

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@mt.com



Accuracy Calibration Certificate

Customer

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

Weighing Device

Manufacturer: Mettler Toledo Instrument Type: Weighing Instrument
Model: MS204TS/00 Asset Number: LABE 05/4
Serial No.: B904136539 Terminal Model: N/A
Building: Laboratory Terminal Serial No.: N/A
Floor: 1 Terminal Asset No.: N/A
Room: Balance

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

Procedure


Calibration Guideline: EURAMET cg-18 v. 4.0 (11/2015)
METTLER TOLEDO Work Instruction: CP/W002/20

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: 25.5 °C	End: 25.2 °C	Start: 50.5 %	End: 44.6 %

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

Approved Signatory: 
Technical Manager / Head of Calibration Center

COPY

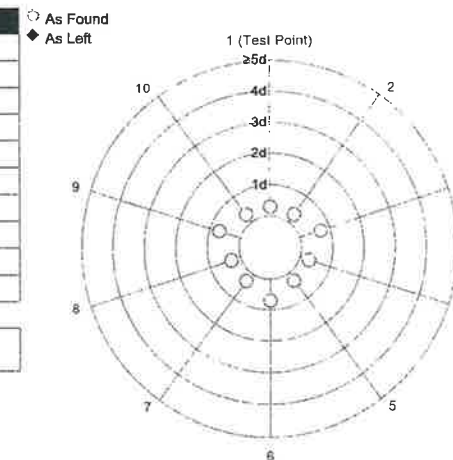
Measurement Results

Repeatability

Test Load: 100 g

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

Standard Deviation	0.00005 g	N/A
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The "d" in the graph represents the readability of the range/interval in which the test was performed.

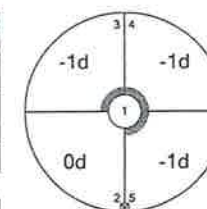
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

Test Load: 100 g

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

Maximum Deviation	0.0001 g	N/A
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As Found

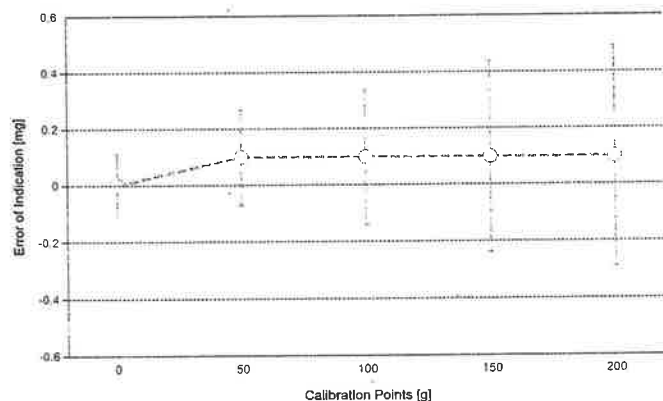
The "d" in the graph represents the readability of the range/interval in which the test was performed.

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Error of Indication

As Found

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



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 – which can be larger than 2 according to EURAMET cg-18. The value of the measurand lies within the assigned range of values with a probability of approximately 95 %.

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

Test Equipment

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

Weight Set 1: OIML E2

Weight Set No.: WS28 Date of Issue: 01-Apr-2022
Certificate Number: 178498 Calibration Due Date: 17-Sep-2023

Thermo Hygrometer

Equipment No.: IN306 Date of Issue: 10-Jan-2023
Certificate Number: 23H4 Calibration Due Date: 03-Jan-2024

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Remarks

FACT adjustment functionality activated

Equipment condition: Good

Next calibration according to customer's procedure

Calibration data not decide by calibration laboratory

End of Accredited Section

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

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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: $1.5 \cdot 10^{-6} / K$

Temperature range on site for the evaluation of the measurement uncertainty in use: 5 K

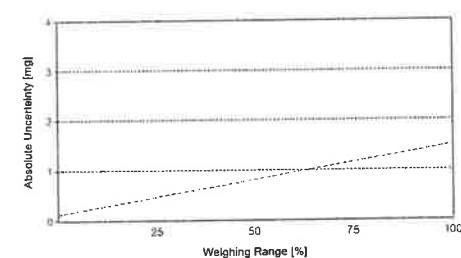
Linearization of Uncertainty Equation

1	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

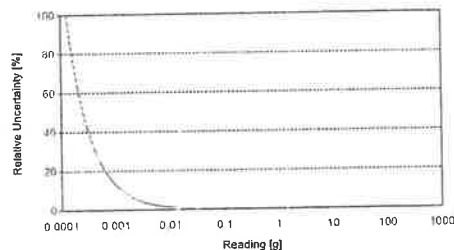
To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

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

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



As Found



As Left

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.

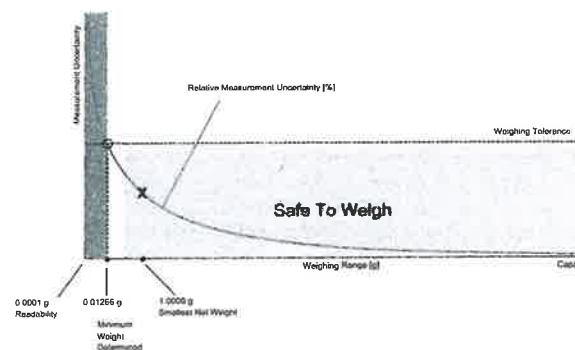
Process Requirements

Weighing Tolerance: 1%

Smallest Net Weight: 1.0000 g

Safety Factor: 2

Safe Weighing Range



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

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Minimum Weight

As Found Minimum Weight Table

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

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

As Left Minimum Weight Table

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

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

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

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

Notes on minimum weight values in above table:

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

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Measurement Results

Results Summary

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

✓ = Passed

✗ = Failed

⚠ = Safety Factor not met

Repeatability

Test Load: 100 g

Tolerance	Control Limit	As Found		As Left	
		Std. Deviation	Result	Std. Deviation	Result
0.1%	0.00050 g	0.00005 g	✓	0.00005 g	✓
0.2%	0.00100 g		✓		✓
0.5%	0.00250 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

Tolerance	Control Limit	As Found		As Left	
		Deviation	Result	Deviation	Result
0.1%	0.0500 g	0.0001 g	✓	0.0001 g	✓
0.2%	0.1000 g		✓		✓
0.5%	0.2500 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.

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Error of Indication

As Found

Reference Value	Error	Control limits for various weighing tolerances					
		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	Error	Control limits for various weighing tolerances					
		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.

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BAROMETER

Equipment : Analog Barometer

ID No. / Tag No. : BM001/41



MIRACLE INTERNATIONAL TECHNOLOGY CO.,LTD

214 Bangwaek Rd. Bangpai Bangkac Bangkok 10160
Tel.: 0-2865-4647-8 Fax: 0-2865-4649 http://www.mit.in.th



CALIBRATION CERTIFICATE

Certificate No. : L202305085-002

Date Issued : 16-May-23

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

Equipment : Analog Barometer

Manufacturer : Barigo

Model : -

Serial No. : -

ID No./Tag No. : BM001/41

Date Received : 11-May-23

Date Calibrated : 15-May-23

Calibrated by : Mr. Jame Khaothong

Calibration Method or Calibration Procedure Used

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

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

Result of Calibration

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

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

Approved by:

Sarayuth T.

(Mr. Sarayuth Tochua)



Page 1 of 2

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Certificate No : L202305085-002

Environment Ambient Temperature : $(25 \pm 2)^\circ\text{C}$
Relative Humidity : $(50 \pm 15)\%\text{RH}$

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

STD = Standard

UUC = Unit Under Calibration

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

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

Condition As-Received : Used Item

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

Measurement Standards Used & Traceability :

The International System of Units (SI) through

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

End of Certificate

Page 2 of 2

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Hot Air Oven

Model : UFE 500

Serial No. : G511.0182

NSC-TIS1-TIS17025
CALIBRATION 0152

Page 1 of 3

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

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapiban 8 Rd., Nongkham,
Sriracha, Chonburi 20230Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.
(Hot Lab)

Equipment : Temperature controlled enclosures (Hot air oven)

Manufacturer : Memmert

Model : UFE 500

Serial No. : G511.0182

ID No. : LABE 17/4

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

3. 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-P1100)	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

Approved by

(Mr. Somchai Neampunt)

Signed for Director

Issue date

24 January 2023

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

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

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

361 Soi Ladprao 122, Ladprao Road,
Phlabphla, Wang Thonglang, Bangkok 10310TEL 02-516-2422
FAX 02-516-6949
Rev 01CONTACT@AMARC.CO.TH
WWW.AMARC.CO.TH
Effective Date 15/10/21NSC-TIS1-TIS17025
CALIBRATION 0152

Page 2 of 3

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

REPORT OF CALIBRATION

Results of Calibration

Resolution : 0.5 °C

1. Reporting of Temperature

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

2. Characterization results

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

Notes

UUC* = Unit Under Calibration

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NSC-TISI-TIS17025
CALIBRATION 0152

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REPORT OF CALIBRATION

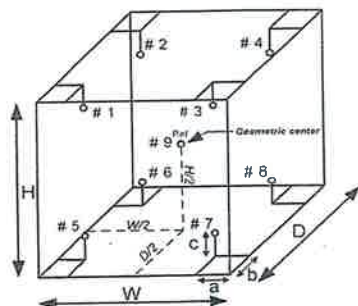
Certificate No. : 23-006679

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 , which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003

- End of Report -

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INDUCTIBELY COUPLED PLASMA SPECTROMETER

Model : Prodigy 7

Serial No. : P70177



บริษัท แอปพลิเคชัน ดีฟายน์ จำกัด
Application Define Company Limited
133/318 ถนนหทัยราษฎร์ แขวงมีนบุรี เขตมีนบุรี กรุงเทพมหานคร 10510
133/318 Hatairath Road., Minburi Sub-district Minburi District, Bangkok 10510
Tel: (66)64455-5191 E-mail: support@apdefine.co.th Website : http://www.apdefine.co.th
เลขประจำตัวผู้เสียภาษี 0105556032491

