  
Limit of Error  $\pm 0.02$  mV

-2.000 ... 20.000 pH  
0.001 pH  
 $\pm 0.02$  pH

Temperature range NTC -30.0 ... 130.0 °C  
Temperature range ATC -5.0 ... 130.0 °C  
Resolution 0.1 °C  
Limit of Error  $\pm 0.1$  °C

## Procedure Statement

METTLER TOLEDO Calibration SOP (Doc. No. ME-300276773) will be used as reference documentation to adjust and certify the instrument indicated in the "Type" and "Serial number" section. The measurement results of this certification were obtained at ambient conditions.

Certificate Number CCP-1416-22

## Certification Tools

Certified digital voltmeter  
Manufacturer GOSSEN METRAWATT  
Control No. ANA77

Serial number ZD1740  
Certificate number EU213108  
Due date August 8, 2023

Certified Temperature  
Resistors

Manufacturer METTLER TOLEDO / ME-51302419  
Control No. ANA137

Serial number A424  
Certificate number 31344  
Due date August 26, 2023

Designation	Nominal value	Certified value
NTC 30 kΩ, 0 °C	94.980 kΩ	94.9859 kΩ
NTC 30 kΩ, 25 °C	30.000 kΩ	30.0137 kΩ
NTC 30 kΩ, 50 °C	10.989 kΩ	10.9849 kΩ
NTC 30 kΩ, 75 °C	4.529 kΩ	4.5267 kΩ
NTC 30 kΩ, 100 °C	2.070 kΩ	2.06949 kΩ
PT1000, 0 °C	1.000 kΩ	1.000168 kΩ
PT1000, 24 °C	1.0974 kΩ	1.097484 kΩ
PT1000, 50 °C	1.1940 kΩ	1.194202 kΩ
PT1000, 75 °C	1.2899 kΩ	1.290139 kΩ
PT1000, 100 °C	1.3861 kΩ	1.395971 kΩ



**Certificate Number** CCP-1416-22

Control No. CCE-1416-22/1

## Performance Test

**Company:** EASTERN THAI CONSULTING 1992 CO., LTD.

Address: 683 Moo 11, Sukaphiban 8 Rd., Nong Kham Siraicha

## Certification Measurements

Designation	Certified value	Measured value	Max. Tolerance	Passed / Failed
-1900 mV	-1900.0 mV	-1899.9 mV	0.2 mV	Passed
-1000 mV	-1000.0 mV	-999.9 mV	0.2 mV	Passed
-500 mV	-500.0 mV	-499.9 mV	0.2 mV	Passed
-180 mV	-180.0 mV	-180.0 mV	0.2 mV	Passed
0 mV	0.0 mV	0.1 mV	0.2 mV	Passed
180 mV	180.0 mV	180.0 mV	0.2 mV	Passed
500 mV	500.0 mV	499.9 mV	0.2 mV	Passed
1000 mV	1000.0 mV	999.9 mV	0.2 mV	Passed
1900 mV	1900.0 mV	1899.9 mV	0.2 mV	Passed

**pH/mV Sensor Input  
at high Impedance**

Designation	Measured low Imp.	Measured high Imp.	Max. Tolerance	Passed / Failed
1900 mV	1900 $\Omega$ mV	1898.6 mV	$\pm 0.2$ mV	Passed

### Temperature Sensor Input

Designation	Nominal value	Measured value	Max. Tolerance	Passed / Failed
NTC 30 kΩ, 0 °C	0.0 °C	0.0 °C	0.1 °C	Passed
NTC 30 kΩ, 25 °C	25.0 °C	25.0 °C	0.1 °C	Passed
NTC 30 kΩ, 50 °C	50.0 °C	50.0 °C	0.1 °C	Passed
NTC 30 kΩ, 75 °C	75.0 °C	74.9 °C	0.1 °C	Passed
NTC 30 kΩ, 100 °C	100.0 °C	99.9 °C	0.1 °C	Passed
110000, 0 °C	0.0 °C	0.1 °C	0.1 °C	Passed
1110000, 25 °C	25.0 °C	25.0 °C	0.1 °C	Passed
111000, 50 °C	50.0 °C	50.0 °C	0.1 °C	Passed
111000, 75 °C	75.0 °C	75.1 °C	0.1 °C	Passed
111000, 100 °C	100.0 °C	100.1 °C	0.1 °C	Passed

**Digital sensor input with  
pH Sensor**

Sensor recognition	The sensor was recognized correctly by the meter	Passed
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### Summary of Certification

### Certification of instrument

**Passed**

The instrument referred to in this certificate has fulfilled the criteria of the certification. This is indicated by the notation Passed in the column above.

Remarks

**Certification of the instrument was performed by**

Name Pallavi Swarnanawat

Place	Laboratory room
1. Preparation of the sample	
2. Measurement of the sample	
3. Calculation of the sample	
4. Interpretation of the sample	
5. Conclusion of the sample	
6. Reporting of the sample	
7. Archiving of the sample	
8. Disposal of the sample	
9. Maintenance of the sample	
10. Calibration of the sample	
11. Verification of the sample	
12. Validation of the sample	
13. Accreditation of the sample	
14. Certification of the sample	
15. Registration of the sample	
16. Documentation of the sample	
17. Communication of the sample	
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100. Coordination of the sample	

**Calibration Date:** February 7, 2022

Signature \_\_\_\_\_  
ELECTRONIC SIGNATURE

February 7, 2022

**Calibration Date:**

Electronic Signature



NSC-TISI-TSI 7025  
CALIBRATION 0152

## CERTIFICATE OF CALIBRATION

Page 1 of 3

Certificate No. : 23-011524

Sample Code : 23-04833-001

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.  
683 Moo 11, Sukhapiban 8 Rd., Nongkham,  
Siriracha, 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 (CRM).

## 3. Reference standard / Certified reference material

Instrument	ID No.	Certificate No.	Due Date
3.1 Voltage Calibrator	LB-AMC-01	22E3240	03 October 2023
3.2 Digital Thermometer	LB-TH-33	22-107027	02 October 2023
Certified Reference Material			
Lot No.	Ref No.	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 of

## 6. Condition of calibration item : Normal

Calibrated by

Approved by

## Issue date

The uncertainties are for a confidence probability of 95%.  
The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration.  
This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

NSC-TISI-TSI 7025  
CALIBRATION 0152

## REPORT OF CALIBRATION

Page 2 of 3

Certificate No. : 23-011524

Sample Code : 23-04833-001

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

## Results of Calibration

## Part 1. DC Voltage measurement

pH Meter Serial No. : B448305208

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

## Part 2. Performance of Electrode system

Electrode Manufacturer : METTLER TOLEDO

Model

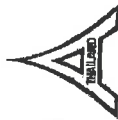
Electrode Serial No. : 2365921

InLab Expert Pro-ISM

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

Standard Buffer Solution 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 confidence probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS



## 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  $\pm 23.0\text{ }^{\circ}\text{C} \pm 3.0\text{ }^{\circ}\text{C}$
  - 1.2 Relative humidity  $\pm 55.0\text{ \%} \pm 15.0\text{ \%}$

## 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).

## 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 $^{\circ}\text{C}$	Average of standard reading $^{\circ}\text{C}$	Unit under calibration		Expanded uncertainty $^{\circ}\text{C}$	Coverage factor $k$
		Immersion depth mm	Average reading $^{\circ}\text{C}$	Correction value $^{\circ}\text{C}$	
25	25.002	120	25.0	+ 0.002	$\pm 0.13$
					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 to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with JICA

- End of report -

**STANDARD WEIGHT 50 g**



ASIA MEDICAL AND  
AGRICULTURAL LABORATORY  
AND RESEARCH CENTER

AMARC

Page 2 of 3

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

## REPORT OF CALIBRATION

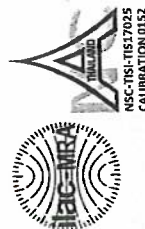
Equipment : Standard Weight 50 g  
Manufacturer : METTLER TOLEDO  
Class : F1  
Serial No. : N/A  
ID No. : LABE 10/1

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 of measurement multiplied by the coverage factor  $k=2.0$ , which for a normal distribution gives a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS



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  
Issue date : 31 May 2022  
Approved by

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

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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Phaholphi, Wang Thonglang, Bangkok 10310  
FM-CL-017  
TEL 02-516-2422  
FAX 02-516-6949  
Rev.05  
CONTACT@AMARC.CO.TH  
WWW.AMARC.CO.TH  
Effective Date: 15/10/21



Certificate No. : 22-052238

Sample Code : 22-19150-003

## REPORT OF CALIBRATION

## Condition of Calibration

1. Ambient Conditions : Temperature  $20^{\circ}\text{C} \pm 1.5^{\circ}\text{C}$ , Relative humidity  $50\% \pm 10\%$  and air density  $1.20 \text{ kg/m}^3$
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	21-079366	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 -

**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 : [REDACTED] Approved by : [REDACTED]

Issue date

The uncertainties are for a 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>

The calibration result is applied only to the above calibrated item and is not valid for other items. The calibration result is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Measurement Capability (TLMC) to the laboratory and its capability to recognize 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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FAX 02-516-6949  
Rev.05  
CONTACT@AMARC.CO.TH  
WWW.AMARC.CO.TH  
Effective Date: 15/10/21

## 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 :

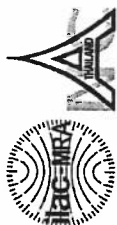
☒ Without adjustment

☐ 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 ( $\rho_0$ ) of 1.2 kg.m<sup>-3</sup>

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

The result expanded uncertainty of measurement  $U$  is stated as the standard uncertainty multiplied by the coverage factor  $k = 2.0$ , which for a normal distribution with UKAS accreditation has a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with the Guide to the Expression of Uncertainty in Measurement (GUM).



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-WF-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 100 g
Shape :	Cylindrical weight with knob
Material :	Stainless steel
Case :	Wooden Box
Comments :	Recalibration

- End of Report -



**STANDARD WEIGHT 50 g**

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

## CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.  
683 Moo 11, Sukhepiban 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 : 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 : [Redacted] Approved by

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 of

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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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

## 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 ( $\rho_a$ ) of 1.2 kg.m<sup>-3</sup>

Description	Deviation	Conventional	Expanded	Maximum	ID No.
		Mass	Uncertainty	Permissible Error	
	(mg)		(mg)	$\pm$ (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 gives a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS

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

Certificate No. : 22-052237  
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/m³
2. Calibration Method : WI-CL-007 base on OIML R 111-1 : 2004(E)

### 3. Reference standard instrument

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

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

Asia Medical and Agricultural Laboratory and Research Center Public Company Limited

(Instrument number 1).

### 5. Condition of Calibration item: Normal

### 6. Description of Calibrated item :

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

- End of Report -

**THERMO-HYGROMETER**

**Model : 608-H1**

**Serial No. : 45106737**



## CERTIFICATE OF CALIBRATION

Certificate No. : 22-068062  
Sample Code : 22-24591-002

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.

663 Moo 11, Sukthapiban 8 Rd., Nongkham,

Srinacha, 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 : 605-H1

Serial No. : 45106737 ID No. : LABE 09/7

Date of Receipt : 22 June 2022 Date of Calibration : 24 June 2022

## 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-01 & LB-DP-01 (DP)	TH-0014-22	16 February 2023
3.2 Digital Thermometer	Optidew Vision	LB-DP-01 & LB-DP-01 (Temp.)	22-029549	14 March 2023
3.3 Digital Thermometer	34972A	LB-DA-07 with RTD-89	21-072473	13 September 2022

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

Approved by

Issue date

The uncertainties are for a confidence interval of 95%.  
The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration.  
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 aspect with the prior written approval of the Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

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WWW.AMARC.CO.TH  
Effective Date 15/10/21



## REPORT OF CALIBRATION

Certificate No. : 22-068062  
Sample Code : 22-24591-002

## 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	20.2	- 0.20	± 0.39
25	50	25.00	24.9	+ 0.10	± 0.39
30	50	30.00	29.8	+ 0.20	± 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	45.13	51.4	- 6.27	± 1.3
60	25.00	60.03	66.5	- 6.47	± 1.5
75	25.00	75.20	81.5	- 6.30	± 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  $k=2$  to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS.

- End of Report -

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**Area Heat Stress Monitor**

**Model : HD32.2**

**Serial No. : 22004318**



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Watthapra, Bangkokkhai, Bangkok 10600 Thailand.  
Tel: (66) 02-8680812#13 Fax: (66) 02-8680860 www.jiranatee.com

## CERTIFICATE OF CALIBRATION

Certificate No.: CL-054-66  
Page 1 of 2

Equipment Name: Heat Stress Monitor  
Manufacturer: Delta OHM  
Model: HD32.2  
Serial No: 22004318  
ID No: -

Customer  
Name: Eastern that consulting 1992 Co.,Ltd.  
Address: 683 Moo 11, Sukhapibarn 8 Rd, Nongkham,  
Sriracha, Chonburi 20230

Received date: 10 Mar 2023  
Calibration date: 10 Mar 2023  
Issue date: 13 Mar 2023

### Reference Used During Calibration

1. Standard Temperature Probe Model: STS-100 A500,  
Serial No.: 667682-09, Due date: 23 Mar 2023
2. Digital Temperature Indicator Model: DTI-1000-A MK  
II, Serial No.: 671407-00591, Due date: 22 July 2023

### Calibration Condition

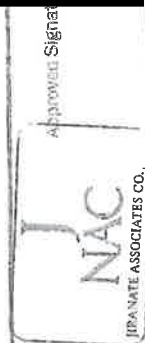
Temperature: (23±3) °C  
Relative Humidity: (55±15)%

### Calibration Procedure

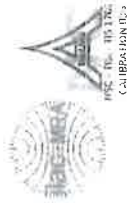
The temperature calibration was done by In-House calibration method as WI-CL-001 according to comparison method with standard digital temperature indicator and standard temperature probe. The temperature scale use was based on ITS-90.

### Traceability

The measurement results are traceable to the international system of units (SI) through National Institute of Metrology Thailand (NIMT) Certificate number: TT-0034-22, Certificate number: ER-0092-22



Approved Signature



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Certificate No.: CL-054-66  
Page 2 of 2

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment  
Calibration Range: 25 - 50 °C

### Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 22010220.

Dimension: Diameter 14 mm. Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
60	25.059	25.1	0.0	0.099
60	30.054	30.1	0.0	0.099
60	35.045	35.1	0.1	0.099
60	40.036	40.1	0.1	0.099
60	45.052	45.1	0.0	0.099
60	50.039	50.0	0.0	0.099

Table 2: This equipment was connected with temperature probe Model: TP3207.2 S/N: 22015196.

Dimension: Diameter 14 mm. Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
70	25.059	25.2	0.1	0.099
70	30.054	30.1	0.0	0.099
70	35.044	35.1	0.1	0.099
70	40.036	39.9	-0.1	0.099
70	45.052	44.9	-0.2	0.099
70	50.038	49.8	-0.2	0.099

Table 3: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 22014931.

Dimension: Diameter 8 mm. Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	25.059	25.1	0.0	0.099
110	30.054	30.1	0.0	0.099
110	35.045	35.1	0.1	0.099
110	40.036	40.1	0.1	0.099
110	45.052	45.1	0.0	0.099
110	50.038	50.1	0.1	0.099

UUC\*: Unit Under Calibration

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

★ End of Certificate ★



**Area Heat Stress Monitor**

**Model : HD32.2**

**Serial No. : 22004319**





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## CERTIFICATE OF CALIBRATION

Certificate No. : CL-055-66  
Page 1 of 2

Equipment Name: Heat Stress Monitor  
Manufacturer: Delta OHM  
Model: HD32.2  
Serial No: 22004319  
ID No: -

Customer  
Name: Eastern thai consulting 1992 Co.,Ltd.  
Address: 683 Moo 11, Sukhapibarn 8 Rd, Nongkham,  
Srirachia, Chonburi 20230

Received date: 10 Mar 2023  
Calibration date: 13 Mar 2023  
Issue date: 13 Mar 2023

### Reference Used During Calibration

1. Standard Temperature Probe Model: STS-100 A500,  
Serial No.: 667682-09, Due date: 23 Mar 2023  
2. Digital Temperature Indicator Model: DTL-1000-A MK  
II, Serial No.: 671407-00591 Due date: 22 July 2023

### Calibration Condition

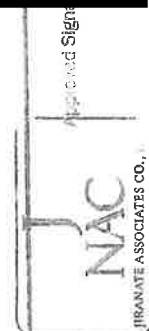
Temperature: (23±3) °C  
Relative Humidity: (55±15)%

### Calibration Procedure

The temperature calibration was done by In-House  
calibration method as WI-CL-001 according to  
comparison method with standard digital temperature  
indicator and standard temperature probe. The  
temperature scale use was based on ITS-90.

### Traceability

The measurement results are traceable to the  
international system of units (SI) through National  
Institute of Metrology Thailand (NIMT) Certificate  
number: TT-0034-22, Certificate number: ER-0092-  
22



Approved Sign



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Certificate No. : CL-055-66  
Page 2 of 2

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment  
Calibration Range: 25 - 50 °C

### Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 22010213.  
Dimension: Diameter 14 mm. Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
60	25.064	25.1	0.0	0.099
60	30.058	30.1	0.0	0.099
60	35.053	35.1	0.0	0.099
60	40.047	40.1	0.1	0.099
60	45.058	45.1	0.0	0.099
60	50.051	50.1	0.0	0.099

Table 2: This equipment was connected with temperature probe Model: TP3207.2 S/N: 22015193.  
Dimension: Diameter 14 mm. Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
70	25.064	25.0	-0.1	0.099
70	30.058	30.1	0.0	0.099
70	35.053	35.2	0.1	0.099
70	40.047	40.2	0.2	0.099
70	45.058	45.2	0.1	0.099
70	50.051	50.3	0.2	0.099

Table 3: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 22014923.  
Dimension: Diameter 8 mm. Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	25.064	25.1	0.0	0.099
110	30.058	30.1	0.0	0.099
110	35.054	35.1	0.0	0.099
110	40.047	40.1	0.1	0.099
110	45.058	45.1	0.0	0.099
110	50.051	50.1	0.0	0.099

UUC\* : Unit Under Calibration

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

✱ End of Certificate ✱



**Area Heat Stress Monitor**

**Model : QUESTemp 32**

**Serial No. : TPL060039**



## CALIBRATION CERTIFICATE

Certificate No. : AD2206-013-0001  
 Date Issued : 07-Jun-22

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

**Equipment** : Area Heat Stress Monitor

**Manufacturer** : Quest Technologies  
**Model** : QUESTemp 32  
**Serial No.** : TPL060039  
**ID No./Tag No.** : 4

**Date Received** : 01-Jun-22  
**Date Calibrated** : 05-Jun-22

**Calibrated by** : Mr. Apiwat Peanrungrat

### Calibration Method or Calibration Procedure Used

In-house method : CP-19 by comparing against Standard Digital Humidity / Temperature Meter

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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Page 1 of 2



Certificate No. : AD2206-013-0001

Environment : Ambient Temperature :  $(25 \pm 2) ^\circ\text{C}$

Relative Humidity :  $(50 \pm 15)\%\text{RH}$

STD	UUC Reading ( $^\circ\text{C}$ )		UUC Error ( $^\circ\text{C}$ )	Measurement Uncertainty ( $\pm^\circ\text{C}$ )
	Before Adjusted	After Adjusted		
37.99	WET 38.0	-	0.01	0.35
37.99	DRY 38.0	-	0.01	0.35
37.99	GLOBE 37.9	-	-0.09	0.35
44.98	WET 45.0	-	0.02	0.35
44.98	DRY 45.0	-	0.02	0.35
44.98	GLOBE 45.0	-	0.02	0.35

STD = Standard

UUC = Unit Under Calibration

Description of UUC : Range 0 to 100  $^\circ\text{C}$   
 Resolution 0.1  $^\circ\text{C}$

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

MIT Certificate No. AD2111-077-0001 for Digital Thermometer with Probe (Fluke) Serial No. 5856603, Due 11-Nov-22

End of Certificate



Area Heat Stress Monitor

Model : HD32.2

Serial No. : 22004316



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Watthapra, Bangkokkhyai, Bangkok 10600 Thailand.  
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## CERTIFICATE OF CALIBRATION

Certificate No.: CL-053-66  
Page 1 of 2

Equipment Name: Heat Stress Monitor  
Manufacturer: Delta OHM  
Model: HD32.2  
Serial No: 22004316  
ID No: -

### Customer

Name: Eastern thai consulting 1992 Co.,Ltd.  
Address: 683 Moo 11, Sukhapibarn 8 Rd, Nongkham,  
Sriracha, Chonburi 20230

Received date: 10 Mar 2023  
Calibration date: 10 Mar 2023  
Issue date: 13 Mar 2023

### Reference Used During Calibration

1. Standard Temperature Probe Model: STS-100 A500,  
Serial No.: 667682-09, Due date: 23 Mar 2023
2. Digital Temperature Indicator Model: DTI-1000-A MK  
II, Serial No.: 671407-00591 Due date: 22 July 2023

### Calibration Condition

Temperature: (23±3) °C  
Relative Humidity: (55±15)%

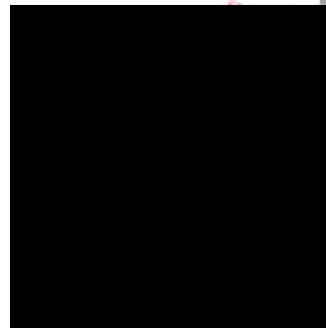
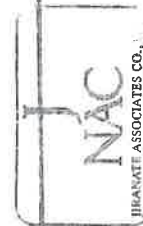
### Calibration Procedure

The temperature calibration was done by In-House calibration method as WI-CL-001 according to comparison method with standard digital temperature indicator and standard temperature probe. The temperature scale use was based on ITS-90.

### Traceability

The measurement results are traceable to the international system of units (SI) through National Institute of Metrology Thailand (NIMT) Certificate number: TT-0034-22, Certificate number: ER-0092-22

Approved Signature



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Certificate No.: CL-053-66  
Page 2 of 2

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 25 - 50 °C

### Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 22010218.

Dimension: Diameter 14 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
60	25.059	25.1	0.0	0.099
60	30.054	30.1	0.0	0.099
60	35.045	35.1	0.1	0.099
60	40.037	40.1	0.1	0.099
60	45.052	45.1	0.0	0.099
60	50.038	50.1	0.1	0.099

Table 2: This equipment was connected with temperature probe Model: TP3207.2 S/N: 22015205.

Dimension: Diameter 14 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
70	25.059	25.1	0.0	0.099
70	30.054	29.9	-0.2	0.099
70	35.045	34.8	-0.2	0.099
70	40.037	39.8	-0.2	0.099
70	45.052	44.8	-0.3	0.099
70	50.039	49.6	-0.4	0.099

Table 3: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 22014929.

Dimension: Diameter 8 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	25.059	25.1	0.0	0.099
110	30.054	30.1	0.0	0.099
110	35.045	35.1	0.1	0.099
110	40.037	40.1	0.1	0.099
110	45.052	45.1	0.0	0.099
110	50.039	50.0	0.0	0.099

UUC\*: Unit Under Calibration

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



**Area Heat Stress Monitor**

**Model : HD32.2**

**Serial No. : 22004320**



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Watthapra, Bangkokyai, Bangkok 10600 Thailand.  
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# CERTIFICATE OF CALIBRATION

Certificate No. : CL-056-66  
Page 1 of 2

Certificate No. : CL-056-66  
Page 2 of 2

Equipment Name: Heat Stress Monitor  
Manufacturer: Delta OHM  
Model: HD32.2  
Serial No: 22004320  
ID No: -

Customer  
Name: Eastern thai consulting 1992 Co.,Ltd.  
Address: 683 Moo 11, Sukhapibarn 8 Rd, Nongkham,  
Sirachia, Chonburi 20230

Received date: 10 Mar 2023  
Calibration date: 13 Mar 2023  
Issue date: 13 Mar 2023

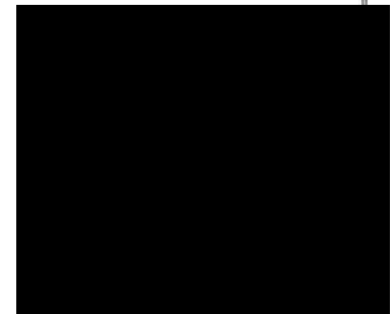
Reference Used During Calibration  
1. Standard Temperature Probe Model: STS-100 A500,  
Serial No.: 667682-09, Due date: 23 Mar 2023  
2. Digital Temperature Indicator Model: DTI-1000-A MK  
II, Serial No.: 671407-00591 Due date: 22 July 2023

Calibration Condition  
Temperature: (23±3) °C  
Relative Humidity: (55±15)%

Calibration Procedure  
The temperature calibration was done by In-House  
calibration method as WI-CL-001 according to  
comparison method with standard digital temperature  
indicator and standard temperature probe. The  
temperature scale use was based on ITS-90.

Traceability  
The measurement results are traceable to the  
international system of units (SI) through National  
Institute of Metrology Thailand (NIMT) Certificate  
number: TT-0034-22, Certificate number: ER-0092-  
22

Calibrated by  
Approved Signator



Calibrated by

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment  
Calibration Range: 25 - 50 °C

Function:  
Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 22010215.  
Dimension: Diameter 14 mm. Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
60	25.064	25.0	-0.1	0.099
60	30.058	30.0	-0.1	0.099
60	35.054	35.0	-0.1	0.099
60	40.048	40.0	0.0	0.099
60	45.058	45.0	-0.1	0.099
60	50.051	50.0	-0.1	0.099

Table 2: This equipment was connected with temperature probe Model: TP3207.2 S/N: 22003554.  
Dimension: Diameter 14 mm. Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
70	25.064	25.0	-0.1	0.099
70	30.058	30.0	-0.1	0.099
70	35.053	34.9	-0.2	0.099
70	40.048	39.9	-0.1	0.099
70	45.058	44.9	-0.2	0.099
70	50.052	49.9	-0.2	0.099

Table 3: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 22014940.  
Dimension: Diameter 8 mm. Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	25.064	25.1	0.0	0.099
110	30.058	30.1	0.0	0.099
110	35.054	35.1	0.0	0.099
110	40.048	40.1	0.1	0.099
110	45.058	45.1	0.0	0.099
110	50.051	50.1	0.0	0.099

UUC\* : Unit Under Calibration

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



**Area Heat Stress Monitor**

**Model : QUESTemp 32**

**Serial No. : TPQ030023**





## CALIBRATION CERTIFICATE

Certificate No. : L202302061-002

Date Issued : 10-Feb-23

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

**Equipment** : Area Heat Stress Monitor

**Manufacturer** : QUEST TECHNOLOGIES

**Model** : QUESTemp32

**Serial No.** : TPQ030023

**ID No./Tag No.** : No.8

**Date Received** : 06-Feb-23

**Date Calibrated** : 08-Feb-23

**Calibrated by** : Mr. Apiwat Peanrungrat

### Calibration Method or Calibration Procedure Used

In-house method : CP-19 by comparing against Standard Digital Humidity / Temperature Meter

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.

Certificate No. : L202302061-002

Environment : Ambient Temperature :  $(25 \pm 2) ^\circ\text{C}$

Relative Humidity :  $(50 \pm 15)\% \text{RH}$

STD Reading ( $^\circ\text{C}$ )	UUC Reading ( $^\circ\text{C}$ )		UUC Error ( $^\circ\text{C}$ )	Measurement Uncertainty ( $\pm^\circ\text{C}$ )
	Before Adjusted	After Adjusted		
37.98	WET 37.9	-	-0.08	0.35
37.98	DRY 38.2	-	0.22	0.35
37.98	GLOBE 38.0	-	0.02	0.35
45.01	WET 44.9	-	-0.11	0.35
45.01	DRY 45.1	-	0.09	0.35
45.01	GLOBE 44.9	-	-0.11	0.35

STD = Standard

UUC = Unit Under Calibration

Description of UUC : Range 0 to 100  $^\circ\text{C}$   
 Resolution 0.1  $^\circ\text{C}$

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

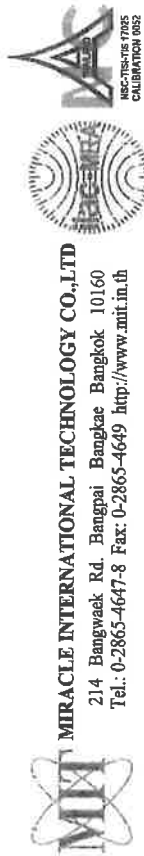
MIT Certificate No. L202210258-006 for Digital Thermometer with Probe (Fluke) Serial No. 5856603, Due 10-Nov-23

End of Certificate

**Area Heat Stress Monitor**

**Model : QUESTemp 32**

**Serial No. : TPL060040**



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

## CALIBRATION CERTIFICATE

Certificate No. : AD2206-013-0002  
Date Issued : 07-Jun-22

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

**Equipment** : Area Heat Stress Monitor

**Manufacturer** : Quest Technologies

**Model** : QUESTemp 32

**Serial No.** : TPL060040

**ID No./Tag No.** : 5

**Date Received** : 01-Jun-22

**Date Calibrated** : 05-Jun-22

**Calibrated by** : Mr. Apiwat Peanrungrat

### Calibration Method or Calibration Procedure Used

In-house method : CP-19 by comparing against Standard Digital Humidity / Temperature Meter

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.