CERTIFICATE OF INSTRUMENT PERFORMANCE

INSTRUMENT: INDUCTIVELY COUPLED PLASMA SPECTROMETER

BRAND: Telandyne Leeman Labs

MODEL: Prodigy 7

SERIAL NO. P70177

CUSTOMER: บริษัท อีสเทิร์นไทย คอนซัลติ้ง 1992 จำกัด

CHECKING: SPECTROMETER

STATUS

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 Cuve & QC Test

DATE: Dec 12, 2022

Mr. Somchai Chumyung
Engineer Sign

PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท อีสเทิร์นไทย คอนซัลติ้ง 1992 จำกัด

Date: Dec 12, 2022

Instrument: ICP-OES

Model: Prodigy 7

S/N: P70177

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

Gas system:

ตรวจสอบแรงดันแก๊สและการรั่วซึม

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 check 31/01/23

เปลี่ยนตัวดูดความชื้นดีเคเคอร์ ทุก 1 ปี

Water Chiller: RF generator

flow rate 4.4 LPM

Temperature 24°C ตรวจสอบอุณหภูมิ

Leak inspected (✓) No leak ตรวจสอบการรั่วซึม

Water Chiller: Camera

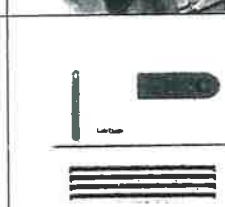
(✓) check water level and refill ตรวจสอบระดับน้ำและเติมน้ำ

(✓) change water เปลี่ยนถ่ายน้ำ

Temperature -31°C ตรวจสอบอุณหภูมิ

Exhaust Hood

Flow rate \approx 700 CFM (system request > 150)



TELEDYNE LEEEMAN LABS
P.O. Box 10000, Houston, TX 77240-0000

PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

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

2. Computer & Software Check

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

3. Instrument Control

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

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PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

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

Power Supply	Value	Status
-12 VDC (11 - 14.5 VDC)	-13.758	ok
+12 VDC (11 - 14.5 VDC)	+12.012	ok
+3.3VDC	3.286	ok
+5.0 VDC	4.995	ok
+13.5 VDC	13.889	ok

Plasma Generator	Value	Status
ICP Current 0.500A = 1kW	0.349	ok
ICP Ref 5.0Vdc = 1kW	5.469	ok
ICP Current 0.00 Vdc = 0kW	0	ok
ICP Ref 0.00Vdc = 0kW	0	ok
RF Water (Hz) OFF	0	ok
RF Water (Hz) ON	23	ok
Air Knife Pres. (0.00V) OFF	0	ok
Air Knife Pres. (3.0 - 7.0 V) ON	4.051	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
Camera Water pump		
Pump Current (0.000 A) OFF	0	ok
Pump Voltage (0.000 V) OFF	0	ok
Pump Current (0.8 to 4.0A) ON	1.09	ok
Pump Voltage (8 to 13 V) ON	12.52	ok

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

COPY

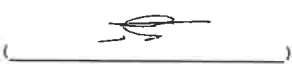

COPY

PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

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

7. Mn Check for performance Test

	<u>Condition for performance Test</u>	<u>Condition Test</u>	<u>Status</u>
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 usi	ok
Pump Speed	25 RPM	25	ok
Integration time	15 s Axial , 5 s Radial	10 s , 5 s	ok
Nebulizer Type	Seaspray, Conikal, Meinhard	Seaspray	ok
Intensity first performance	1 ppm ≥ 4,000,000 5 ppm ≥ 15,000,000 10ppm ≥ 50,000,000	265,000,000	ok

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

COPY

IC-THERMO

Serial No. : 20053176



Certificate of Calibration

Integrion : Anion and Cation (ID#960)

This certificate is to verify that instrument below are calibrated
by Archemica Lab Co.,Ltd.

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

For

Easternthai Consulting 1992 Co., Ltd.

Operator Signature : Nutdanai Date : Oct 20, 2022

(Mr.Nutdanai Laekhwan)

Application Chemist

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ORIFICE TRANSFER STANDARD CERTIFICATION

WORKSHEET TE-5025A

ROOTSMETER S/N 0438320



TISCH ENVIRONMENTAL, INC.
145 SOUTH MIAMI AVE
VILLAGE OF CLEVELAND, OH
44102
513.467.9000
877.263.7610 TOLL FREE
513.467.9009 FAX

ORIFICE TRANSFER STANDARD CERTIFICATION WORKSHEET TE-5025A

Date - Mar 24, 2016 Rootsmeter 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)	ORFICE 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
intercept (b) = -0.03249
coefficient (r) = 0.99993

Qa slope (m) = 1.22896
intercept (b) = -0.02060
coefficient (r) = 0.99993

y axis = SQRT[H2O(Pa/760) (298/Ta)]

y axis = SQRT[H2O(Ta/Pa)]

CALCULATIONS

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

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

For subsequent flow rate calculations:

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

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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 :
Address : 683 Moo 11, Sukhaphibarn 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
Sensor Model : -
Sensor Serial Number : -

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 %.

Calibration By : Mr. Noppadon Luangart
Service Calibration Engineer

Approved By : Mr. Pacit Mathavorn
Calibration Engineer Supervisor

Issue Date : 6 February 2023



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

Result of Calibration :

Flow Setting	STD Flow Reading	UUC Flow Reading	Correction Flow	Uncertainty
(L/min)	(L/min)	(L/min)	(L/min)	(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, Sukhapibarn 8 Rd., Nongkham, Sriracha, Chonburi 20230

Certificate No : 23-AFM-024

Request No : Req-2023-0196

Unit Under Calibration Details

Measurement Item : Primary Flow Calibrator

Sensor Model : -

Manufacturer : Mesa Labs

Sensor Serial Number : -

Model : Defender 510-M

Serial Number : 207510

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 : 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	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 %.

Calibration By : 
Mr. Noppadon Luangart
Service Calibration Engineer

Approved By : 
Mr. Pacit Mathavorn
Calibration Engineer Supervisor

Issue Date : 6 February 2023

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The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-708-AFM-01 Rev.00 Issue date 01/07/19

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

STD : Standard

UUC : Unit Under Calibration

End of Certificate

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The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-708-AFM-01 Rev.00 Issue date 01/07/19

THERMO-HYGROMETER

Model : 608-H1

Serial No. : 45106737

NSC-TISI-TIS17025
CALIBRATION 0152

Page 1 of 2

CERTIFICATE OF CALIBRATION

Certificate No. : 23-055203

Sample Code : 23-21440-001

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

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

Equipment : Digital thermo-hygrometer

Manufacturer : testo Model : 608-H1

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

Date of Receipt : 25 May 2023 Date of Calibration : 29 May 2023

Condition of Calibration

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

2. Calibration method

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

3. Reference standard instrument

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

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

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

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

6. Condition of calibration item : Normal

Calibrated by Miss Pornsuda Lohabal

Scientist

31 May 2023

Approved by

(Mr. Somchai Neampunt)

Signed for Director

The uncertainties are for a confidence probability of approximately 95%

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

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

NSC-TISI-TIS17025
CALIBRATION 0152

Page 2 of 2

REPORT OF CALIBRATION

Certificate No. : 23-055203

Sample Code : 23-21440-001

Results of Calibration

Temperature measurement

Resolution : 0.1 °C

Range : 0 °C to 50 °C

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

Humidity measurement

Resolution : 0.1 %RH

Range : 10 %RH to 95 %RH

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

Notes

- Calibration results without adjustment.

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

- End of Report -

Calibrated by

Miss Pornsuda Lohabal

Approved by

(Mr. Somchai Neampunt)

Signed for Director

Issue date

31 May 2023

The uncertainties are for a confidence probability of approximately 95%

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

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CERTIFICATE OF ANALYSIS

EPA PROTOCOL GAS

Cylinder No. : EB0062815

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: E04NI99E15ACX9C 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	16060607	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
GMS	0315201604	CC503358	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	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 APW1100391 CO	FTIR	Feb 08, 2018
Nicolet 6700 APW1100391 NO	FTIR	Feb 15, 2018
Nicolet 6700 APW1100391 NO2	FTIR	Feb 16, 2018
Nicolet 6700 APW1100391 SO2	FTIR	Mar 01, 2018

Triad Data Available Upon Request

NOTES:NET WEIGHT: 10.43lbs

GROSS WEIGHT: 60.93lbs

PO# 5218000763

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



TESTING CERT No. 3082.05

Don Maceri
Approved for Release

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ANALYTICAL BALANCE (DU)

Model. : XS205DU

Serial No. : 1126323724

NSC-TISI-TIS17025
CALIBRATION 0152

Page 1 of 4

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

CERTIFICATE OF CALIBRATION

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

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

Equipment : ELECTRONIC BALANCE

Manufacturer : METTLER TOLEDO

Model : XS205DU

Serial No. : 1126323724

ID No. : LABE 05/1

Date of Receipt : 20 January 2023

Date of Calibration : 20 January 2023

Calibrated by : Mr. Thanadol Pholthep
Scientist

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

Issue date : 25 January 2023

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

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

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

NSC-TISI-TIS17025
CALIBRATION 0152

Page 2 of 4

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

REPORT OF CALIBRATION

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

Result of Calibration

1. Test weight and repeatability of reading

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

Unit : g	Range : 80	<input type="checkbox"/> Before adjustment	<input type="checkbox"/> After adjustment
<input checked="" type="checkbox"/> No adjustment	Nominal value	40	90
<input type="checkbox"/> Adjustment	Standard weight	40.000042	90.000045
	Average reading of indicator	40.00015	90.00019
	Standard deviation	0.000004	0.000007

Unit : g	Range : 200	<input type="checkbox"/> Before adjustment	<input type="checkbox"/> After adjustment
<input checked="" type="checkbox"/> No adjustment	Nominal value	100	200
<input type="checkbox"/> Adjustment	Standard weight	100.000022	200.000199
	Average reading of indicator	100.0001	200.0004
	Standard deviation	0.00004	0.00008

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

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	20.000016	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

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

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

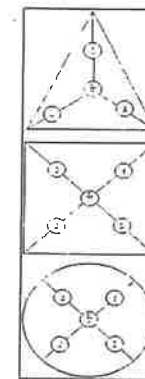
REPORT OF CALIBRATION

Result of Calibration :

4. Eccentric or off-centre loading

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

Weighing pan	<input type="radio"/> Circle <input type="radio"/> Triangular <input checked="" type="radio"/> Rectangular	Test weight : 50 and 100 Unit : g
Range	80	200
Position	Reading of indicator	Reading of indicator
1	50.00014	100.0001
2	50.00014	99.9998
3	50.00006	100.0000
4	50.00010	100.0001
5	50.00017	100.0001
6	50.00014	100.0001
Maximum difference	0.00008	0.0003



Condition of Calibration

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 on y.