Certificate No. : AD2206-013-0002

Environment : Ambient Temperature :  $(25 \pm 2) ^\circ\text{C}$

Relative Humidity :  $(50 \pm 15)\%\text{RH}$

STD	UUC Reading ( $^\circ\text{C}$ )		UUC Error ( $^\circ\text{C}$ )	Measurement Uncertainty ( $\pm^\circ\text{C}$ )
	Reading ( $^\circ\text{C}$ )	Before Adjusted After Adjusted		
37.99	WET	38.0	0.01	0.35
		DRY	0.01	0.35
		GLOBE	-0.09	0.35
44.98	WET	45.0	0.02	0.35
		DRY	0.12	0.35
		GLOBE	-0.08	0.35

STD = Standard

UUC = Unit Under Calibration

Description of UUC : Range 0 to 100  $^\circ\text{C}$   
Resolution 0.1  $^\circ\text{C}$

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

MIT Certificate No. AD2111-077-0001 for Digital Thermometer with Probe (Fluke) Serial No. 5856603, Due 11-Nov-22

End of Certificate

**Area Heat Stress Monitor**

**Model : QUESTemp 32**

**Serial No. : TPI050070**

## CALIBRATION CERTIFICATE



**Certificate No. :** L202302061-004  
**Date Issued :** 10-Feb-23

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

**Equipment** : Area Heat Stress Monitor

**Manufacturer** : QUEST TECHNOLOGIES

**Model** : QUESTemp32

**Serial No.** : TP050070

**ID No./Tag No.** : No.3

**Date Received** : 06-Feb-23

**Date Calibrated** : 08-Feb-23

**Calibrated by** : Mr. Apiwat Peanrungrat

### Calibration Method or Calibration Procedure Used

In-house method : CP-19 by comparing against Standard Digital Humidity / Temperature Meter

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

**Certificate No. :** L202302061-004

**Environment :** Ambient Temperature :  $(25 \pm 2) ^\circ\text{C}$

Relative Humidity :  $(50 \pm 15)\%\text{RH}$

STD	UUC Reading ( $^\circ\text{C}$ )		UUC Error ( $^\circ\text{C}$ )	Measurement Uncertainty ( $\pm ^\circ\text{C}$ )
	Reading ( $^\circ\text{C}$ )	Before Adjusted	After Adjusted	
37.98	WET	37.7	-	0.35
37.98	DRY	38.2	-	0.35
37.98	GLOBE	37.8	-	0.35
45.01	WET	44.9	-	0.35
45.01	DRY	45.2	-	0.35
45.01	GLOBE	44.9	-	0.35

STD = Standard

UUC = Unit Under Calibration

**Description of UUC :**  
 Range 0 to 100  $^\circ\text{C}$   
 Resolution 0.1  $^\circ\text{C}$

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

MIT Certificate No. L202210258-006 for Digital Thermometer with Probe (Fluke) Serial No. 5856603, Due 10-Nov-23

End of Certificate

**Area Heat Stress Monitor**

**Model : QUESTemp 32**

**Serial No. : TPL090017**



## CALIBRATION CERTIFICATE

Certificate No. : L202302061-001  
Date Issued : 10-Feb-23

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

**Equipment** : Area Heat Stress Monitor

**Manufacturer** : QUEST TECHNOLOGIES

**Model** : QUESTemp32

**Serial No.** : TPL090017

**ID No./Tag No.** : No.7

**Date Received** : 06-Feb-23

**Date Calibrated** : 08-Feb-23

**Calibrated by** : Mr. Apiwat Peanrungrat

### Calibration Method or Calibration Procedure Used

In-house method : CP-19 by comparing against Standard Digital Humidity / Temperature Meter

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 Co., Limited

Certificate No. : L202302061-001

Environment : Ambient Temperature :  $(25 \pm 2) ^\circ\text{C}$

Relative Humidity :  $(50 \pm 15)\%\text{RH}$

STD	Reading ( $^\circ\text{C}$ )	Before Adjusted	After Adjusted	UUC Error ( $^\circ\text{C}$ )	Measurement Uncertainty ( $^\circ\text{C}$ )
	37.98	WET 38.1	-	0.12	0.35
	37.98	DRY 37.7	-	-0.28	0.35
	37.98	GLOBE 38.2	-	0.22	0.35
	45.01	WET 44.9	-	-0.11	0.35
	45.01	DRY 44.9	-	-0.11	0.35
	45.01	GLOBE 44.9	-	-0.11	0.35

STD = Standard

UUC = Unit Under Calibration

Description of UUC : Range 0 to 100  $^\circ\text{C}$   
Resolution 0.1  $^\circ\text{C}$

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

MIT Certificate No. L202210258-006 for Digital Thermometer with Probe (Fluke) Serial No. 5856603, Due 10-Nov-23

End of Certificate

## **DIGITAL LIGHT METER**

**Model : LX-73**

**Serial No. : S 008890**





**INTERNATIONAL TESTING SERVICE CO., LTD**  
1213/388 Ladprao 94 Ladprao Rd. Wangtonglang Bangkok 10310  
Tel 0-2559-2095 Fax 0-2559-2096  
E-mail : sale@itest-lab.com web site : www.itest-lab.com



NSC-TS-17025  
CALIBRATION 129

## CALIBRATION CERTIFICATE

Issued date : 18 April 2022

Client Name : **EASTERN THAI CONSULTING 1992 CO., LTD.**

Address : 683 Moo 11, Sukhaphibal 8 Rd., Nongkham, Si Racha, Chon buri 20230

Request No. : **C-2204 - 180**

Laboratory No. : **CAL- 180**

Date of Request : 8 April 2022.

Date of Calibration : 12 April 2022.

Unit Under Calibration (UUC) :

Nomenclature : Digital Light Meter

Maker : DIGICON

Serial No. : S 008890

Model : LX - 73

2. Place of Calibration : Photometry Standard Laboratory, INTERNATIONAL TESTING SERVICE CO., LTD.

3. Range of Calibration : 3 Range

4. Condition of Laboratory : Ambient temperature :  $(25 \pm 2) ^\circ\text{C}$  and relative humidity  $(60 \pm 20) \%$ .

5. Reference Standard : Standard Tungsten Halogen Lamp , Serial No.: 504010, which was calibrated on

14 September 2021, can be traceable to International System of Unit (SI) through Electrical and Electronics

Institute Foundation for Industrial development, Certificate No.: 0117L121.

6. Support Equipment :

1. Photometric bench , 6.3 meter long.

2. DC. power supply, Serial No.: EJ 19A 009, Model : GPR-25H 300 , Maker : GW INSTR.

3. Digital Multimeter , Model : 34401A , S/N : MY44011212 and MY44011215.

4. Foot Candle / Lux Meter , Model : 407026, S/N : Q 558437, Maker : EXTECH.

7. Calibration Procedure :

The measurement was done in accordance with WI-CP-01. The reported uncertainty is based on standard uncertainty multiplied by a coverage factor  $k = 2$ , providing a level of confidence of approximately 95 %.

The Results shown in this certification report refer only to the equipment(s) calibrated under the conditions stated. This Calibration Certificate cannot be reproduced, except in full, without permission of the company.



**INTERNATIONAL TESTING SERVICE CO., LTD**  
1213/388 Ladprao 94 Ladprao Rd. Wangtonglang Bangkok 10310  
Tel 0-2559-2095 Fax 0-2559-2096  
E-mail : sale@itest-lab.com web site : www.itest-lab.com



NSC-TS-17025  
CALIBRATION 129

Request No. : **C-2204 - 180**

Laboratory No. : **CAL - 180**

Serial No. : S 008890

Results :

UUC Range	Standard (lx)	UUC Reading (lx)		Correction (lx)	Uncertainty of Measurement ( $\pm$ lx)
		Before adjust	After adjust		
400	0	---	---	-	2.1 % of Reading
	50	50.4	50.9	-0.9	
	100	101.8	103.2	-3.2	
	200	202.2	205.4	-5.4	
	300	299.1	302.1	-2.1	
4000	400	391.7	398.1	+1.9	2.1 % of Reading
	500	491	499	+1	
	1000	982	999	+1	
	2000	1972	1995	+5	
	3000	2891	2973	+27	
40000 x10	4000	3856	3924	+76	2.1 % of Reading
	5000	448	456	+410	

Note : The UUC is calibrate at 5000 lx is not NSC-ONSC Accredited.

Calibration result approved by

Approved on behalf of  
International Testing Service Co., Ltd

The Results shown in this certification report refer only to the equipment(s) calibrated under the conditions stated. This Calibration Certificate cannot be reproduced, except in full, without permission of the company.

**ANALYTICAL BALANCE (DU)**

**Model. : XS205DU**

**Serial No. : 1126323724**



Certificate No. : 23-006683

Sample Code : 23-02820-006

## CERTIFICATE OF CALIBRATION

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

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

Equipment : ELECTRONIC BALANCE

Manufacturer : METTLER TOLEDO

Model : XS205DU

Serial No. : 1126323724

ID No. : LABE 05/1

Date of Receipt : 20 January 2023

Date of Calibration : 20 January 2023

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



Certificate No. : 23-006683

Sample Code : 23-02820-006

## REPORT OF CALIBRATION

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

## Result of Calibration

## 1. Test weight and repeatability of reading

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

Unit : g	Range : 80	<input type="checkbox"/> Before adjustment	<input type="checkbox"/> After adjustment
<input checked="" type="checkbox"/> No adjustment	Nominal value	40	80
<input type="checkbox"/> Adjustment	Standard weight	40.000042	80.000045
	Average reading of indicator	40.00015	80.00019
	Standard deviation	0.000004	0.000007
Unit : g	Range : 200	<input type="checkbox"/> Before adjustment	<input type="checkbox"/> After adjustment
<input checked="" type="checkbox"/> No adjustment	Nominal value	100	200
<input type="checkbox"/> Adjustment	Standard weight	100.000022	200.000199
	Average reading of indicator	100.00001	200.00004
	Standard deviation	0.000004	0.000008

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

Page 3 of 4

## REPORT OF CALIBRATION

## Result of Calibration

## 2. Sensitivity or value of a scale division

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

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

## 3. Departure of indication from nominal value, Linearity

Nominal Value	Standard Value	Average Reading of Indicator	Correction Value	Expanded Uncertainty	Coverage Factor (k)
Unload	0.0000000	0.00000	0.00000	0.0000090	2.01
0.01	0.0100036	0.01000	0.00000	0.0000093	2.01
0.1	0.1000062	0.10000	0.00001	0.000012	2.00
1	1.0000036	1.00001	-0.00001	0.000014	2.00
5	5.0000044	5.00003	-0.00003	0.000020	2.00
10	10.000000	10.00007	-0.00007	0.000032	2.00
20	20.000016	20.00011	-0.00009	0.000036	2.00
50	50.000029	50.00013	-0.00010	0.000067	2.00
100	100.000022	100.0001	-0.0001	0.00016	2.00
150	150.000051	150.0001	0.0000	0.00023	2.00
200	200.000199	200.0003	-0.0001	0.00028	2.00

The result expanded uncertainty of measurement  $U$  is stated as the standard uncertainty of measurement  $u$  multiplied by a coverage factor  $k$  of approximately 95%. The standard uncertainty  $u$  of measurement was determined in accordance with UKAS M3003.

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

Page 4 of 4

## REPORT OF CALIBRATION

## Result of Calibration :

## 4. Eccentric or off-centre loading

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

Weighing pan ☐ Circle ☐ Triangular ☒ Rectangular  
Test weight : 50 and 100  
Unit : g

Range	Position	Reading of indicator	Reading of indicator
1	50.00014	100.0001	200
2	50.00014	99.9998	
3	50.00006	100.0000	
4	50.00010	100.0001	
5	50.00017	100.0001	
6	50.00014	100.0001	
Maximum difference	0.00008	0.0003	

## Condition of Calibration

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

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

3. Condition of Calibration item: Normal

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

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

5. Reference standard instrument :

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

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

- End of Report -

## **BAROMETER**

**Equipment : Analog Barometer**

**ID No. / Tag No. : BM001/41**



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



## CALIBRATION CERTIFICATE

Certificate No. : AD2205-163-0001  
Date Issued : 20-May-22

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

**Equipment** : Analog Barometer

**Manufacturer** : Barigo  
**Model** : -  
**Serial No.** : -  
**ID No./Tag No.** : BM001/41  
**Date Received** : 12-May-22  
**Date Calibrated** : 20-May-22

**Calibrated by** : Mr. Sanith Srichutikul

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.

Certificate No : AD2205-163-0001

Environment : Ambient Temperature : (25 ± 2)°C

Relative Humidity : (50 ± 15)%RH

STD Reading hPa	UUC Reading (hPa) Before Adjusted	UUC Reading (hPa) After Adjusted	UUC Error hPa	Uncertainty ± hPa
990.00	990.0	-	0.00	0.59
1000.00	1000.0	-	0.00	0.59
1010.00	1010.0	-	0.00	0.59
1020.00	1020.0	-	0.00	0.59
1030.00	1030.0	-	0.00	0.59

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

Description of UUC :

Range	955 - 1075	hPa Absolute
Calibration Range	990 - 1030	hPa Absolute
Scale Interval	1	hPa
Resolution	0.5	hPa 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-P210086 for Reference Pressure Monitor Serial No. 1598, Due 08-Nov-22

End of Certificate

**Hot Air Oven**

**Model : UFE 500**

**Serial No. : G511.0182**

# CERTIFICATE OF CALIBRATION

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

— 100% TOTAL CONSOLIDATING 1992 CO., LTD.

(Hot Lab)

Controlled enclosures (Hot air oven)

Equipment	Temperature Controller	Model
	UFE 500	

Manufacturer : Memmert

Serial No.	: G511.0182	ID No.	: 20 January 2023
------------	-------------	--------	-------------------

Date of Receipt : 20 January 2023

### Condition of Calibration

- | 1. Environment |                       | Maximum | 27.5  | Minimum | 38.5  |
|----------------|-----------------------|---------|-------|---------|-------|
| 1.1            | Ambient temperature   | Maximum | 50.9  | Minimum | VAC   |
| 1.2            | Relative humidity     | Maximum | 221.9 | Minimum | 218.5 |
| 1.3            | Line voltage supplied | Maximum |       | Minimum | VAC   |

#### Calibration method

## 12 Calibration method

o *reference standard instrument*

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

- (RID-PT000)
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

## REPORT OF CALIBRATION

Certificate No. : 23-006679  
Sample Code : 23-02820-002

## Results of Calibration

Resolution : 0.5 °C

## 1. Reporting of Temperature

Calibration point (°C)	UUC* setting (°C)	UUC* reading (°C)	Measured temperature at each positions (°C)									Uncertainty ± (°C)	Coverage factor <i>k</i>
			# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	# 9 <sup>Ref</sup>		
104	103.5	103.5	104.10	104.08	104.08	103.99	104.08	104.08	103.96	104.01	103.84	0.47	2.00

## 2 Characterization results

Calibration point (°C)	Stability $\pm$ (°C)	Uniformity (°C)	Overall variation (°C)
104.0	0.08	0.32	0.39

## Notes

UUC\* = Unit Under Calibra



## REPORT OF CALIBRATION

Certificate No. : 23-006679

Sample Code : 23-02820-002

### 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 = 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.

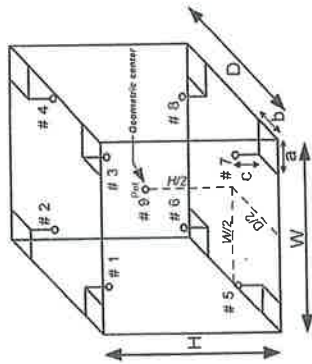


Figure: Example of sensor installation Positions

The result expanded uncertainty of measurement  $U$  is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k=2$  to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS.

- End of Report -

**Primary Flow Calibrator**

**Serial No. : 110619 , 207510**

Certificate No : 23-AFM-022  
 Request No : Req-2023-0128

## Certificate of Calibration

**Customer**  
 Name : Eastern Thai Consulting 1992 Co., Ltd.  
 Address : 683 Moo 11, Subhapham 8 Rd., Nongkham, Sriracha, Chonburi 20230

**Unit Under Calibration Details**  
 Measurement Item : Primary Flow Calibrator  
 Manufacturer : BIOS  
 Model : Defender 510-L  
 Serial Number : 110619  
 ID : -

Location of Calibration : LAB 4 AIR VELOCITY METER

### Calibration Environment and Details

Temperature : 23 °C ± 3 °C  
 Humidity : 55 %RH ± 20 %RH  
 Barometric Pressure : 1013 hPa ± 10 hPa  
 Received Date : 20 January 2023  
 Calibration Date : 6 February 2023

Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	18501010006	Sensidyne	15 June 2023
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	15 June 2023

**Traceability :**  
 This certificate provides traceability of measurement to recognized national standard, and to the realization of the international System of

Units (SI)

Note :

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor k=2, providing a level of confidence approximately 95 %.

### Result of Calibration :

Flow Setting (L/min)	STD Flow Reading (L/min)	UUC Flow Reading (L/min)	Correction Flow (L/min)	Uncertainty (L/min)
0.02	0.02018	0.020259	-0.00008	0.00032
0.05	0.05041	0.050541	-0.00013	0.00083
0.1	0.1025	0.10153	0.0010	0.0015
0.25	0.2519	0.25043	0.0015	0.0036
0.5	0.5023	0.50069	0.0016	0.0072

Note

STD : Standard

UUC : Unit Under Calibration

End of Certificate

# Certificate of Calibration

Certificate No: 23-AFM-024

Request No : Req-2023-0196

Eastern Thai Consulting 1992 Co., Ltd.

๔๖๓-๑๕ สุโขทัย ๘๒๐ Nongkham, Sriracha, Chonburi 20230

### Unit Under Calibration Details

Sensor Model: -

**Sensor Model : -**

Sensor Serial Number : -

Sensor Serial Number : -

Model : Defender 510-M

Serial Number : 207510

1

Location of Calibration : LAB 4 AIR VELOCITY METER

## Calibration Environment and Details

Temperature :  $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$ Humidity : 55 %RH  $\pm$  20 %RH: 55 %RH  $\pm$  20 %RH

16  $1013 \text{ hPa} \pm 10 \text{ hPa}$

 $1013 \text{ hPa} \pm 10 \text{ hPa}$ 

Received Date : 25 January 2023

Calibration Date : 6 February 2023

### Calibration Data

Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	15 June 2023

## Traceability:

**Traceability:** the ability to trace a national standard and to the realization of the international System of

{Units (SI)}

**Note:**

NOTE:  
4.1. Fixed Threshold Coverage Factor  $k=2$  providing a level of confidence

approximately 95%.

Certificate No: 23-AFM-024

Request No : Req-2023-0196

### Result of Calibration

Calibration Point	STD Flow Reading	UUC Flow Reading	Correction Flow	Uncertainty (±)
(cc/min)	(cc/min)	(cc/min)	(cc/min)	(cc/min)
500	501.1	506.43	-5.3	7.2
1000	1019	1032.2	-13	15
2000	2003	2017.8	-15	29
3000	3007	3023.8	-17	43
4000	4013	4027.2	-15	57

## Note

STP Standard

### IT(C): Unit Under Calibration

## End of Certificate

**NOISE DOSI METER**

**MODEL : CR:110A**

**SERIAL No. : CB0641**

CERTIFICATE OF CALIBRATION

ISSUED BY      Cirrus Research plc  
DATE OF ISSUE    12 January 2023      CERTIFICATE NUMBER    185804

**Cirrus Research plc**  
**Acoustic House**  
**Bridlington Road**  
**Hummanby**  
**North Yorkshire**  
**YO14 0PH**  
**United Kingdom**

Page 1 of 2  
Approved signatory  
N.Smith  
Electronically signed:

*N.D. S...*

Dosimeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer:      Cirrus Research plc      Notes:  
Model:              CR:110A  
Serial number:      CB0641  
Firmware version:    5.4

Test summary

Date of calibration:    12 January 2023  
The calibration was performed respecting the requirements of ISO/IEC 17025:2017.  
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.  
The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	KEYSIGHT	33511B	MY58001553
Attenuator	Cirrus Research	ZE:952	64370
Environmental Monitor	Comet	T7510	16966334
doseBadge Reader	Cirrus Research plc	RC:110A	92610

Notes

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

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CERTIFICATE OF CALIBRATION

Environmental conditions

The following conditions were recorded at the time of the test:

Before    Pressure: 98.95 kPa      Temperature: 20.9 °C      Humidity: 37.0 %  
After     Pressure: 98.97 kPa      Temperature: 21.1 °C      Humidity: 37.3 %

Test results summary

Test	Result
Absolute Acoustic Sensitivity	Complies
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies

**NOISE DOSI METER**

**MODEL : CR:110A**

**SERIAL No. : CB0643**

CERTIFICATE OF CALIBRATION

ISSUED BY  
Cirrus Research plc

DATE OF ISSUE  
12 January 2023

CERTIFICATE NUMBER  
185805



Cirrus Research plc  
Acoustic House  
Bridlington Road  
Hunmanby  
North Yorkshire  
YO14 0PH  
United Kingdom

Page 1 of 2

Approved signatory  
N.Smith  
Electronically signed:

Dosemeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer:  
Model:  
Serial number:  
Firmware version:

Cirrus Research plc  
CR:110A  
CB0643  
5.4

Notes:

Test summary

Date of calibration:

The calibration was performed respecting the requirements of ISO/IEC 17025:2017.  
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.

The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	TTi	TG4001	395851
Attenuator	Cirrus Research	ZE:952	52200
Environmental Monitor	Comet	T7510	16966334
doseBadge Reader	Cirrus Research plc	RC:110A	79620

Notes

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



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CERTIFICATE OF CALIBRATION

Certificate Number:  
185805

Page 2 of 2

Environmental conditions

The following conditions were recorded at the time of the test:

Before

Pressure: 98.92 kPa  
Temperature: 20.7 °C  
Humidity: 36.5 %

After

Pressure: 98.96 kPa  
Temperature: 20.9 °C  
Humidity: 36.5 %

Test results summary

Test	Result
Absolute Acoustic Sensitivity	Complies
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies





**NOISE DOSI METER**

**MODEL : CR:110A**

**SERIAL No. : CA8888**

CERTIFICATE OF CALIBRATION

ISSUED BY  
Cirrus Research plc

DATE OF ISSUE  
12 January 2023

CERTIFICATE NUMBER  
185817



Cirrus Research plc  
Acoustic House  
Bridlington Road  
Hunmanby  
North Yorkshire  
YO14 0PH  
United Kingdom

Page 1 of 2

Approved signatory  
N.Smith  
Electronically signed:

Dosimeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer:  
Model:  
Serial number:  
Firmware version:

Cirrus Research plc  
CR:110A  
CA8888  
5.4

Notes:

Test summary

Date of calibration: 12 January 2023

The calibration was performed respecting the requirements of ISO/IEC 17025:2017.

The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.

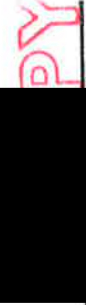
The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	KEYSIGHT	33511B	MY58001553
Attenuator	Cirrus Research	ZE:952	64370
Environmental Monitor	Comet	T7510	16966334
doseBadge Reader	Cirrus Research plc	RC:110A	92610

Notes

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



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CERTIFICATE OF CALIBRATION

Certificate Number:  
185817

Page 2 of 2

Environmental conditions

The following conditions were recorded at the time of the test:

Before  
After

Pressure: 98.94 kPa  
Pressure: 98.93 kPa

Temperature: 21.5 °C  
Temperature: 21.5 °C

Humidity: 38.4 %  
Humidity: 38.4 %

Test results summary

Test	Result
Absolute Acoustic Sensitivity	Complies
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies



**NOISE DOSI METER**

**MODEL : CR:110A**

**SERIAL No. : CA8887**



Cirrus Research plc

Acoustic House

Bridlington Road

Hummanby


North Yorkshire

YO14 0PH

United Kingdom

Page 1 of 2

Approved signatory  
N.Smith

Electronically signed:  


Dosemeter : IEC 61252-1993+A1:2000

Instrument information			Notes:
Manufacturer:	Cirrus Research plc		
Model:	CR:110A		
Serial number:	CA8887		
Firmware version:	5.4		

**Test summary**

Date of calibration: 11 January 2023

The calibration was performed respecting the requirements of ISO/IEC 17025:2017.



The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.

The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment			
Equipment	Manufacturer	Model	Serial number
Signal Generator	KEYSIGHT	33511B	MY58001553
Attenuator	Cirrus Research	ZE:952	64370
Environmental Monitor	Cornet	T7510	16966334
doseBadge Reader	Cirrus Research plc	RC:110A	92610

**Notes**

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**Environmental conditions**

The following conditions were recorded at the time of the test:

<b>Before</b>	Pressure: 99.11 kPa	Temperature: 22.4 °C	Humidity: 43.7 %
<b>After</b>	Pressure: 99.14 kPa	Temperature: 22.4 °C	Humidity: 42.9 %

**Test results summary**

Test	Result
Absolute Acoustic Sensitivity	Complies
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies

**NOISE DOSI METER**


**MODEL : CR:110A**

**SERIAL No. : CB0640**

CERTIFICATE OF CALIBRATION

ISSUED BY      Cirrus Research plc  
DATE OF ISSUE    12 January 2023      CERTIFICATE NUMBER    185802

Cirrus Research plc  
Acoustic House  
Bridlington Road  
Hunmanby  
North Yorkshire  
YO14 0PH  
United Kingdom

Page 1 of 2  
Approved signatory  
N.Smith  
Electronically signed:  


Dosimeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer:      Cirrus Research plc      Notes:  
Model:              CR:110A  
Serial number:      CB0640  
Firmware version:    5.4

Test summary

Date of calibration:    12 January 2023  
The calibration was performed respecting the requirements of ISO/IEC 17025:2017.  
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.  
The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	TTi	TG4001	395851
Attenuator	Cirrus Research	ZE-952	52200
Environmental Monitor	Comet	T7510	16966334
doseBadge Reader	Cirrus Research plc	RC:110A	79620

Notes

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

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CERTIFICATE OF CALIBRATION

Certificate Number:  
185802  
Page 2 of 2

Environmental conditions

The following conditions were recorded at the time of the test

Before    Pressure: 98.95 kPa      Temperature: 20.9 °C      Humidity: 37.0 %  
After      Pressure: 98.97 kPa      Temperature: 21.1 °C      Humidity: 37.3 %

Test results summary

Test	Result
Absolute Acoustic Sensitivity	Complies
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies

**NOISE DOSI METER**

**MODEL : CR:110A**

**SERIAL No. : CA8886**

# CERTIFICATE OF CALIBRATION

ISSUED BY      **Cirrus Research plc**  
DATE OF ISSUE    **12 January 2023**      CERTIFICATE NUMBER    **185797**

**Cirrus Research plc**  
**Acoustic House**  
**Bridlington Road**  
**Hummanby**  
**North Yorkshire**  
**YO14 0PH**  
**United Kingdom**

Page 1 of 2  
Approved signatory  
N.Smith  
Electronically signed:



## Dosimeter : IEC 61252-1993+A1:2000

### Instrument information

Manufacturer:      Cirrus Research plc      Notes:  
Model:              CR:110A  
Serial number:      CA8886  
Firmware version:    5.4

### Test summary

Date of calibration:    11 January 2023  
The calibration was performed respecting the requirements of ISO/IEC 17025:2017.  
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.  
The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

### Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	TTi	TG4001	395851
Attenuator	Cirrus Research	ZE:952	52200
Environmental Monitor	Comet	T7510	16966334
doseBadge Reader	Cirrus Research plc	RC:110A	79620

### Notes

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

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# CERTIFICATE OF CALIBRATION

### Environmental conditions

The following conditions were recorded at the time of the test:

**Before**    Pressure: 99.13 kPa      Temperature: 22.5 °C      Humidity: 42.8 %  
**After**     Pressure: 99.14 kPa      Temperature: 22.4 °C      Humidity: 43.0 %