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

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 -

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BAROMETER

Equipment : Analog Barometer

ID No. / Tag No. : BM001/41



MIRACLE INTERNATIONAL TECHNOLOGY CO.,LTD

214 Bangwaek Rd. Bangpai Bangkac Bangkok 10160
Tel.: 0-2865-4647-8 Fax: 0-2865-4649 http://www.mit.in.th



CALIBRATION CERTIFICATE

Certificate No. : L202305085-002

Date Issued : 16-May-23

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

Equipment : Analog Barometer

Manufacturer : Barigo

Model : -

Serial No. : -

ID No./Tag No. : BM001/41

Date Received : 11-May-23

Date Calibrated : 15-May-23

Calibrated by : Mr. Jame Khaothong

Calibration Method or Calibration Procedure Used

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

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

Result of Calibration

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

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

Approved by:

Sarayuth T.

(Mr. Sarayuth Tochua)



Page 1 of 2

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Certificate No : L202305085-002

Environment Ambient Temperature : $(25 \pm 2)^\circ\text{C}$
Relative Humidity : $(50 \pm 15)\%\text{RH}$

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

STD = Standard

UUC = Unit Under Calibration

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

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

Condition As-Received : Used Item

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

Measurement Standards Used & Traceability :

The International System of Units (SI) through

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

End of Certificate

Page 2 of 2

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CERTIFICATE OF ANALYSIS

EPA PROTOCOL GAS

Cylinder No. : EB0145030

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: E03NI99E15AC0U4 Reference Number: 160-402242242-1
Cylinder Number: EB0145030 Cylinder Volume: 144.4 CF
Laboratory: 124 - Plumsteadville - PA Cylinder Pressure: 2015 PSIG
PGVP Number: A12021 Valve Outlet: 350
Gas Code: CH4,PPN,BALN 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 000/R-12/501, 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 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	Assay Dates
METHANE	180.0 PPM	177.0 PPM	G1	+/- 1.0% NIST Traceable	10/15/2021
PROPANE	185.0 PPM	187.0 PPM	G1	+/- 1.0% NIST Traceable	10/15/2021
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
WTRM	08011503	K002564	246.7 PPM METHANE/AIR	+/- 0.6%	May 15, 2025
RTRM	200602-06	6162660Y	243.3 PPM PROPANE/AIR	+/- 0.5%	Mar 17, 2027

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet iS50 FTIR AUP2110295 CH4	FTIR	Oct 13, 2021
Nicolet iS50 FTIR AUP2110295 C3H8	FTIR	Oct 14, 2021

Triad Data Available Upon Request

NOTES:

Gross Weight: 28.0 Kg
Net Weight: 4.9 Kg
PO# 5221004861



Michael A. Harker
Approved for Release



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DRY GAS METER MC-572V

Serial No. : 0504003

Certificate Of Calibration

Method 5 Pre-Test Console Calibration - Cubic meter (m3)

Meter Console Information
Console Model : MC572V
Console serial : 0504003
DGM Model #: SK25EX
DGM Serial #: 0003854

Calibration Condition
Calibration Date: 3-Apr-23
Issue Date: 3-Apr-23
Cal. Report No.: WDS-SV680039
Ambient Temp (°C): 25
Pressure (mm Hg): 758
Relative Humidity (%): 60

Factors/Conversion
Std. Temp (°C): 28
Std. Pressure (mm Hg): 760
K₁ (K/mm Hg): 0.3857

Reference Equipment
WTM Model: WANKOde-5B
WTM Serial: 600245
WTM Cal. Due Date: Nov. 2022
Gamma: 1.0000


UT Meter (DGM)				Reference Meter (WTM)					
Run Time	DGM Office (mm H ₂ O)	Volume		Outlet Temp		Volume		Outlet Temp	
		Initial V _{in}	Final V _{out}	Initial T _{in}	Final T _{out}	Initial V _{in}	Final V _{out}	Initial T _{in}	Final T _{in}
15.00	13.0	2.1249	2.2873	26	26	11.24924	11.40853	25	25
10.00	25.0	1.9384	2.0964	26	26	11.06845	11.22136	25	25
8.00	50.0	1.7294	1.9105	26	26	10.86093	11.03905	25	25
7.00	80.0	1.4887	1.6921	26	26	10.62322	10.82407	25	25
5.00	120.0	1.1950	1.3736	26	26	10.33100	10.50914	25	25

Standardized Data						Calibration Results			
Test Meter		Reference Meter		Correction Factor		Flow Rate		$\Delta H @ (mm \text{ H}_2\text{O})$	
Std Volume $V_{inlet} (m^3)$	Std Flow Rate $Q_{inlet} m^3/min$	Std. Volume Value (m^3)	Std. Flow Rate $Q_{outlet} m^3/min$	"Gamma" (γ)	Variation ($\Delta \gamma$)	Std & Corr $Q_{inlet/corr}$	ΔH_s	Variation $\Delta \Delta H_s$	
0.159	0.011	0.156	0.010	0.983	-0.001	0.010	52.990	5.531	
0.155	0.015	0.152	0.015	0.981	-0.002	0.015	47.999	0.540	
0.178	0.022	0.175	0.022	0.982	-0.002	0.022	46.696	-0.763	
0.200	0.029	0.197	0.028	0.983	-0.001	0.028	45.249	-2.210	
0.177	0.035	0.175	0.035	0.989	0.006	0.035	44.361	-3.098	
				0.984	γ Avg			47.459	$\Delta H @ \Delta \gamma$

Pass/Fail Result: Pass

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptably within ±0.02 of individual values from the average is 10.02.
Note: For ΔH_g, orifice pressure differential that equates to 0.75cmH₂O (0.0212m³/min) at standard temperature and pressure, acceptable to 0.01 of individual values from the average is ±0.2inches (5.1mm) H₂O.

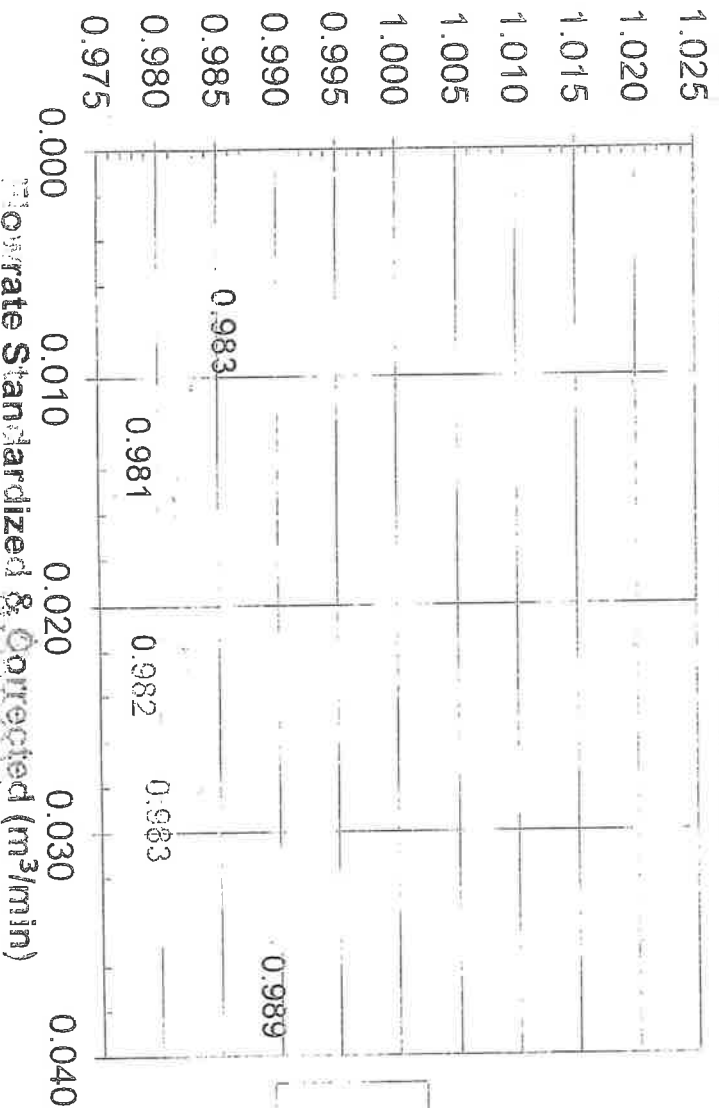
Approved By: 
(Palpasu Chatsana)
Service Manager

Witnessed By: 
WISDOM SCIENCE, SELF-AUDITING GROUP COMPANY LIMITED

Date: 3-Apr-23

COPY

Meter Gamma vs Flowrate



Gamma Y
Max Allow Y
Min Allow Y

Console Serial

0504003

Console Model

WISDOM SCIENCE, SELF-AUDITING GROUP COMPANY LIMITED

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TEMPERATURE DISPLAY CALIBRATION

Meter Console Information

Console Model : MC572V
Console Serial : 0504003
Temp. Indicator Model : 765-KF
Temp. Indicator Serial : JC17852

Calibration Conditions

Cal. Date : 3-Apr-23
Issue Date : 3-Apr-23
Cal. Report No. : WDS-SV660039
Ambient Temp. (°C) : 25
Pressure (mm Hg) : 758
Humidity (%) : 60

Reference Equipment

Temp. Simulator Model : FLUKE 714B
Serial No : 60590035

Temperature Sensor Calibration

Reference Point	Ref. Thermometer Temperature	Thermometer Display Temperature	Difference
#	°C	°C	°C
1	-18.0	-17.0	1.0
2	38.0	37.0	1.0
3	93.0	92.0	1.0
4	149.0	148.0	1.0
5	260.0	259.0	1.0
6	371.0	372.0	-1.0
7	482.0	482.0	0.0
8	593.0	594.0	-1.0
9	816.0	816.0	0.0
10	1038.0	1038.0	0.0
Maximum			1.0

PASS

Note

For valid test results, the maximum difference between temperature readings should $\leq 1.0^{\circ}\text{C}$ (EPA Method 5, Section 6.1.1.8).
Perform all TC Channel calibrations. Except meter (DGM) channel

DGM Out Temperature Sensor Calibration

Temperature point	Ref. Thermometer Temperature	Thermometer Display Temperature	Difference
#	°C	°C	°C
Ambient	26.5	26.0	0.5
Heat	100.5	102.0	-1.5

Difference Rang

DGM Out Temp. Diff. $\pm 3^{\circ}\text{C}$

PASS

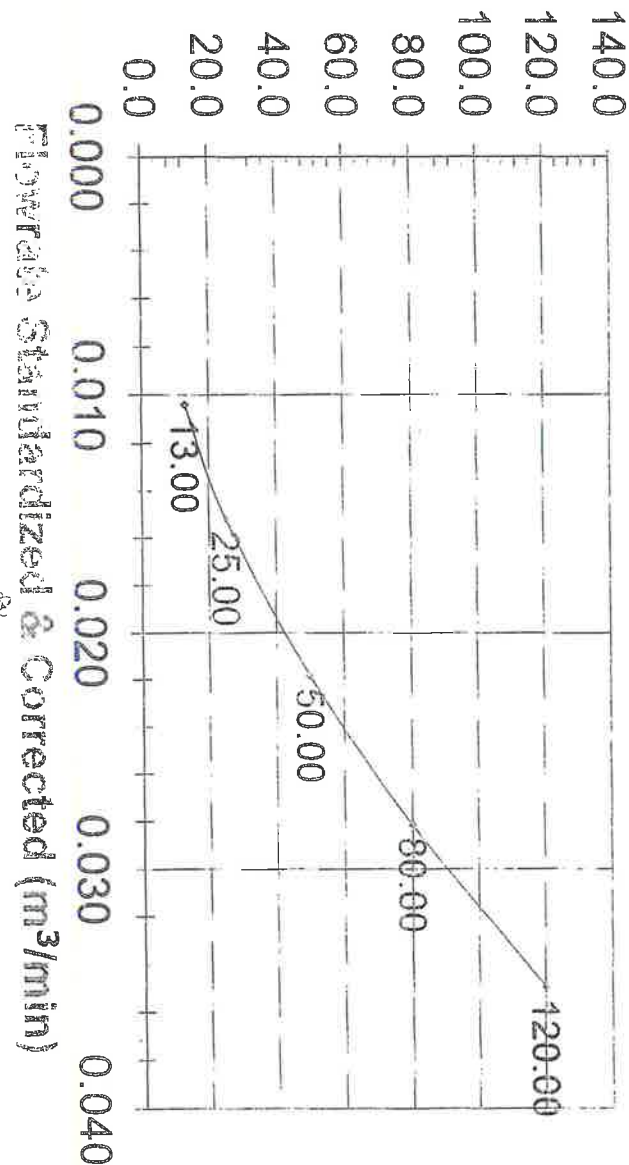
Approved By :

(Patrasai Chaisana)

Service Manager

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DGM Orifice ΔH (mm H₂O)



Console Serial :

0504003

WISDOM SCIENCE SALE AND SERVICE GROUP COMPANY LIMITED

Console Model :

MC572V

COPY

DRY GAS METER XC-572-OV

Serial No. : A2204323



WISDOM SCIENCE
WISDOM SERVICE GROUP COMPANY LIMITED

Certificate Of Calibration

Method 5 Pre-Test Console Calibration - Cubic meter (m³)

Meter Console Information

Console Model : XC-572-OV
Console serial : A2204323
DGM Model #: SK25EX
DGM Serial #: 00008294

Calibration Condition

Calibration Date: 2-May-2023
Due Date : 1-May-2024
Cal. Report No.: WDS-SV/600066
Ambient Temp (°C): 25
Pressure (mm Hg): 756
Relative Humidity (%): 55

Factors/Conversion

Std. Temp. (°C): 28
Std. Pressure (mm Hg): 760
K_f (K/mm Hg): 0.3857

Reference Equipment

WTM Model: W-NK05-SB
WTM Serial: 600245
WTM Cal. Date: 22-Nov-2022
Gamma: 1.0000

UT Meter (DGM)

Run Time (minutes)	DGM Orifice (mm H ₂ O) P _{meas}	Volume		Outlet Temp		Reference Meter (WTM)		Outlet Temp	
		Initial V _{ref}	Final V _{ref}	Initial t _{ref}	Final t _{ref}	Initial V _{ref}	Final V _{ref}	Initial t _{ref}	Final t _{ref}
15.00	13.0	18.0885	18.2252	25	26	17.58944	17.71673	25	25
10.00	25.0	18.2477	18.3884	25	26	17.73937	17.88948	25	25
8.00	50.0	18.4339	18.6066	25	26	17.92817	18.09730	25	25
7.00	80.0	18.6458	18.8344	25	27	18.13775	18.32707	25	25
5.00	120.0	18.8639	19.0510	25	27	18.37706	18.54528	25	25

Standardized Data

Test Meter		Reference Meter		Correction Factor		Calibration Results	
Std. Volume V _{ref} (m ³)	Std. Flow Rate Q _{ref} m ³ /min	Std. Volume V _{ref} (m ³)	Std. Flow Rate Q _{ref} m ³ /min	"Gamma" (Y)	Variation (ΔY)	Flow Rate Std & Corr Q _{ref} (m ³ /min)	ΔH@ (mm H ₂ O) 0.0212 SCMM ΔH _{ref} Variation ΔΔH _{ref}
0.154	0.010	0.154	0.010	1.004	0.003	0.010	54.437 50.528 -1.058
0.148	0.015	0.148	0.015	1.002	0.001	0.015	50.928 50.928 -0.216
0.168	0.021	0.169	0.021	0.999	-0.001	0.021	49.741 49.741 -1.403
0.165	0.027	0.166	0.027	0.999	-0.001	0.027	51.144 51.144 = ΔH@ Avg
0.165	0.033	0.165	0.033	0.999	-0.002	0.033	

Pass/Fail Result: PASS

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance is ±0.5% (0.005 m³ at 1.0 m³ flow rate). For ΔH_{ref}, orifice pressure differential that equates to 0.75cm (0.0212m/min) at standard temperature and pressure, acceptable tolerance of individual values from the average is ±0.2inches (5.1mm) H₂O.

Approved By:

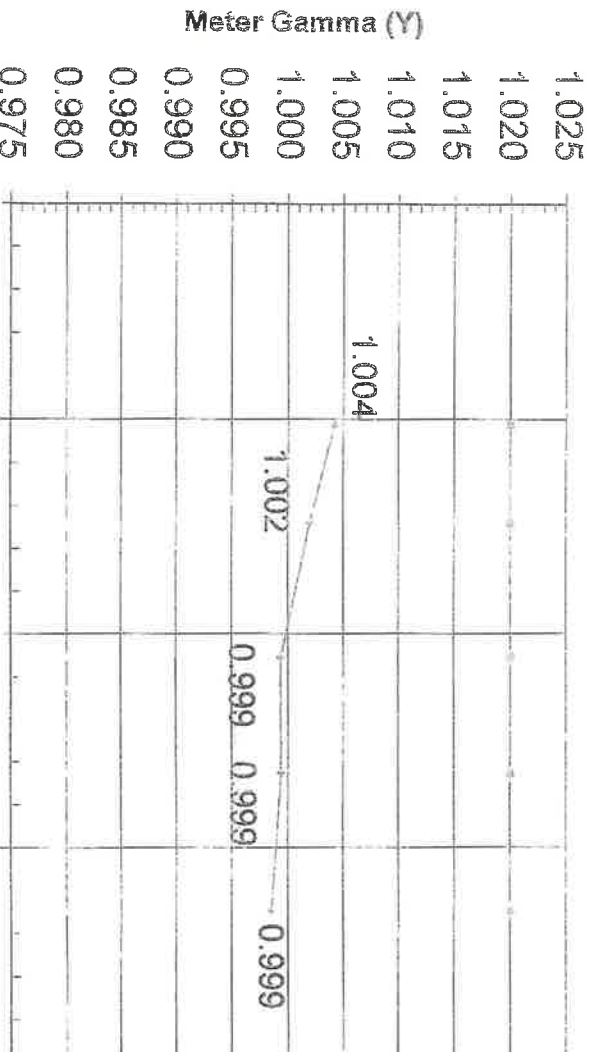
Palpasu Chatsana
Service Manager

WISDOM SCIENCE
WISDOM SERVICE GROUP COMPANY LIMITED

2-May-2023

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Meter Gamma vs Flowrate



→ Gamma Y
-- Max Allow Y
-- Min Allow Y

Console Serial:

A2204323

Console Model:

XC-572-OV

Flowrate Standardized & Corrected (m³/min)

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WISDOM SERVICE GROUP COMPANY LIMITED

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TEMPERATURE DISPLAY CALIBRATION

Meter Console Information

Console Model : XC-572-OV
Console Serial : A2204323
Temp.Indicator Model : 765-KF
Temp. Indicator Serial : JC19022

Calibration Conditions

Cal. Date : 2-May-2023
Due Date : 1-May-2024
Cal. Report No. : WDS-SV660066
Ambient Temp. (°C) : 25
Pressure (mm Hg) : 758
Humidity (%) : 55

Reference Equipment

Temp. Simulator Model : FLUKE 714B
Serial No. : 60590035
Calibration Date. : 14-Feb-2023