### Test results summary

Test	Result
Absolute Acoustic Sensitivity	Complies
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies

Certificate Number:  
**185797**

Page 2 of 2



**NOISE DOSI METER**

**MODEL : CR:110A**

**SERIAL No. : CB0958**



**Cirrus Research plc**  
Acoustic House  
Bridlington Road  
Hunmanby  
North Yorkshire  
YO14 0PH  
United Kingdom

Page 1 of 2

Approved signatory  
N.Smith  
Electronically signed:  


Dosimeter : IEC 61252-1993+A1:2000

Instrument information			Notes:
Manufacturer:	Cirrus Research plc		
Model:	CR:110A		
Serial number:	CB0958		
Firmware version:	5.4		

**Test summary**  
Date of calibration: 11 January 2023  
The calibration was performed respecting the requirements of ISO/IEC 17025:2017.  
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.  
The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment			
Equipment	Manufacturer	Model	Serial number
Signal Generator	TTI	TG4001	395851
Attenuator	Cirrus Research	ZE:952	52200
Environmental Monitor	Comet	T7510	16966334
doseBadge Reader	Cirrus Research plc	RC:110A	79620

**Notes**  
Eastern Thai Consulting 1992 Co.,Ltd. 683 Moo.11 , Sukaphibal 8 Rd., Nongkham , Sriracha , Chonburi 20230

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Environmental conditions

The following conditions were recorded at the time of the test:

Before	Pressure: 99.16 kPa	Temperature: 22.3 °C	Humidity: 44.0 %
After	Pressure: 99.15 kPa	Temperature: 22.4 °C	Humidity: 43.1 %

Test results summary

Test	Result
Absolute Acoustic Sensitivity	Complies
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies

**NOISE DOSI METER**

**MODEL : CR:110A**

**SERIAL No. : CA8889**

# CERTIFICATE OF CALIBRATION

ISSUED BY      Cirrus Research plc

DATE OF ISSUE    12 January 2023      CERTIFICATE NUMBER    185795



Cirrus Research plc  
Acoustic House  
Bridlington Road  
Hummanby  
North Yorkshire  
YO14 0PH  
United Kingdom

## Dosimeter : IEC 61252-1993+A

### Instrument information

Manufacturer:      Cirrus Research plc      Notes:  
Model:              CR:110A  
Serial number:      CA8889  
Firmware version:    5.4

### Test summary

Date of calibration:    12 January 2023  
The calibration was performed respecting the requirements of ISO/IEC 17025:2017.  
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.  
The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

### Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	KEYSIGHT	33511B	MY58001553
Attenuator	Cirrus Research	ZE:952	64370
Environmental Monitor	Comet	T7510	15966334
doseBadge Reader	Cirrus Research plc	RC:110A	92610

### Notes

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

This certificate provides traceability of measurement to the SI system of units and/or to units of measurement of a national metrology institute. This certificate may not be reproduced or used for any other purpose without the written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a coverage probability of approximately 95%.

# CERTIFICATE OF CALIBRATION

### Environmental conditions

The following conditions were recorded at the time of the test:

Before    Pressure: 98.92 kPa      Temperature: 20.7 °C      Humidity: 36.7 %  
After     Pressure: 98.95 kPa      Temperature: 20.9 °C      Humidity: 36.5 %

### Test results summary

Test	Result
Absolute Acoustic Sensitivity	Complies
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies

Certificate Number:  
185795

Page 2 of 2

**NOISE DOSI METER**

**MODEL : CR:110A**

**SERIAL No. : CA8879**

CERTIFICATE OF CALIBRATION

ISSUED BY      Cirrus Research plc  
DATE OF ISSUE    12 January 2023    CERTIFICATE NUMBER 185796

Cirrus Research plc  
Acoustic House  
Bridlington Road  
Hunmanby  
North Yorkshire  
YO14 0PH  
United Kingdom

Dosimeter : IEC 61252-1993+

Instrument information

Manufacturer:      Cirrus Research plc      Notes:  
Model:              CR:110A  
Serial number:      CA8879  
Firmware version:    5.4

Test summary

Date of calibration:    11 January 2023  
The calibration was performed respecting the requirements of ISO/IEC 17025:2017.  
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.  
The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	KEYSIGHT	33511B	MY58001553
Attenuator	Cirrus Research	ZE:952	64370
Environmental Monitor	Comet	T7510	16966334
doseBadge Reader	Cirrus Research plc	RC:110A	92610

Notes

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

This certificate provides traceability of measurement to the SI system of units and/or to units of a recognised national metrology institute. This certificate may not be reproduced or used in any way without the prior written approval of the issuing laboratory. The results within this certificate relate only to the items called out and are not to be taken as an approval of the standard uncertainty multiplied by a coverage factor k=2, providing a coverage probability of approximately 95%.

CERTIFICATE OF CALIBRATION

Certificate Number:  
185796

Page 2 of 2

Environmental conditions

The following conditions were recorded at the time of the test:

Before    Pressure: 99.14 kPa      Temperature: 22.3 °C      Humidity: 43.0 %  
After     Pressure: 99.14 kPa      Temperature: 22.4 °C      Humidity: 43.4 %

Test results summary

Test	Result
Absolute Acoustic Sensitivity	Complies
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies

**NOISE DOSI METER**

**MODEL : CR:110A**

**SERIAL No. : CB0644**

CERTIFICATE OF CALIBRATION

ISSUED BY      Cirrus Research plc

DATE OF ISSUE    12 January 2023    CERTIFICATE NUMBER    185807

Cirrus Research plc  
Acoustic House  
Bridlington Road  
Hunmanby  
North Yorkshire  
YO14 0PH  
United Kingdom

Dosimeter : IEC 61252-1993+A1

Instrument information

Manufacturer:      Cirrus Research plc      Notes:  
Model:              CR:110A  
Serial number:      CB0644  
Firmware version:    5.4

Test summary

Date of calibration:    11 January 2023  
The calibration was performed respecting the requirements of ISO/IEC 17025:2017.  
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.  
The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	TTI	TG4001	395851
Attenuator	Cirrus Research	ZE:952	52200
Environmental Monitor	Comet	T7510	16966334
doseBadge Reader	Cirrus Research plc	RC:110A	79620

Notes

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

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CERTIFICATE OF CALIBRATION

Certificate Number:  
185807

Page 2 of 2

Environmental conditions

The following conditions were recorded at the time of the test:

Before    Pressure: 99.14 kPa    Temperature: 22.5 °C    Humidity: 43.1 %  
After    Pressure: 99.13 kPa    Temperature: 22.5 °C    Humidity: 43.6 %

Test results summary

Test	Result
Absolute Acoustic Sensitivity	Complies
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies



**NOISE DOSI METER**

**MODEL : CR:110A**

**SERIAL No. : CB0954**

CERTIFICATE OF CALIBRATION

ISSUED BY      Cirrus Research plc  
DATE OF ISSUE    12 January 2023    CERTIFICATE NUMBER    185813

Cirrus Research plc  
Acoustic House  
Bridlington Road  
Hunmanby  
North Yorkshire  
YO14 0PH  
United Kingdom

Page 1 of 2  
Approved signatory  
N.Smith  
Electronically signed:

Dosimeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer:      Cirrus Research plc      Notes:  
Model:              CR:110A  
Serial number:      CB0954  
Firmware version:    5.4

Test summary

Date of calibration:    11 January 2023  
The calibration was performed respecting the requirements of ISO/IEC 17025:2017.  
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.  
The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	TTI	TG4001	395851
Attenuator	Cirrus Research	ZE:952	52200
Environmental Monitor	Comet	T7510	16966334
doseBadge Reader	Cirrus Research plc	RC:110A	79620

Notes

Eastern That Consulting 1992 Co.,Ltd. 683 Moo.11 , Sukaphibal 8 Rd., Nongkham , Sriracha , Chonburi 20230

This certificate provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a coverage probability of approximately 95%.

CERTIFICATE OF CALIBRATION

Certificate Number:  
185813  
Page 2 of 2

Environmental conditions

The following conditions were recorded at the time of the test:

Before    Pressure:    99.13 kPa    Temperature:    22.3 °C    Humidity:    43.2 %  
After    Pressure:    99.11 kPa    Temperature:    22.3 °C    Humidity:    43.4 %

Test results summary

Test	Result
Absolute Acoustic Sensitivity	Complies
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies

**NOISE DOSI METER**

**MODEL : CR:110A**

**SERIAL No. : CB0956**

CERTIFICATE OF CALIBRATION

ISSUED BY      Cirrus Research plc  
DATE OF ISSUE    12 January 2023      CERTIFICATE NUMBER    185821

**Cirrus Research plc**  
**Acoustic House**  
**Bridlington Road**  
**Hunmanby**  
**North Yorkshire**  
**YO14 0PH**  
**United Kingdom**

Page 1 of 2  
Approved signatory  
N.Smith  
Electronically signed:

Dosimeter : IEC 61252-1993+A1:

Instrument information

Manufacturer:      Cirrus Research plc      Notes:  
Model:              CR:110A  
Serial number:      CB0956  
Firmware version:    5.4

Test summary

Date of calibration:    11 January 2023  
The calibration was performed respecting the requirements of ISO/IEC 17025:2017.  
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.  
The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	TTi	TG4001	395851
Attenuator	Cirrus Research	ZE:952	52200
Environmental Monitor	Comet	T7510	16966334
doseBadge Reader	Cirrus Research plc	RC:110A	79620

Notes

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

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CERTIFICATE OF CALIBRATION

Environmental conditions

The following conditions were recorded at the time of the test:

Before    Pressure: 99.16 kPa      Temperature: 22.3 °C      Humidity: 43.9 %  
After     Pressure: 99.16 kPa      Temperature: 22.4 °C      Humidity: 43.4 %

Test results summary

Test	Result
Absolute Acoustic Sensitivity	Complies
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies

**NOISE DOSI METER**

**MODEL : CR:110A**

**SERIAL No. : CB0957**

CERTIFICATE OF CALIBRATION

ISSUED BY      Cirrus Research plc  
DATE OF ISSUE    12 January 2023      CERTIFICATE NUMBER    185809



Cirrus Research plc  
Acoustic House  
Bridlington Road  
Hunmanby  
North Yorkshire  
YO14 0PH  
United Kingdom

Page 1 of 2  
Approved signatory  
N.Smith  
Electronically signed:



Dosimeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer:    Cirrus Research plc      Notes:  
Model:            CR:110A  
Serial number:    CB0957  
Firmware version: 5.4

Test summary

Date of calibration:    12 January 2023  
The calibration was performed respecting the requirements of ISO/IEC 17025:2017.  
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.  
The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	KEYSIGHT	33511B	MY58001553
Attenuator	Cirrus Research	ZE:952	64370
Environmental Monitor	Comet	T7510	16966334
doseBadge Reader	Cirrus Research plc	RC:110A	92610

Notes

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CERTIFICATE OF CALIBRATION

Certificate Number:  
185809

Page 2 of 2

Environmental conditions

The following conditions were recorded at the time of the test:

Before    Pressure: 98.97 kPa      Temperature: 21.1 °C      Humidity: 37.2 %  
After     Pressure: 98.96 kPa      Temperature: 21.3 °C      Humidity: 38.0 %

Test results summary

Test	Result
Absolute Acoustic Sensitivity	Complies
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies



**NOISE DOSI METER**

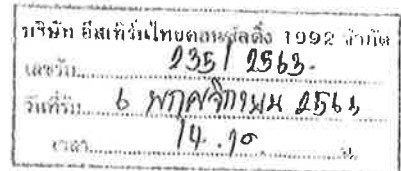
**MODEL : CR:110A**

**SERIAL No. : CB0955**





ภาคผนวก ง : หนังสืออนุญาตขึ้นทะเบียน  
ห้องปฏิบัติการวิเคราะห์เอกชน



ที่ อก ๐๓๑๐(๓)/ ๑๒๕๐๐

กรมโรงงานอุตสาหกรรม  
ถนนพระรามที่ ๖ เขตราชเทวี  
กรุงเทพมหานคร ๑๐๕๐๐

๐๓ พฤศจิกายน ๒๕๖๓

เรื่อง ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท อีสเทิร์น ไทย คอนซัลติ้ง ๑๙๙๒ จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน  
ลงวันที่ ๑๕ มิถุนายน ๒๕๖๓

- สิ่งที่ส่งมาด้วย ๑. รายชื่อผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๓๑ ราย  
๒. รายชื่อเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๓๑ ราย  
๓. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๑๑๗ รายการ

ตามหนังสือที่อ้างถึง บริษัท อีสเทิร์น ไทย คอนซัลติ้ง ๑๙๙๒ จำกัด ขอต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ๖-๐๐๓ สถานที่ตั้งเลขที่ ๖๘๓ หมู่ที่ ๑๑ ถนนสุขุมวิท ๘ ตำบลหนองขาม อำเภอศรีราชา จังหวัดชลบุรี ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท อีสเทิร์น ไทย คอนซัลติ้ง ๑๙๙๒ จำกัด ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน โดยมีองค์ประกอบดังนี้

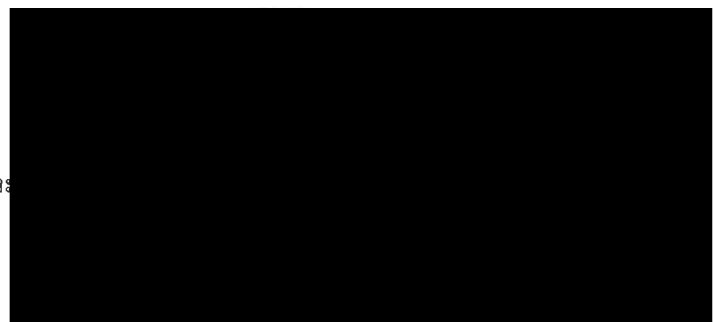
- ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๓๑ ราย ตามสิ่งที่ส่งมาด้วย ๑  
ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๓๑ ราย ตามสิ่งที่ส่งมาด้วย ๒  
ค. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย จำนวน ๔๓ รายการ  
อากาศเสีย (ปล่องระบาย) จำนวน ๒๑ รายการ น้ำใต้ดิน จำนวน ๑๙ รายการ ดิน จำนวน ๑๖ รายการ  
และสิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน ๑๘ รายการ รวมทั้งสิ้นจำนวน ๑๑๗ รายการ ตามสิ่งที่ส่งมาด้วย ๓

หนังสือฉบับนี้จะหมดอายุในวันที่ ๕ กรกฎาคม ๒๕๖๖ หากประสงค์จะต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอต่อม กรมโรงงานอุตสาหกรรมภายใน ๓๐ วัน ก่อนวันสิ้นอายุของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ซึ่งคำขอต่ออายุดังกล่าวขอรับได้ที่กรมโรงงานอุตสาหกรรม

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

กองวิจัยและเตือนภัยมลพิษโรงงาน  
ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก  
โทร. ๐ ๓๘๐๕ ๗๒๖๑-๓  
โทรสาร ๐ ๓๘๐๕ ๗๒๖๓



เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

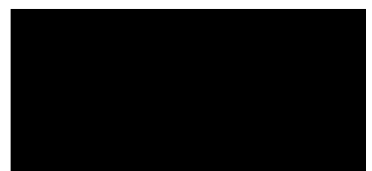
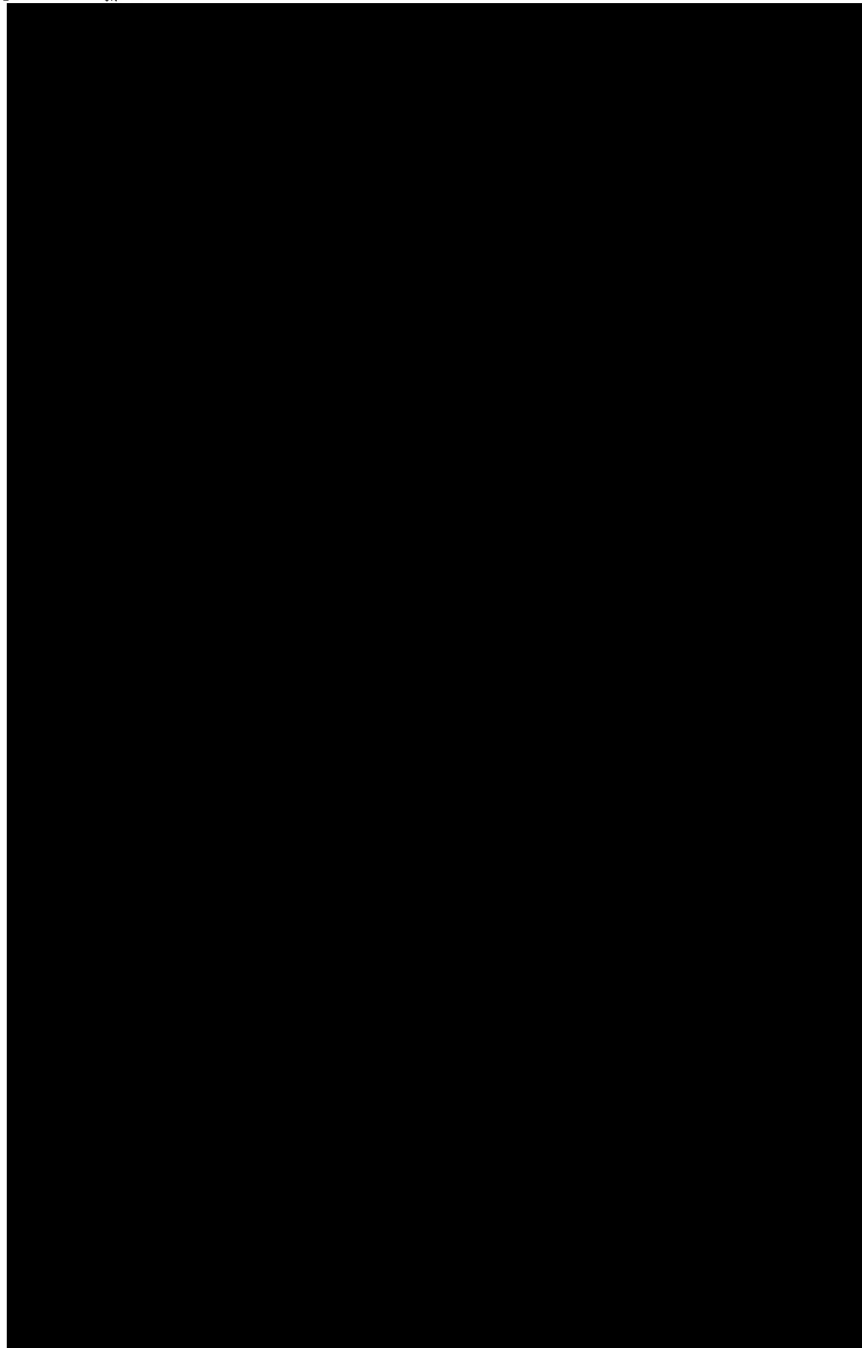
บริษัท อีสเทิร์น ไทย คอนซัลติ้ง ๑๙๙๒ จำกัด

เลขทะเบียน ว-๐๐๓

ที่ อก ๐๓๑๐(๓)/ ๑ ๒ ๔ ๐ ๐

ลงวันที่ ๐๓ พฤศจิกายน ๒๕๖๓

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๓๑ ราย



เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

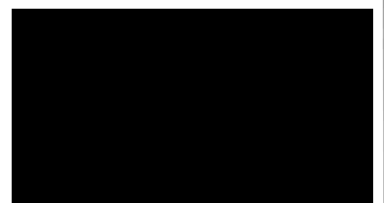
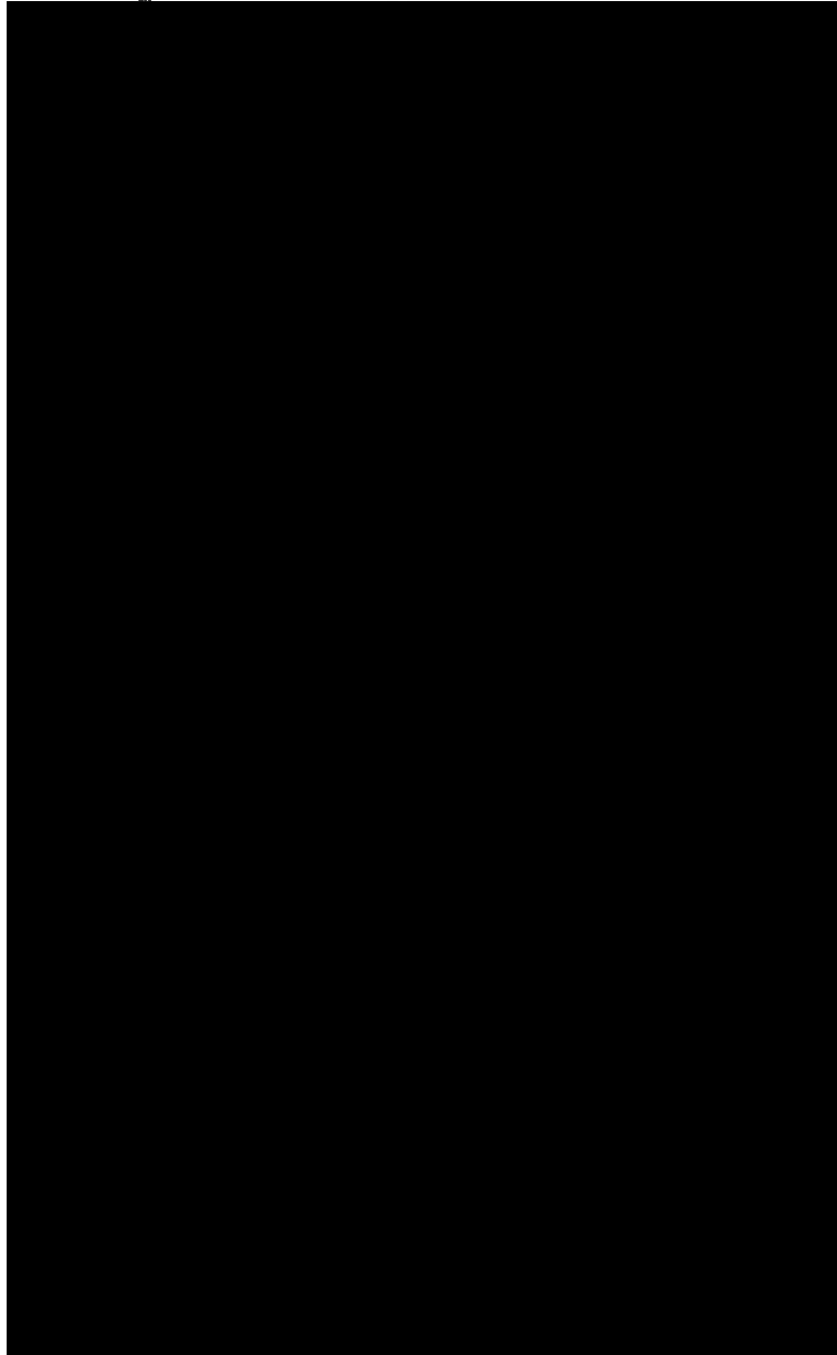
บริษัท อีสเทิร์น ไทย คอนซัลติ้ง ๑๙๙๒ จำกัด

เลขทะเบียน ว-๐๐๓

ที่ อก ๐๓๑๐(๓)/ ๑ ๒ ๕ ๐ ๐

ลงวันที่ ๐๓ พฤศจิกายน ๒๕๖๓

ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๓๑ ราย



เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท อีสเทิร์น ไทย คอนซัลติ้ง ๑๙๙๒ จำกัด

เลขทะเบียน ว-๐๐๓

ที่ อก ๐๓๑๐(๓)/ ๑ ๒ ๔ ๐ ๐

ลงวันที่ ๐๓ พฤศจิกายน ๒๕๖๓

ขอขยายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๑๑๗ รายการ  
น้ำเสีย จำนวน 43 รายการ

ลำดับที่	ชนิดสารมลพิษ	วิธีวิเคราะห์
1	Aldrin	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[4]</sup>
2	Arsenic	1) Continuous Hydride Generation/Atomic Absorption Spectrometric Method <sup>[4]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>
3	Barium	Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>
4	$\alpha$ -BHC	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[4]</sup>
5	$\beta$ -BHC	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[4]</sup>
6	$\delta$ -BHC	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[4]</sup>
7	$\gamma$ -BHC	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[4]</sup>
8	Biochemical Oxygen Demand	1) 5-Day BOD Test, Membrane Electrode Method <sup>[4]</sup> 2) 5-Day BOD Test, Azide Modification Method <sup>[4]</sup>
9	Cadmium	Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>
10	Chemical Oxygen Demand	Closed Reflux, Titrimetric Method <sup>[4]</sup>
11	cis-Chlordane	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[4]</sup>
12	trans-Chlordane	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[4]</sup>
13	Chromium	1) Digestion, Direct Air-Acetylene Flame Method <sup>[4]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>
14	Color	ADMI Weighted-Ordinate Spectrophotometric Method <sup>[4]</sup>
15	Copper	1) Digestion, Direct Air-Acetylene Flame Method <sup>[4]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>
16	Cyanide	Distillation, Colorimetric Method <sup>[4]</sup>

ลำดับที่	ชนิดสารมลพิษ	วิธีวิเคราะห์
17	4,4'-DDD	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[4]</sup>
18	4,4'-DDE	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[4]</sup>
19	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[4]</sup>
20	Endosulfan I	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[4]</sup>
21	Endosulfan II	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[4]</sup>
22	Endosulfan sulfate	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[4]</sup>
23	Endrin aldehyde	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[4]</sup>
24	Endrin ketone	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[4]</sup>
25	Formaldehyde	Distillation, Colorimetric Method <sup>[3]</sup>
26	Free Chlorine	1) Iodometric Method <sup>[4]</sup> 2) Colorimetric Method <sup>[c]</sup>
27	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[4]</sup>
28	Heptachlor epoxide	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[4]</sup>
29	Hexavalent Chromium	Filtration, Colorimetric Method <sup>[4]</sup>
30	Lead	1) Digestion, Direct Air-Acetylene Flame Method <sup>[4]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>
31	Manganese	Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>
32	Mercury	Cold-Vapor Atomic Absorption Spectrometric Method <sup>[4]</sup>
33	Nickel	1) Digestion, Direct Air-Acetylene Flame Method <sup>[4]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>
34	Oil and Grease	Partition-Gravimetric Method <sup>[4]</sup>
35	pH	Electrometric Method <sup>[4]</sup>

ลำดับที่	ชนิดสารมลพิษ	วิธีวิเคราะห์
36	Phenols	Distillation, Direct Photometric Method <sup>[4]</sup>
37	Sulfide	ZnS Precipitation, Iodometric Method <sup>[4]</sup>
38	Temperature	Laboratory and Field Method <sup>[4]</sup>
39	Trivalent Chromium	1) Digestion, Direct Air-Acetylene Flame Method; Filtration, Colorimetric Method; Calculation <sup>[4]</sup> 2) Digestion, Inductively Coupled Plasma Method; Filtration, Colorimetric Method; Calculation <sup>[4]</sup>
40	Total Dissolved Solids	Dried at 180 °C <sup>[4]</sup>
41	Total Kjeldahl Nitrogen	Macro Kjeldahl Method <sup>[4]</sup>
42	Total Suspended Solids	Dried at 103-105 °C <sup>[4]</sup>
43	Zinc	Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>

**อากาศเสีย (ปล่อยระบาย) จำนวน 21 รายการ**

ลำดับที่	ชนิดสารมลพิษ	วิธีวิเคราะห์
1	Antimony	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>[5]</sup>
2	Arsenic	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>[5]</sup>
3	Cadmium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>[5]</sup>
4	Carbon Monoxide	Bag, Non-Dispersive Infrared Method <sup>[5]</sup>
5	Chromium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>[5]</sup>
6	Cobalt	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>[5]</sup>
7	Copper	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>[5]</sup>
8	Hydrogen Sulfide	Absorption Sampling, Iodometric Method <sup>[5]</sup>
9	Lead	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>[5]</sup>
10	Manganese	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>[5]</sup>