Temperature Sensor Calibration

Reference Point	Ref. Thermometer Temperature	Thermocouple Display Temperature	Temperature Difference
#	°C	°C	°C
1	-18.0	-17.0	1.0
2	25.0	25.0	0.0
3	90.0	90.0	0.0
4	120.0	120.0	0.0
5	250.0	249.0	1.0
6	380.0	380.0	0.0
7	500.0	500.0	0.0
8	620.0	620.0	0.0
9	740.0	739.0	1.0
10	860.0	860.0	0.0

Maximum¹

1.0

PASS

Note

¹ For valid test results , the maximum difference between temperature readings should $\leq 1.0^{\circ}\text{C}$ (EPA Method 5, Section 6.1.1.8).
Perform AUX, STACK, PROBE, OVEN, FILTER, EXIT. Except meter (DGM) channel

DGM Out Temperature Sensor Calibration

Temperature point	Ref. Thermometer Temperature	Thermocouple Display Temperature	Temperature Difference
#	°C	°C	°C
Ambient	28.8	29.0	-0.2
Heat	100.0	101.3	-1.3

Difference Rang

DGM Out Temp, Diff. $\pm 3^{\circ}\text{C}$

PASS

Approved By :

(Paton's Chaisana)
Service Manager
WISDOM SCIENCE SALE AND SERVICE GROUP COMPANY LIMITED

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Console Serial:

A2204323

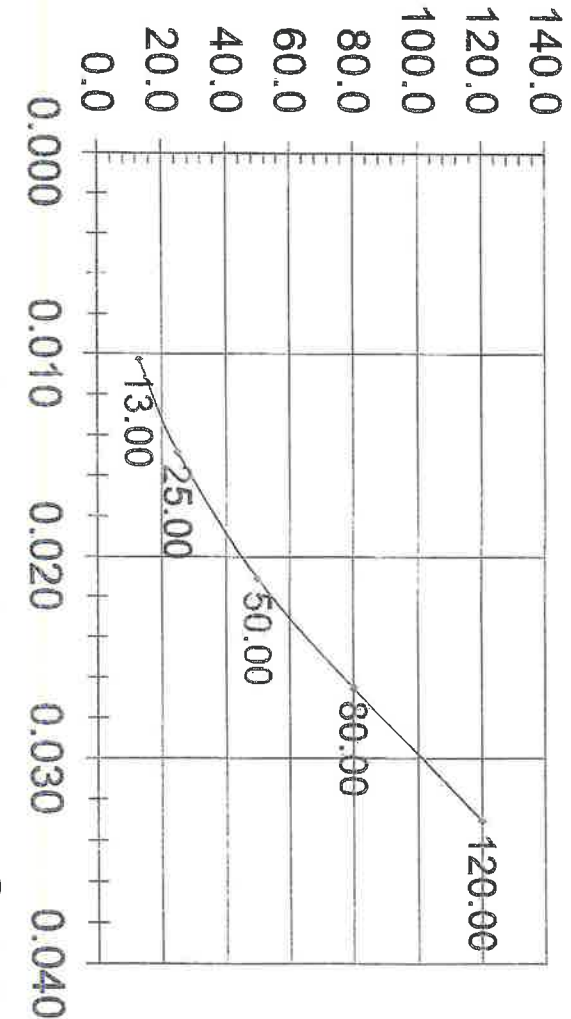
Console Model:

XC-572-OV

WISDOM SCIENCE
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WISDOM SCIENCE SALE AND SERVICE GROUP COMPANY LIMITED

DGM Orifice ΔH (mm H₂O)

Flowrate Standardized & Corrected (m³/min)



Meter Pressure vs Flowrate

COPY

DRY GAS METER XC572V

Serial No. : 1110070

TEMPERATURE DISPLAY CALIBRATION

WISDOM SCIENCE

Meter Console Information

Console Model : XC572V
Console serial : 1110070
Temp. Indicator Model : 765-KF
Temp. Indicator Serial : JC17852

Calibration Conditions

Cal. Date : 3-Jul-23
Issue Date : 2-Jul-24
Cal. Report No. : WDS-SV660107
Ambient Temp. (°C) : 25
Pressure (mm Hg) : 758
Humidity (%) : 60

Reference Equipment

Temp. Simulator Model : FLUKE 714B
Serial No. : 60590035

Temperature Sensor Calibration

Reference Point	Ref. Thermometer Temperature	Thermocouple Display Temperature	Temperature Difference
#	°C	°C	°C
1	-18.0	-17.0	1.0
2	38.0	37.0	1.0
3	93.0	93.0	0.0
4	149.0	149.0	0.0
5	260.0	259.0	1.0
6	371.0	372.0	-1.0
7	482.0	482.0	0.0
8	593.0	594.0	-1.0
9	816.0	816.0	0.0
10	1038.0	1038.0	-1.0
Maximum			1.0

PASS

Note

* For valid test results, the maximum difference between temperature readings should $\leq 1.0^{\circ}\text{C}$ (EPA Method 5, Section 6.1.1.8).
Perform all TC Channel calibrations. Except meter (DGM) channel

DGM Out Temperature Sensor Calibration

Temperature point	Ref. Thermometer Temperature	Thermocouple Display Temperature	Temperature Difference
#	°C	°C	°C
Ambient	26.5	27.0	-0.5
Heat	100.5	102.5	-2.0

Difference Rang

DGM Out Temp. Diff. $\pm 3^{\circ}\text{C}$

PASS

Approved By :

(Patpasu Chaisana)

Service Manager

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WISDOM SCIENCE

Certificate Of Calibration

Method 5 Pre-Test Console Calibration - Cubic meter (m³)

Factorial/Conversion

Std. Temp. (°C) : 28
Std. Pressure (mm Hg) : 760
K₁ (K/mm Hg) : 0.3657

Reference Equipment

WTM Model : W-NK02A-58
WTM Serial : 600245
WTM Cal. Due Date : Nov. 2022
Gamma : 1.0000

Calibration Date : 3-Jul-23
Due Date : 2-Jul-24
Cal. Report No. : WDS-SV660107
Ambient Temp (°C) : 25
Pressure (mm Hg) : 758
Relative Humidity (%) : 60

UUT Meter (DGM)

Run Time (minutes)	DGM Office (mm H ₂ O)	Initial V _{ref}	Final V _{ref}	Initial I _{ref}	Final I _{ref}	Initial V _{ref}	Final V _{ref}	Initial I _{ref}	Final I _{ref}
15.00	13.0	599.3828	599.5462	27	27	20.05690	20.22161	28	27
10.00	25.0	599.5689	599.7246	27	26	20.24425	20.39990	27	27
8.00	50.0	599.7405	599.9176	26	26	20.41692	20.59344	27	27
7.00	80.0	599.9333	600.1337	26	26	20.60920	20.81034	27	27
5.00	120.0	600.1569	600.3319	26	26	20.83271	21.00960	27	27

Reference Meter (WTM)

Test Meter	Reference Meter	Correction Factor	Flow Rate	ΔH ₂ O (mm H ₂ O)
Std. Volume V _{ref} (m ³)	Std. Flow Rate Q _{ref} (m ³ /min)	Std. Flow Rate Q _{ref} (m ³ /min)	Std. & Corr ΔH ₂ O	ΔH ₂ O
0.159	0.011	0.160	0.011	50.181
0.152	0.015	0.152	0.015	48.086
0.174	0.022	0.173	0.022	47.505
0.187	0.028	0.186	0.028	46.688
0.174	0.035	0.172	0.034	45.602
= Y Avg.				47.134
= Y Avg.				ΔH ₂ O

Standardized Data

Calibration Results

Pass/Fail Result: Pass

ote: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is 40.02
ote: For ΔH₂O, office pressure differential that equates to 0.75mm (0.0212in) at standard temperature and pressure

Approved By:

(Patpasu Chaisana)

Service Manager

Date

3-Jul-23

COPY

ELAPSED TIMER CALIBRATION

Meter Console Information

Model #: XC572V
Serial #: 1110070
Elapsed Timer Model #: C342-1464
Elapsed Timer Serial #: -

Calibration Conditions

Cal. Date : 03-Jul-23
Issue Date : 02-Jul-24
Cal. Report No. : WDS-SV360107
Ambient Temp. (°C) : 25
Pressure (mm Hg) : 753
Humidity (%) : 60

Reference Equipment

Calibration Standard: JS-307
Method Reference: Compare

Run Time Elapsed STD	Elapsed Timer				Average Time	Deviation
	1	2	3	4		
Minute	Minute	Minute	Minute	Minute	Minute	Minute
2.00	2.00	2.00	2.00	2.00	2.000	0.000
3.00	3.00	3.00	3.00	3.00	3.000	0.000
5.00	5.00	5.00	5.00	5.00	5.000	0.000
7.00	7.00	7.00	7.00	7.00	7.000	0.000
9.00	9.00	9.00	9.00	9.00	9.000	0.000

Approved By

(Patpasu Chaisana)
Service Engineer

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WISDOM SCIENCE SALE AND SERVICE GROUP COMPANY LIMITED

COPY

Differential Pressure Meter

Testo 510

Serial No. 51501728/004



MIRACLE INTERNATIONAL TECHNOLOGY CO.,LTD

214 Bangwaek Rd. Bangpai Bangkac Bangkok 10160
Tel.: 0-2865-4647-8 Fax: 0-2865-4649 http://www.mit.in.th



CALIBRATION CERTIFICATE

Certificate No. : L202208422-001

Date Issued : 07-Sep-22

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

Equipment : Differential Pressure Meter

Manufacturer : Testo

Model : 510

Serial No. : 51501728/004

ID No./Tag No. : -

Date Received : 01-Sep-22

Date Calibrated : 07-Sep-22

Calibrated by : Mr. Saruth Srichutikul

Calibration Method or Calibration Procedure Used

In-house method : CP-07 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:

(Mr. Sarayuth Tochua)



Page 1 of 2

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Certificate No : L202208422-001

Environment Ambient Temperature : $(25 \pm 2)^{\circ}\text{C}$
Relative Humidity : $(50 \pm 15)\%\text{RH}$