ลำดับที่	ชนิดสารมลพิษ	วิธีวิเคราะห์
11	Mercury	Isokinetic Sampling, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>[5]</sup>
12	Nickel	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>[5]</sup>
13	Opacity	Ringelmann's Method <sup>[1]</sup>
14	Oxide of Nitrogen	1) Absorption Sampling, Phenoldisulfonic Acid Method <sup>[5]</sup> 2) Instrumental Analyzer Method <sup>[5]</sup>
15	Selenium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>[5]</sup>
16	Sulfur Dioxide	1) Absorption Sampling, Barium-Thorin Titrimetric Method <sup>[5]</sup> 2) Instrumental Analyzer Method <sup>[5]</sup>
17	Sulfuric Acid	Isokinetic Sampling, Barium-Thorin Titrimetric Method <sup>[5]</sup>
18	Tin	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>[5]</sup>
19	Total Suspended Particulate	Isokinetic Sampling, Gravimetric Method <sup>[5]</sup>
20	Vanadium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>[5]</sup>
21	Xylene	Adsorption Sampling, Gas Chromatographic Method <sup>[5]</sup>

**น้ำใต้ดิน จำนวน 19 รายการ**

ลำดับที่	ชนิดสารมลพิษ	วิธีวิเคราะห์
1	Antimony	Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>
2	Arsenic	1) Continuous Hydride Generation/Atomic Absorption Spectrometric Method <sup>[4]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>
3	Barium	Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>
4	Beryllium	Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>
5	Cadmium	Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>
6	Chromium	1) Digestion, Direct Air-Acetylene Flame Method <sup>[4]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>
7	Cyanide	Distillation, Colorimetric Method <sup>[4]</sup>
8	Hexavalent Chromium	Filtration, Colorimetric Method <sup>[4]</sup>



ลำดับที่	ชนิดสารมลพิษ	วิธีวิเคราะห์
9	Lead	1) Digestion, Direct Air-Acetylene Flame Method <sup>[4]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>
10	Manganese	Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>
11	Mercury	Cold-Vapor Atomic Absorption Spectrometric Method <sup>[4]</sup>
12	Nickel	1) Digestion, Direct Air-Acetylene Flame Method <sup>[4]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>
13	pH	Electrometric Method <sup>[4]</sup>
14	Phenols	Distillation, Direct Photometric Method <sup>[4]</sup>
15	Selenium	Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>
16	Silver	Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>
17	Trivalent Chromium	1) Digestion, Direct Air-Acetylene Flame Method; Filtration, Colorimetric Method; Calculation <sup>[4]</sup> 2) Digestion, Inductively Coupled Plasma Method; Filtration, Colorimetric Method; Calculation <sup>[4]</sup>
18	Vanadium	Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>
19	Zinc	Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>

**ดิน จำนวน 16 รายการ**

ลำดับที่	ชนิดสารมลพิษ	วิธีวิเคราะห์
1	Antimony	Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup>
2	Arsenic	Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup>
3	Barium	Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup>
4	Beryllium	Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup>
5	Cadmium	Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup>
6	Chromium	Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup>
7	Hexavalent Chromium	Alkaline Digestion, Colorimetric Method <sup>[9,10]</sup>
8	Lead	Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup>
9	Manganese	Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup>
10	Mercury	Digestion, Cold vapor Atomic Absorption Spectrometric Method <sup>[6,8]</sup>
11	Nickel	Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup>
12	Selenium	Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup>
13	Silver	Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup>

ลำดับที่	ชนิดสารมลพิษ	วิธีวิเคราะห์
14	Trivalent Chromium	1) Digestion, Inductively Coupled Plasma Method; Filtration, Colorimetric Method; Calculation <sup>[6,7]</sup> 2) Alkaline Digestion, Colorimetric Method; Calculation <sup>[9,10]</sup>
15	Vanadium	Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup>
16	Zinc	Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup>

**สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน 18 รายการ**

ลำดับที่	ชนิดสารมลพิษ	วิธีวิเคราะห์
1	Antimony	Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup>
2	Arsenic	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[2,6,7]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup>
3	Barium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[2,6,7]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup>
4	Beryllium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[2,6,7]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup>
5	Cadmium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[2,6,7]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup>
6	Chromium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[2,6,7]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup>
7	Cobalt	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[2,6,7]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup>
8	Copper	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[2,6,7]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup>
9	Hexavalent chromium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[2,6,7]</sup> 2) Alkaline Digestion, Colorimetric Method <sup>[9,10]</sup>

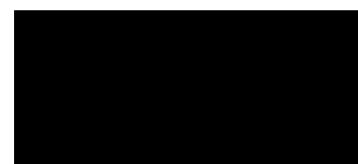
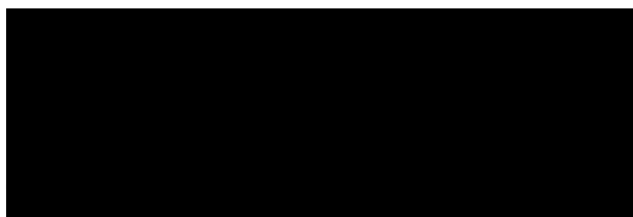
ลำดับที่	ชนิดสารมลพิษ	วิธีวิเคราะห์
10	Lead	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[2,6,7]</sup>
11	Mercury	2) Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup> 1) Waste Extraction, Digestion, Cold Vapor Atomic Absorption Spectrometric Method <sup>[2,8]</sup> 2) Digestion, Cold vapor Atomic Absorption Spectrometric Method <sup>[6,8]</sup>
12	Nickel	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[2,6,7]</sup>
13	Molybdenum	2) Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup> 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[2,6,7]</sup>
14	Selenium	2) Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup> 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[2,6,7]</sup>
15	Silver	2) Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup> 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[2,6,7]</sup>
16	Thallium	2) Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup> 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[2,6,7]</sup>
17	Vanadium	2) Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup> 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[2,6,7]</sup>
18	Zinc	2) Digestion, Inductively Coupled Plasma Method <sup>[6,7]</sup> 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[2,6,7]</sup>

#### เอกสารอ้างอิง

1. กระทรวงอุตสาหกรรม. ประกาศกระทรวงอุตสาหกรรม พ.ศ.2549 เรื่องกำหนดค่าปริมาณ  
เขม่าควันที่เจือปนในอากาศที่ระบายออกจากปล่องของหม้อน้ำโรงสีข้าวที่ใช้แก๊สเป็นเชื้อเพลิง.  
ราชกิจจานุเบกษา. 4 ธันวาคม 2549. เล่มที่ 123 ตอนพิเศษ 125 ง.

2. กระทรวงอุตสาหกรรม. ประกาศกระทรวงอุตสาหกรรม พ.ศ.2548 เรื่อง การกำจัดสิ่งปฏิกูล  
หรือวัสดุที่ไม่ใช้แล้ว. ราชกิจจานุเบกษา. 25 มกราคม 2549. เล่มที่ 123 ตอนพิเศษ 11ง.

3. สมาคมวิศวกรรมสิ่งแวดล้อมแห่งประเทศไทย. คู่มือวิเคราะห์น้ำเสีย. พิมพ์ครั้งที่ 4. กรุงเทพฯ: เรือนแก้วการพิมพ์, 2547.
4. APHA, AWWA, WEF. **Standard Methods for the Examination of Water and Wastewater**. 23<sup>rd</sup> ed. Washington, DC : APHA, 2017
5. United States Environmental Protection Agency. **Standard of Performance for New Stationary Sources**. 40 CFR Part 60. Appendix A, 2019.
6. United States Environmental Protection Agency. Acid Digestion of Sediments Sludge and Soils. **SW-846 Method 3050B**, 1996.
7. United States Environment Protection Agency, Inductively Coupled Plasma-Atomic Emission spectrometry. **SW-846 Method 6010C**, 2007.
8. United States Environment Protection Agency. Mercury in Solid or Semisolid Waste (Manual Cold-Vapor Technique). **SW-846 Method 7471B**, 2007.
9. United States Environment Protection Agency. Alkaline digestion for Hexavalent Chromium. **SW-846 Method 3060A**, 1996.
10. United States Environment Protection Agency. Chromium. Hexavalent (Colormetric). **SW-846 Method 7196A**, 1992





บริษัท สีสันไทยคอส จำกัด 1992 จำกัด
เลขที่ 048/2564
วันที่ 17/8/64
เลข 15 26

ที่ อก ๐๓๑๐(๓)/ ๗ ๔ ๒๓

กรมโรงงานอุตสาหกรรม  
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท  
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๐ ๔ สิงหาคม ๒๕๖๔

เรื่อง เปลี่ยนแปลงบุคลากรและสารมลพิษที่วิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท อีสเทิร์น ไทย คอนซัลติ้ง ๑๙๙๒ จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน  
ลงวันที่ ๑๕ มิถุนายน ๒๕๖๔

สิ่งที่ส่งมาด้วย เอกสารแนบท้ายหนังสือเปลี่ยนแปลงบุคลากรและสารมลพิษที่วิเคราะห์  
บริษัท อีสเทิร์น ไทย คอนซัลติ้ง ๑๙๙๒ จำกัด จำนวน ๓ แผ่น

ตามหนังสือที่อ้างถึง บริษัท อีสเทิร์น ไทย คอนซัลติ้ง ๑๙๙๒ จำกัด ห้องปฏิบัติการวิเคราะห์  
เอกชน เลขทะเบียน ๖-๐๐๓ สถานที่ตั้งเลขที่ ๖๘๓ หมู่ที่ ๑๑ ถนนสุขาภิบาล ๘ ตำบลหนองขาม อำเภอสรีราชา  
จังหวัดชลบุรี ขอเปลี่ยนแปลงบุคลากรและสารมลพิษที่วิเคราะห์ ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว มีความเห็นดังนี้

ก. ให้ยกเลิกผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๒ ราย

[Redacted]

ข. ให้ยกเลิกเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑ ราย

[Redacted]

ค. ให้เพิ่มเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๕ ราย

[Redacted]

ง. ให้เพิ่มขอบข่ายสารมลพิษที่วิเคราะห์ในน้ำใต้ดิน จำนวน ๔๑ รายการ ตามสิ่งที่ส่งมาด้วย

อนึ่ง หนังสือฉบับนี้จะหมดอายุพร้อมหนังสือต่ออายุรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์  
เอกชน ที่ อก ๐๓๑๐(๓)/๑๒๔๐๐ ลงวันที่ ๓ พฤศจิกายน ๒๕๖๓ คือในวันที่ ๕ กรกฎาคม ๒๕๖๖

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

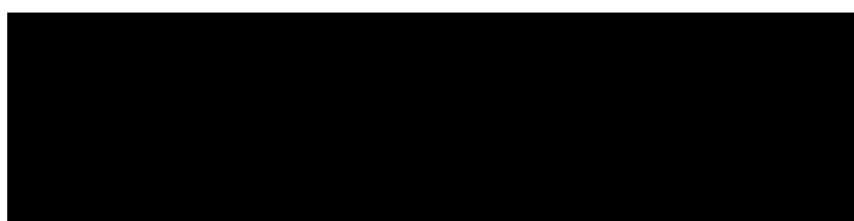
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กองวิจัยและเตือนภัยมลพิษโรงงาน  
ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาค  
โทร. ๐ ๓๘๐๕ ๗๒๖๑-๓  
ไปรษณีย์อิเล็กทรอนิกส์ eirw@diw.mail.go.th

เอกสารแนบท้ายหนังสือเปลี่ยนแปลงบุคลากรและชนิดสารมลพิษที่วิเคราะห์  
บริษัท อีสเทิร์น ไทย คอนซัลติ้ง ๑๙๙๒ จำกัด เลขทะเบียน ว-๐๐๓  
ที่ ออก ๐๓๑๐(๓)/ ๗๔๒๓ ลงวันที่ ๐๔ สิงหาคม ๒๕๖๔

ขอขยายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๔๑ รายการ  
น้ำใต้ดิน จำนวน 41 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Acetone	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method
2	Benzene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method
3	Bromodichloromethane	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method
4	Bromoform	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method
5	Butanol	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method
6	Carbon disulfide	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method
7	Carbon tetrachloride	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method
8	Chlorobenzene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method
9	Chlorodibromomethane	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method
10	Chloroform	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method
11	Dichloromethane	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method
12	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method
13	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method
14	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method



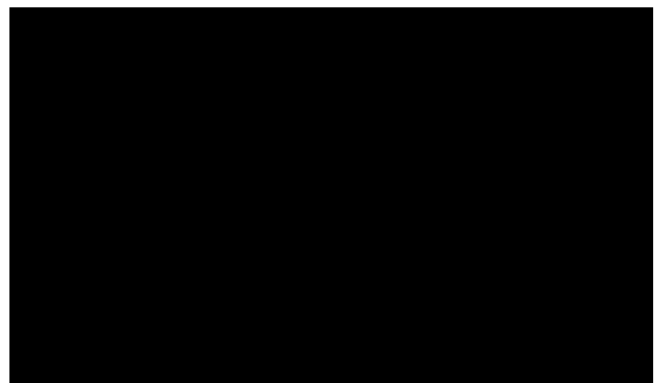
15 1,1-Dichloroethane...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
15	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method
16	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method
17	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method
18	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method
19	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method
20	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method
21	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method
22	Ethylbenzene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method
23	n-Hexane	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method
24	Methyl tert-butyl ether	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method
25	Naphthalene	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method
26	Nitrobenzene	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method
27	Styrene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method
28	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method
29	Tetrachloroethylene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method
30	Toluene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
31	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method
32	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method
33	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method
34	Trichloroethylene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method
35	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method
36	Vinyl acetate	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method
37	Vinyl chloride	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method
38	m-Xylene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method
39	o-Xylene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method
40	p-Xylene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method
41	Xylene Total	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method

#### เอกสารอ้างอิง

APHA, AWWA, WEF. Standard Methods for the Examination of Water and Wastewater, 23<sup>rd</sup> ed. Washington, DC : APHA, 2017







ที่ อก ๐๓๑๐(๓)/ ๑ ๒ ๒๘ ๐

กรมโรงงานอุตสาหกรรม  
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท  
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๐๗ ธันวาคม ๒๕๖๕

เรื่อง เปลี่ยนแปลงบุคลากรและสารมลพิษที่วิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท อีสเทิร์น ไทย คอนซัลติ้ง ๑๙๙๒ จำกัด

อ้างถึง คำขอเปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน  
ลงวันที่ ๑๔ ตุลาคม ๒๕๖๔

สิ่งที่ส่งมาด้วย เอกสารแนบท้ายหนังสือเปลี่ยนแปลงบุคลากรและสารมลพิษที่วิเคราะห์  
บริษัท อีสเทิร์น ไทย คอนซัลติ้ง ๑๙๙๒ จำกัด จำนวน ๔ แผ่น

ตามที่อ้างถึง บริษัท อีสเทิร์น ไทย คอนซัลติ้ง ๑๙๙๒ จำกัด ห้องปฏิบัติการวิเคราะห์เอกชน

ขอเปลี่ยนแปลงบุคลากรและสารมลพิษที่วิเคราะห์ ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว มีความเห็นดังนี้

๑. ให้เพิ่มเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๒ ราย

๒. ให้เพิ่มขอบข่ายสารมลพิษท่วเคราะห์หนาเสีย จำนวน ๑ รายการ นาเตตน จำนวน  
๑ รายการ และดิน จำนวน ๔๑ รายการ รวมทั้งสิ้นจำนวน ๔๓ รายการ ตามสิ่งที่ส่งมาด้วย

อนึ่ง หนังสือฉบับนี้จะหมดอายุพร้อมหนังสือต่ออายุรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์  
เอกชน ที่ อก ๐๓๑๐(๓)/๑๒๔๐๐ ลงวันที่ ๓ พฤศจิกายน ๒๕๖๓ คือในวันที่ ๕ กรกฎาคม ๒๕๖๖

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

กองวิจัยและเตือนภัยมลพิษโรงงาน  
ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก  
โทร. ๐ ๓๘๐๕ ๗๒๖๑-๓  
ไปรษณีย์อิเล็กทรอนิกส์ eirw@diw.mail.go.th

เอกสารแนบท้ายหนังสือเปลี่ยนแปลงบุคลากรและชนิดสารมลพิษที่วิเคราะห์

บริษัท อีสเทิร์น ไทย คอนซัลติ้ง ๑๙๙๒ จำกัด

เลขทะเบียน ว-๐๐๓

ที่ อก ๐๓๑๐(๓)/ ๑๒๒๘๐

ลงวันที่ ๐๗ ธันวาคม ๒๕๖๕

ขอขยายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๔๓ รายการ  
น้ำเสีย จำนวน 1 รายการ

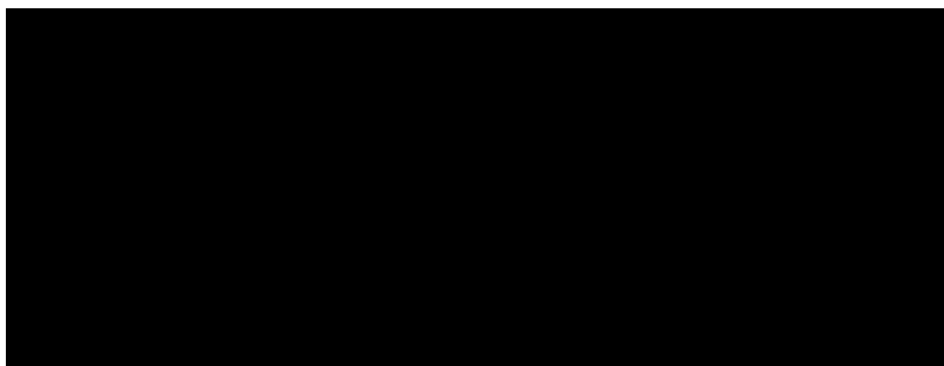
ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Selenium	Digestion, Hydride Generation/Atomic Absorption Spectrophotometer Method <sup>[1]</sup>

น้ำใต้ดิน จำนวน 1 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Selenium	Digestion, Hydride Generation/Atomic Absorption Spectrophotometer Method <sup>[1]</sup>

ดิน จำนวน 41 รายการ

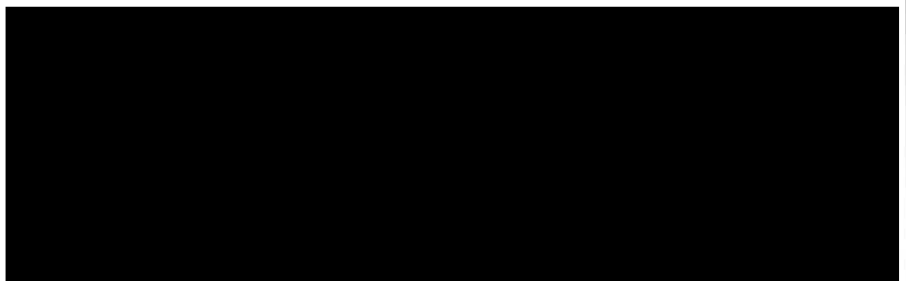
ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Acetone	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method <sup>[2,3]</sup>
2	Benzene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method <sup>[2,3]</sup>
3	Bromodichloromethane	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method <sup>[2,3]</sup>
4	Bromoform	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method <sup>[2,3]</sup>
5	Butanol	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method <sup>[2,3]</sup>
6	Carbon disulfide	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method <sup>[2,3]</sup>
7	Carbon tetrachloride	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method <sup>[2,3]</sup>



8 Chlorobenzene...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
8	Chlorobenzene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method <sup>[2,3]</sup>
9	Chlorodibromomethane	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method <sup>[2,3]</sup>
10	Chloroform	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method <sup>[2,3]</sup>
11	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method <sup>[2,3]</sup>
12	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method <sup>[2,3]</sup>
13	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method <sup>[2,3]</sup>
14	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method <sup>[2,3]</sup>
15	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method <sup>[2,3]</sup>
16	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method <sup>[2,3]</sup>
17	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method <sup>[2,3]</sup>
18	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method <sup>[2,3]</sup>
19	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method <sup>[2,3]</sup>
20	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method <sup>[2,3]</sup>
21	Ethylbenzene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method <sup>[2,3]</sup>
22	n-Hexane	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method <sup>[2,3]</sup>
23	Methylene Chloride	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method <sup>[2,3]</sup>

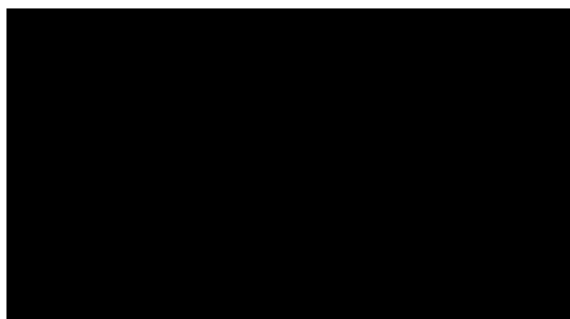
ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
24	Methyl tert-butyl ether	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method <sup>[2,3]</sup>
25	Naphthalene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method <sup>[2,3]</sup>
26	Nitrobenzene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method <sup>[2,3]</sup>
27	Styrene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method <sup>[2,3]</sup>
28	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method <sup>[2,3]</sup>
29	Tetrachloroethylene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method <sup>[2,3]</sup>
30	Toluene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method <sup>[2,3]</sup>
31	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method <sup>[2,3]</sup>
32	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method <sup>[2,3]</sup>
33	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method <sup>[2,3]</sup>
34	Trichloroethylene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method <sup>[2,3]</sup>
35	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method <sup>[2,3]</sup>
36	Vinyl Acetate	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method <sup>[2,3]</sup>
37	Vinyl Chloride	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method <sup>[2,3]</sup>
38	m-Xylene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method <sup>[2,3]</sup>



ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
39	o-Xylene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method <sup>[2,3]</sup>
40	p-Xylene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method <sup>[2,3]</sup>
41	Xylene (Total)	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method <sup>[2,3]</sup>

#### เอกสารอ้างอิง

1. APHA, AWWA, WEF. Standard Methods for the Examination of Water and Wastewater. 23<sup>rd</sup> ed. Washington, DC : APHA, 2017
2. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Closed-System Purge-and-Trap and Extraction for Volatile Organics in Soil and Waste Samples. SW-846 Method 5035A, 2002.
3. United States Environment Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS). SW-846 Method 8260D, 2018.





ที่ อก ๐๓๒๐/ ๑๒๒๔ ๓

กรมโรงงานอุตสาหกรรม  
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท  
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๐๒ กันยายน ๒๕๖๕

เรื่อง เปลี่ยนแปลงบุคลากรและสารมลพิษที่วิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท อีสเทิร์น ไทย คอนซัลติ้ง ๑๙๙๒ จำกัด

อ้างถึง คำขอเปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน  
ลงวันที่ ๒๐ กรกฎาคม ๒๕๖๕

สิ่งที่ส่งมาด้วย เอกสารแนบท้ายหนังสือเปลี่ยนแปลงบุคลากรและสารมลพิษที่วิเคราะห์  
บริษัท อีสเทิร์น ไทย คอนซัลติ้ง ๑๙๙๒ จำกัด จำนวน ๕ แผ่น

ตามคำขอที่อ้างถึง บริษัท อีสเทิร์น ไทย คอนซัลติ้ง ๑๙๙๒ จำกัด ห้องปฏิบัติการวิเคราะห์  
เอกชน เลขทะเบียน ว-๐๐๓ สถานที่ตั้งเลขที่ ๖๘๓ หมู่ที่ ๑๑ ถนนสุขาภิบาล ๘ ตำบลหนองขาม อำเภอสรีราชา  
จังหวัดชลบุรี ขอเปลี่ยนแปลงบุคลากรและสารมลพิษที่วิเคราะห์ ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว มีความเห็นดังนี้

๑. ให้ยกเลิกเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๓ ราย



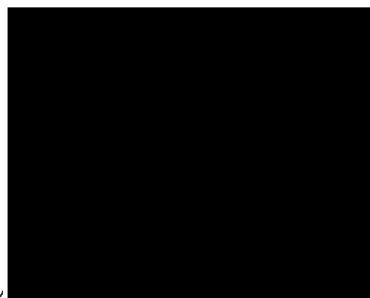
๒. ให้เพิ่มเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๒ ราย



๓. ให้เพิ่มขอบข่ายสารมลพิษที่วิเคราะห์ในน้ำใต้ดิน จำนวน ๓๘ รายการ และดิน จำนวน  
๓๘ รายการ รวมทั้งสิ้นจำนวน ๗๖ รายการ ตามสิ่งที่ส่งมาด้วย

อนึ่ง หนังสือฉบับนี้จะหมดอายุพร้อมหนังสือต่ออายุรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน  
ที่ อก ๐๓๑๐(๓)/๑๒๔๐๐ ลงวันที่ ๓ พฤศจิกายน ๒๕๖๓ คือในวันที่ ๕ กรกฎาคม ๒๕๖๖ ทั้งนี้ สามารถยื่น  
คำขอผ่านระบบอิเล็กทรอนิกส์ได้ที่หน้าเว็บไซต์กรมโรงงานอุตสาหกรรม ตาม QR Code ท้ายหนังสือ

จึงเรียนมาเพื่อทราบ



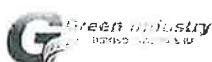
ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก

โทร. ๐ ๓๓๑๓ ๖๐๕๕ ต่อ ๕๐๐๑-๒

ไปรษณีย์อิเล็กทรอนิกส์ eirw@diw.mail.go.th



ยื่นคำขอผ่านระบบอิเล็กทรอนิกส์



“อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว”



เอกสารแนบท้ายหนังสือเปลี่ยนแปลงบุคลากรและชนิดสารมลพิษที่วิเคราะห์  
บริษัท อีสเทิร์น ไทย คอนซัลติ้ง ๑๙๙๒ จำกัด เลขทะเบียน ว-๐๐๓  
ที่ ออก ๐๓๒๐/ ๑ ๒ ๒ ๔ ๓ ลงวันที่ ๐ ๒ กันยายน ๒๕๖๕

ขอข่ายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๗๖ รายการ  
น้ำใต้ดิน จำนวน 38 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
2	Anthracene	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
3	Benz(a)anthracene	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
4	Benzo(b)fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
5	Benzo(k)fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
6	Benzo(a)pyrene	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
7	Benzo(g,h,i)perylene	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
8	Bis(2-chloroethyl)ether	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
9	Bis(2-ethylhexyl)phthalate	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
10	Butyl benzyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
11	Carbazole	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
12	p-Chloroaniline	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
13	2-Chlorophenol	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
14	Chrysene	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
15	Dibenz(a,h)anthracene	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>

16 Di-n-butyl phthalate...



ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
16	Di-n-butyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
17	2,4-Dichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
18	Diethyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
19	2,4-Dimethylphenol	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
20	2,4-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
21	2,6-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
22	Di-n-octyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
23	Fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
24	Fluorene	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
25	Hexachlorobenzene	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
26	Hexachloro-1,3-butadiene	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
27	Hexachlorocyclopentadiene	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
28	Hexachloroethane	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
29	Indeno(1,2,3-cd)pyrene	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
30	Isophorone	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
31	2-Methylphenol	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
32	2-Methylnaphthalene	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>



ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
33	N-Nitrosodi-n-propylamine	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>[1]</sup>
34	Phenanthrene	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>[1]</sup>
35	Phenol	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>[1]</sup>
36	Pyrene	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>[1]</sup>
37	2,4,5-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>[1]</sup>
38	2,4,6-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>[1]</sup>

ดิน จำนวน 38 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>
2	Anthracene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>
3	Benz(a)anthracene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>
4	Benzo(b)fluoranthene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>
5	Benzo(k)fluoranthene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>
6	Benzo(a)pyrene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>
7	Benzo[g,h,i]perylene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>
8	Bis(2-chloroethyl)ether	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>
9	Bis(2-ethylhexyl)phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>

Butyl benzyl...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
10	Butyl benzyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>
11	Carbazole	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>
12	p-Chloroaniline	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>
13	2-Chlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>
14	Chrysene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>
15	Dibenz(a,h)anthracene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>
16	Di-n-butyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>
17	2,4-Dichlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>
18	Diethyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>
19	2,4-Dimethylphenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>
20	2,4-Dinitrotoluene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>
21	2,6-Dinitrotoluene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>
22	Di-n-octyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>
23	Fluoranthene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>
24	Fluorene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>
25	Hexachlorobenzene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>
26	Hexachloro-1,3-butadiene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>

27 Hexachlorocyclopentadiene...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
27	Hexachlorocyclopentadiene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>
28	Hexachloroethane	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>
29	Indeno(1,2,3-cd)pyrene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>
30	Isophorone	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>
31	2-Methylphenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>
32	2-Methylnaphthalene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>
33	N-Nitrosodi-n-propylamine	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>
34	Phenanthrene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>
35	Phenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>
36	Pyrene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>
37	2,4,5-Trichlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>
38	2,4,6-Trichlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>

#### เอกสารอ้างอิง

1. APHA, AWWA, WEF. Standard Methods for the Examination of Water and Wastewater. 23<sup>rd</sup> ed. Washington, DC : APHA; 2017
2. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Ultrasonic Extraction. SW-846 Method 3550C, 2007
3. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry. SW-846 Method 8270E, 2018