UUC Reading	STD Reading (inH ₂ O)	STD Reading (inH ₂ O)	UUC Error	Uncertainty
inH ₂ O	Before Adjusted	After Adjusted	inH ₂ O	\pm inH ₂ O
0.00	0.0000	-	0.0000	0.12
10.00	10.0024	-	-0.0024	0.12
20.00	20.0068	-	-0.0068	0.12
30.00	30.0025	-	-0.0025	0.12
40.00	40.0041	-	-0.0041	0.12

STD = Standard

UUC = Unit Under Calibration

Calibrated condition : Pressure Medium Air : Density = 1.19 kg/m³ @ 20°C, 1 bar
Mounting Position Vertical
Reference Level at the end of pressure port
Conversion Factor Multiply by 2.490 889 E+02 - Pa unit

Description of UUC : Range 0 - 40 inH₂O
Calibration Range 0 - 40 inH₂O
Resolution 0.01 inH₂O

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

NIMT Certificate No. MP-0138-21 for Digital Manometer Serial No. 2652GA559, Due 09-Sep-22

End of Certificate

Page 2 of 2

COPY

Flue gas Analyzer
Testo 350XL
Serial No. 01807527

Calibration Certificate



Certificate No: G 660335

Date of issue : 14-Jun-23

Calibration Certificate



Certificate No.: G 660335

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 : Eastern Thai Consulting 1992 Company Limited
Customer address : 683 Moo 11, Sukhapibarn 8 Road, Nongkham, Si Racha, Chon Buri 20280

Total pages of certificate : 2 Pages
Receiving no. : L-231681
Receiving date. : 12-Jun-23
Parameter of calibration : Gas Calibration(Oxygen 2.498,10.04,21.02 %vol, Carbon Monoxide 80.14,309.9,1003 ppm
Nitrogen Dioxide 80.96 ppm, Nitric Oxide 151.5 ppm, Sulphur Dioxide 100.8 ppm)
Condition of UUC. : Used
Ambient condition : All of the Measurment were caried out the stabilized labotary
Temperature : 23 ±5 °C
Humidity : 55 ± 15 %RH
Calibration piace : 17/121 Soi Ngamwongwan 47 Yaek 48, Toongsonghong, Laksi, Bangkok 10210
Calibration procedure no. : This instrument was calibrated by comparison with Standard gas mixture according to calibration work instration no. WI-CL-28-C

The calibration certificate expanded uncertainty of measurement is stated as the standard uncertainty of measurent 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 reporduced other than in full except with the permission of the Issuing laboratory.
Calibration certificates without signature and seal not valid and The results relate only to the items tested/calibrated.
This calibration certificate documents are tracebility to national standards, which realize measurement according to the International System of Units (SI).

Date of calibration : 13-Jun-23

Kwanchai K.

Mr. Kwanchai Khamdoun

Calibration Technician

D. Wongsettee

Mrs. Nongluck Wongsettee

Technical Manager

Standard References (Table 1)

Standard	Certificate No.	Vendor	Due date
Oxygen (O2) 2.498 % Vol	4219/21	Linde	30-Sep-25
Oxygen (O2) 10.04 % Vol	CG-0153-21	Nimt	18-Nov-26
Oxygen (O2) 21.02 % Vol	CG-0041-22	Nimt	10-Feb-27
Carbon monoxide (CO) 80.14 ppm	CG-0040-22	Nimt	14-Feb-27
Carbon monoxide (CO) 309.9 ppm	2803/21	Linde	22-Jun-23
Carbon monoxide (CO) 1003 ppm	2583/22	Linde	09-Aug-24
Nitrogen Dioxide (NO2) 80.96 ppm	3240/21	Linde	26-Jun-24
Nitric Oxide (NO) 151.5 ppm	0161/23	Linde	22-Jan-25
Sulphur Dioxide (SO2) 100.8 ppm	3507/22	Linde	09-Nov-24

Measured room conditions

Temperature : 22.7 °C Humidity : 69.3 %RH Pressure : 1007.1 mbar

Calibration conditions

Gas Temperature : 23 °C Flow rate : 1,200 ml/min Gas pressure : 1020.2 mbar

Calibration Results (before adjustment) (Table 2)

Parameter of Standard	Standard Values	Mean of UUC	Error	Uncertainty (±)
O2 (%Vol)	2.498	2.59	0.092	0.15
O2 (%Vol)	10.04	10.13	0.09	0.20
O2 (%Vol)	21.02	21.14	0.12	0.30
CO (ppm)	80.14	81	0.86	3.0
CO (ppm)	309.9	311	1.1	6.0
CO (ppm)	1003	1004	1	12
*NO2 (ppm)	80.96	72.3	-8.66	8.0
*NO (ppm)	151.5	137	-14.5	8.0
*SO2 (ppm)	100.8	101	0.2	6.0

Calibration Results (after adjustment) (Table 3)

Parameter of Standard	Standard Values	Mean of UUC	Error	Uncertainty (±)
O2 (%Vol)	2.498	2.59	0.092	0.15
O2 (%Vol)	10.04	10.13	0.09	0.20
O2 (%Vol)	21.02	21.14	0.12	0.30
CO (ppm)	80.14	81	0.86	3.0
CO (ppm)	309.9	311	1.1	6.0
CO (ppm)	1003	1004	1	12
*NO2 (ppm)	80.96	79.9	-1.06	8.0
*NO (ppm)	151.5	151	-0.5	8.0
*SO2 (ppm)	100.8	101	0.2	6.0

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

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

End of Report

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Issued Date 26/02/16

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Issued Date 26/02/16

Hot Air Oven

Model : UFE 500

Serial No. : G511.0182

NSC-TIS1-TIS17025
CALIBRATION 0152

Page 1 of 3

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

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapiban 8 Rd., Nongkham,
Sriracha, Chonburi 20230Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.
(Hot Lab)

Equipment : Temperature controlled enclosures (Hot air oven)

Manufacturer : Memmert

Model : UFE 500

Serial No. : G511.0182

ID No. : LABE 17/4

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

3. 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-P1100)	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

Approved by

(Mr. Somchai Neampunt)
Signed for Director

Issue date

24 January 2023

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

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

361 Soi Ladprao 122, Ladprao Road,
Phlabphla, Wang Thonglang, Bangkok 10310TEL 02-516-2422
FAX 02-516-6949
Rev 01CONTACT@AMARC.CO.TH
WWW.AMARC.CO.TH
Effective Date 15/10/21NSC-TIS1-TIS17025
CALIBRATION 0152

Page 2 of 3

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

REPORT OF CALIBRATION

Results of Calibration

Resolution : 0.5 °C

1. Reporting of Temperature

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 ^{Ref}		
104	103.5	103.5	104.10	104.08	103.87	103.99	104.08	104.08	103.96	104.01	103.84	0.47	2.00

2. Characterization results

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

Notes

UUC* = Unit Under Calibration

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361 Soi Ladprao 122, Ladprao Road,
Phlabphla, Wang Thonglang, Bangkok 10310
TEL 02-516-2422
FAX 02-516-6949
Rev 01TEL 02-516-2422
FAX 02-516-6949
Rev 01CONTACT@AMARC.CO.TH
WWW.AMARC.CO.TH
Effective Date 15/10/21

NSC-TISI-TIS17025
CALIBRATION 0152

Page 3 of 3

REPORT OF CALIBRATION

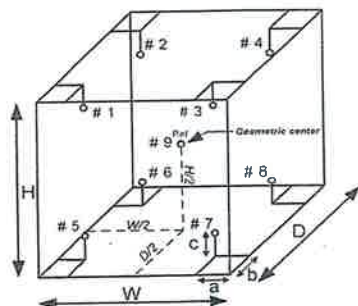
Certificate No. : 23-006679

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 , which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003

- End of Report -

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INDUCTIBELY COUPLED PLASMA SPECTROMETER

Model : Prodigy 7

Serial No. : P70177



บริษัท แอปพลิเคชัน ดีฟายน์ จำกัด
Application Define Company Limited
133/318 ถนนหทัยราษฎร์ แขวงมีนบุรี เขตมีนบุรี กรุงเทพมหานคร 10510
133/318 Hatairath Road., Minburi Sub-district Minburi District, Bangkok 10510
Tel: (66)64455-5191 E-mail: support@apdefine.co.th Website : http://www.apdefine.co.th
เลขประจำตัวผู้เสียภาษี 0105556032491

CERTIFICATE OF INSTRUMENT PERFORMANCE

INSTRUMENT: INDUCTIVELY COUPLED PLASMA SPECTROMETER

BRAND: Telandyne Leeman Labs

MODEL: Prodigy 7

SERIAL NO. P70177

CUSTOMER: บริษัท อีสเทิร์นไทย คอนซัลติ้ง 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 Ignitation software & Analytical Software

ANALYTICAL TEST

Full Frame Capture & Echellogram check

Calibration Cuve & QC Test

STATUS

ok
ok
ok
ok

ok

ok
ok

ok
ok
ok

ok

ok
ok

DATE: Dec 12, 2022

Mr. Somchai Chumyung
Engineer Sign

PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท อีสเทิร์นไทย คอนซัลติ้ง 1992 จำกัด

Date: Dec 12, 2022

Instrument: ICP-OES

Model: Prodigy 7

S/N: P70177

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

Gas system:

ตรวจสอบแรงดันแก๊สและการรั่วซึม

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 check 31/12

เปลี่ยนตัววัดความชื้นดีไฮเดรต ทุก 1 ปี

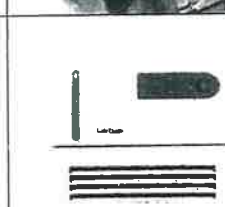


Water Chiller: RF generator

flow rate 4.4 LPM

Temperature 24°C ตรวจสอบอุณหภูมิ

Leak inspected (✓) No leak ตรวจสอบการรั่วซึม



Water Chiller: Camera

(✓) check water level and refill ตรวจสอบระดับน้ำและเติมน้ำ

(✓) change water เปลี่ยนถ่ายน้ำ

Temperature -31°C ตรวจสอบอุณหภูมิ



Exhaust Hood

Flow rate \approx 700 CFM (system request > 150)



TELEDYNE LEEEMAN LABS
P.L.E. & P.E. & V.O. & L.

PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

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

2. Computer & Software Check

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

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PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

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

3. Instrument Control

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

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PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

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

Power Supply	Value	Status
-12 VDC (11 - 14.5 VDC)	-13.758	ok
+12 VDC (11 - 14.5 VDC)	+12.012	ok
+3.3VDC	3.286	ok
+5.0 VDC	4.995	ok
+13.5 VDC	13.889	ok

Plasma Generator	Value	Status
ICP Current 0.500A = 1kW	0.349	ok
ICP Ref 5.0Vdc = 1kW	5.469	ok
ICP Current 0.00 Vdc = 0kW	0	ok
ICP Ref 0.00Vdc = 0kW	0	ok
RF Water (Hz) OFF	0	ok
RF Water (Hz) ON	23	ok
Air Knife Pres. (0.00V) OFF	0	ok
Air Knife Pres. (3.0 - 7.0 V) ON	4.054	ok
Neb 25 @ setting of 25 PSI	25	ok
Cool 18 @ setting of 18 LPM	18	ok
Aux 0.6 @ setting of .6 LPM	0.6	ok
Camera Water pump		
Pump Current (0.000 A) OFF	0	ok
Pump Voltage (0.000 V) OFF	0	ok
Pump Current (0.8 to 4.0A) ON	1.09	ok
Pump Voltage (8 to 13 V) ON	12.52	ok

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

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PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท อีทีพีเอ็นไทย คอนสตรัคติง 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 usi	ok
Pump Speed	25 RPM	25	ok
Integration time	15 s Axial , 5 s Radial	10 s , 5 s	ok
Nebulizer Type	Seaspray, Conikal, Meinhard	Seaspray	ok
Intensity first performance	1 ppm \geq 4,000,000 5 ppm \geq 15,000,000 10ppm \geq 50,000,000	265,000,000	ok

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

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IC-THERMO

Serial No. : 20053176



Certificate of Calibration

Integrion : Anion and Cation (ID#960)

This certificate is to verify that instrument below are calibrated
by Archemica Lab Co.,Ltd.

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

For

Easternthai Consulting 1992 Co., Ltd.

Operator Signature : Nutdanai Date : Oct 20, 2022

(Mr.Nutdanai Laekhwan)

Application Chemist

COPY

UV/VIS SPECTROPHOTOMETER

Model : UV - 1800

Serial No. : A11635101643 CD



Bara Scientific Co., Ltd.
968 U Chu Liang Building Floor7 Rama4 Road
Silom Bangrak Bangkok Thailand 10500
Tel : 02-6324300 Fax : 02-6375496-7
www.barascientific.com



Certificate of Calibration

Number of Page(s) 1 of 3

Certificate No. BSCC-UV-152/23
Equipment UV/Vis Spectrophotometer
Model UV-1800
Manufacturer Shimadzu
Serial No. A11635101643 CD
ID No. N/A
Date of receipt 25 April 2023
Date of calibration 25 April 2023
Date of issue 27 April 2023

Customer name Eastern Thai Consulting 1992 Co.,Ltd

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

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

Equipment condition Good Operation

Calibration Location Analysis Department

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

Traceability Wavelength Accuracy is traceable to certificate No. 94780 and 94775
Photometric Accuracy is traceable to certificate No. 94808 and 100147
Stray Light is traceable to certificate No. 94791
The above certificate are traceable to SI unit through Starna Scientific Ltd.
(UKAS accredited calibration laboratory NO. 0659)

Calibrated by Mr.Pannaphong Phanmekakul

Approved by

Mr.Kanchit Choothep
Technical Manager

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



Bara Scientific Co., Ltd.
968 U Chu Liang Building Floor7 Rama4 Road
Silom Bangrak Bangkok Thailand 10500
Tel : 02-6324300 Fax : 02-6375496-7
www.barascientific.com



Certificate of Calibration

Certificate No. BSCC-UV-152/23

Number of Page(s) 2 of 3

Calibration Results:

1.Wavelength Accuracy

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

2.Photometric Accuracy (UV)

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

*CNR = Customer not request

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Certificate of Calibration

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

Calibration Results:

3. Photometric Accuracy (Visible)

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

*CNR = Customer not request

4. Stray Light*

Standard cut-off wavelength (nm)	Unit Under Calibration(UUC)		
	Wavelength (nm)	Transmission (%T)	Absorbance (A)
200.75 \pm 0.11nm	200.72	0.9630	2.0164

The Stray light transmission reference is less than 1.0%T and Stray light absorbance reference is greater than 2.00A

*Stray Light not NSC-ONSC Accredited.

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

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SOUND LEVEL CALIBRATOR

MODEL : NC-75

SERIAL No. : 34802645



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0021

MTC No. EEL. BP. 35/1065

CALIBRATION CERTIFICATE

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

Address : 683 Moo 11 Sukaphibal8 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 : $(23 \pm 3) ^\circ\text{C}$

Relative Humidity : $(50 \pm 15) \%$

Ambient Pressure : $(101.325 \pm 1.500) \text{ kPa}$

Standards used : 1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.

2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.

3. Programmable Attenuator Tarnagawa TPA-303A S/N OF 2214.

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

5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.

6. Audio Analyzer Panasonic VP-7722A S/N 041477D122.

7. Condenser Microphone B&K 4180 S/N 2633526.

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

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

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

Date of Receipt : 10 Oct. 2022

Date of Calibration : 18 Oct. 2022

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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 IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	93.98	-0.02	± 0.10	$\pm 0.40 \text{ dB}$

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	1000.0	0.0	± 1.5	$\pm 1.0\%$

3. Total distortion

Standard Microphone Type	Measured Total distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	0.30	± 0.50	$\pm 3.0\%$

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :

(Mr. Weerachai Deechaiyae)

Approved by :

(Mr. Praveen K. K. K. K.)

Date of Calibration : 18 Oct. 2022

Date of Issue : 19 Oct. 2022

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Ref : 2011265101004372001

End of Certificate

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SOUND LEVEL METER

MODEL : NL-52A

SERIAL No. : 00230992



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

MTC No. EEL. BP. 154/0266

Request No. 21-66/0343

CALIBRATION CERTIFICATE

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

Ambient Environment

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

Instrument Calibrated :

Description : Sound Level Meter
 Manufacturer : Rion
 Model : NL-52A
 Serial No. : 00230992
 Microphone : Type UC-59 No.22769
 Preamplifier : Type NH-25 No.22428

Standards used :

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

Date of Receipt : 27 Feb. 2023

Date of Calibration : 21-23 Mar. 2023

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0343

MTC No. EEL. BP. 154/0266

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

Calibration Procedure :

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

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

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

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

Date of Calibration : 21-23 Mar. 2023

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1. Absolute Sensitivity

Reference Acoustic Signal (dB)	Measured value (dB)		Deviation value (dB)	Acceptance limit Class 1 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	Before adjust	After adjust				
113.89	114.0	113.9	0.0	0.7	0.30	N/A

Note: The external calibration adjustment was firstly performed. The internal calibration adjustment was then completed at the display of 123.9 dB.

2. Self-generated noise

2.1 Normal test

Measured value (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
20.8	0.10	N/A

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

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

Date of Calibration : 21-23 Mar. 2023

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3. Acoustical signal test of frequency weightings

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

4. Electrical signal test of frequency weightings

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

Date of Calibration : 21-23 Mar. 2023

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5. Long-term stability

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

6. Frequency and time weightings at 1 kHz

6.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 1 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
A-weight	94.0	0.0	0.2	0.20	0.2
C-weight	94.0	0.0	0.2	0.20	0.2
Flat	94.1	0.1	0.2	0.20	0.2

6.2 Time weightings at 1 kHz

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

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7. Level linearity on the reference level range

Anticipated value (dB)	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 1 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
137	137.1	0.1	0.8	0.30	0.3
136	136.1	0.1	0.8	0.30	0.3
135	135.1	0.1	0.8	0.30	0.3
134	134.1	0.1	0.8	0.30	0.3
133	133.0	0.0	0.8	0.30	0.3
132	132.0	0.0	0.8	0.30	0.3
131	131.0	0.0	0.8	0.30	0.3
130	130.0	0.0	0.8	0.30	0.3
129	129.0	0.0	0.8	0.30	0.3
124	124.0	0.0	0.8	0.30	0.3
119	119.0	0.0	0.8	0.30	0.3
114	114.0	0.0	0.8	0.30	0.3
109	109.0	0.0	0.8	0.30	0.3
104	104.0	0.0	0.8	0.30	0.3
99	99.0	0.0	0.8	0.30	0.3
94	94.0	0.0	0.8	0.30	0.3
89	89.0	0.0	0.8	0.30	0.3
84	84.0	0.0	0.8	0.30	0.3
79	79.1	0.1	0.8	0.30	0.3

Date of Calibration : 21-23 Mar. 2023

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

Anticipated value (dB)	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 1 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
74	74.0	0.0	0.8	0.30	0.3
69	69.0	0.0	0.8	0.30	0.3
64	64.0	0.0	0.8	0.30	0.3
59	59.0	0.0	0.8	0.30	0.3
54	53.9	-0.1	0.8	0.30	0.3
49	49.0	0.0	0.8	0.30	0.3
44	43.9	-0.1	0.8	0.30	0.3
39	39.0	0.0	0.8	0.30	0.3
34	34.0	0.0	0.8	0.30	0.3
29	28.9	-0.1	0.8	0.30	0.3
28	28.0	0.0	0.8	0.30	0.3
27	27.0	0.0	0.8	0.30	0.3
26	26.0	0.0	0.8	0.30	0.3
25	24.9	-0.1	0.8	0.30	0.3

8. Level linearity including the level range control

At reference sound level on the reference level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 1 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
30-130	94.0	94.0	0.0	0.8	0.00	0.3

Date of Calibration : 21-23 Mar. 2023

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8. Level linearity including the level range control

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

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

9. Tone burst response

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

Date of Calibration : 21-23 Mar. 2023

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10. Peak C sound level

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

11. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limit class 1 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Positive one-half cycle	Negative one-half cycle				
136.5	136.5	0.0	1.5	0.20	0.25

12. High-level stability

Time	Measured value (dB)	Deviated value (dB)	Acceptance limit class 1 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Begin	129.0	0.0	0.1	0.10	0.1
End	129.0				

Calibrated by :

Pannasit Phasingsri

(Mr. Pannasit Phasingsri)

Approved by :

(Mr. Prawit Khaypa)

Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 21-23 Mar. 2023

Date of Issue : 23 Mar. 2023

Ref : 2011266022700825007

End of Certificate

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FM.BL.MTC.002 Re

SOUND LEVEL METER

MODEL : NL-52A

SERIAL No. : 00230989



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0343

MTC No. EEL. BP. 152/0266

CALIBRATION CERTIFICATE

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

Instrument Calibrated :

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

Ambient Environment

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

Standards used :

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

Date of Receipt : 27 Feb. 2023

Date of Calibration : 24 Mar. 2023

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

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FM.BL.MTC.002 Re

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FM.BL.MTC.002 Rev.4



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0343

MTC No. EEL. BP. 152/0266

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

Calibration Procedure :

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

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

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

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

Date of Calibration : 24 Mar. 2023

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1. Absolute Sensitivity

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

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

2. Self-generated noise

2.1 Normal test

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

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

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

Date of Calibration : 24 Mar. 2023

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FM.BL.MTC.002 Rev

3. Acoustical signal test of frequency weightings

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

4. Electrical signal test of frequency weightings

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

Date of Calibration : 24 Mar. 2023

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5. Long-term stability

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

6. Frequency and time weightings at 1 kHz

6.1 Frequency weightings at 1 kHz

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

6.2 Time weightings at 1 kHz

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

Date of Calibration : 24 Mar. 2023

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FM.BL.MTC.002 R

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FM.BL.MTC.002 Rev.4

7. Level linearity on the reference level range

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

Date of Calibration : 24 Mar. 2023

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0343

MTC No. EEL. BP. 152/0266

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

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

8. Level linearity including the level range control

At reference sound level on the reference level range

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

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0343

MTC No. EEL. BP. 152/0266

8. Level linearity including the level range control

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

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

9. Tone burst response

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

Date of Calibration : 24 Mar. 2023

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FM.BL.MTC.002 Rev.4

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MTC No. EEL. BP. 152/0266

Request No. 21-66/0343

10. Peak C sound level

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

11. Overload indication

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

12. High-level stability

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

Calibrated by :

Wittawat Supanich
(Mr. Wittawat Supanich)

Approved by :

Prawate Klongyap
(Mr. Prawate Klongyap)
Director

Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Date of Calibration : 24 Mar. 2023

Date of Issue : 24 Mar. 2023

End of Certificate

Ref: 2011266022700825005

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FM.BLMTC.002 Re

ANALYTICAL BALANCE (DU)

Model. : XS205DU

Serial No. : 1126323724

NSC-TISI-TIS17025
CALIBRATION 0152

Page 1 of 4

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

CERTIFICATE OF CALIBRATION

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

Approved by

(Mr. Somchai Neampunt)

Signed for Director

Issue date 25 January 2023

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

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

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

NSC-TISI-TIS17025
CALIBRATION 0152

Page 2 of 4

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

REPORT OF CALIBRATION

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

Result of Calibration

1. Test weight and repeatability of reading

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

Unit : g	Range : 80	<input type="checkbox"/> Before adjustment	<input type="checkbox"/> After adjustment
<input checked="" type="checkbox"/> No adjustment	Nominal value	40	30
<input type="checkbox"/> Adjustment	Standard weight	40.000042	30.000045
	Average reading of indicator	40.000015	30.000019
	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	200.00004
	Standard deviation	0.00004	0.00008

COPY

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

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	10.000000	10.00007	-0.00007	0.000032	2.00
20	20.000016	20.00011	-0.00009	0.000036	2.00
50	50.000029	50.00013	-0.00010	0.000067	2.00
100	100.000022	100.0001	-0.0001	0.00016	2.00
150	150.000051	150.0001	0.0000	0.00023	2.00
200	200.000199	200.0003	-0.0001	0.00028	2.00

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

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

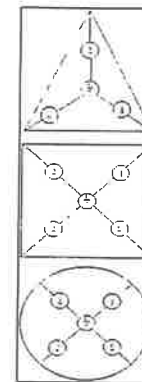
REPORT OF CALIBRATION

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	<input type="radio"/> Circle <input type="radio"/> Triangular <input checked="" type="radio"/> Rectangular	Test weight : 50 and 100 Unit : g
Range	80	200
Position	Reading of indicator	Reading of indicator
1	50.00014	100.0001
2	50.00014	99.9998
3	50.00006	100.0000
4	50.00010	100.0001
5	50.00017	100.0001
6	50.00014	100.0001
Maximum difference	0.00008	0.0003



Condition of Calibration

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.	Certificate No.	Due Date
1) STANDARD WEIGHT 1 mg to 1 kg	E2	LB-WE-57	22-060639	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 -

ANALYTICAL BALANCE

Model. : SECURA224-1S

Serial No. : 0036707137



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,
Sriracha, 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 : 20 January 2023

Date of Calibration : 20 January 2023

Calibrated by Mr. Thanadol Pholthep
Scientist

Approved by

(Mr. Somchai Neampunt)

Signed for Director

Issue date 25 January 2023

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

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

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



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

REPORT OF CALIBRATION

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

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

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Certificate No. : 23-006682

Sample Code : 23-02820-005

REPORT OF CALIBRATION

Result of Calibration

2. Sensitivity or value of a scale division

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

Unit : g

Range : 220

Test Point	Sensitivity, S
0	0.9980
100	0.9980
200	0.9980

Range :

Test Point Sensitivity, S

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	20.000016	20.0000	0.0000	0.00012	2.03
50	50.000029	50.0000	0.0000	0.00013	2.02
100	100.000022	99.9998	0.0002	0.00017	2.01
200	200.000199	200.0000	0.0002	0.00028	2.00

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

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.

Weighing pan ☒ Circle
☐ Triangular
☐ Rectangular

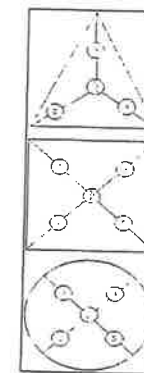
Test weight : 100

Unit : g

Range : 220

Position	Reading of indicator	Reading of indicator
1	99.9998	
2	100.0001	
3	99.9997	
4	99.9998	
5	99.9998	
6	99.9998	

Maximum difference 0.0003



Condition of Calibration

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

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

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

5. Reference standard instrument :

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

6. Ambient conditions	Min	Max
Temperature (°C)	21.2	22.5
Relative Humidity (%Rh)	37.1	44.3
Air pressure (hPa)	1012.1	1013.0

- 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.mit.in.th



CALIBRATION CERTIFICATE

Certificate No. : L202305085-002

Date Issued : 16-May-23

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

Equipment : Analog Barometer

Manufacturer : Barigo

Model : -

Serial No. : -

ID No./Tag No. : BM001/41

Date Received : 11-May-23

Date Calibrated : 15-May-23

Calibrated by : Mr. Jame Khaothong

Calibration Method or Calibration Procedure Used

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

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

Result of Calibration

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

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

Approved by:

Sarayuth T.

(Mr. Sarayuth Tochua)



Page 1 of 2

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Certificate No : L202305085-002

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

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

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

STD = Standard

UUC = Unit Under Calibration

Calibrated condition :

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

Description of UUC :

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

Condition As-Received : Used Item

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

Measurement Standards Used & Traceability :

The International System of Units (SI) through

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

End of Certificate

Page 2 of 2

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BOD INCUBATOR

ID No. : LABE 19/2



Page 1 of 3

CERTIFICATE OF CALIBRATION

Certificate No. : 22-136844
Sample Code : 22-51164-006

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.
(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-P100)	LB-DA-11 (RTD-148 to RTD-155, RTD-227)	22-040308	24 April 2023

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

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

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

6. Condition of calibration item : Normal

Calibrated by : Mr. Natthan Phosri
Scientist

Approved by :
Signed for Director

(Mr. Somchai Neampunt)

Issue date : 26 December 2022

The uncertainties are for a confidence probability of approximately 95%

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

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be 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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CALIBRATION 0152

Page 2 of 3

REPORT OF CALIBRATION

Certificate No. : 22-136844
Sample Code : 22-51164-006

Results of Calibration

Resolution : 0.1 °C

1. Reporting of Temperature

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

2. Characterization results

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

Notes

* UUC* = Unit Under Calibration

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CALIBRATION 0152

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REPORT OF CALIBRATION

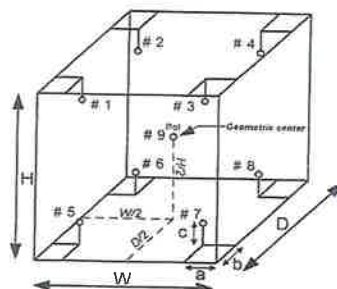
Certificate No. : 22-136844

Sample Code : 22-51164-006

Results of Calibration

Notes

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

Figure: Example of sensor
installation Positions

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

- End of Report -

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BOD INCUBATOR

ID No. : LABE 19/5



Page 1 of 3

CERTIFICATE OF CALIBRATION

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

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.
(Laboratory)

Equipment : Temperature controlled enclosures (Incubator)

Manufacturer : Lovibond Model : Tc445S

Serial No. : 0520/005227 ID No. : LABE 19/5

Date of Receipt : 21 April 2023 Date of Calibration : 21 April 2023

Condition of Calibration

1. Environment
1.1 Ambient temperature : Maximum 36.1 °C ; Minimum 34.5 °C
1.2 Relative humidity : Maximum 51.8 % ; Minimum 49.3 %
1.3 Line voltage supplied : Maximum 224.7 VAC ; Minimum 221.9 VAC

2. Calibration method

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

3. Reference standard instrument

Instrument	ID No.	Certificate No.	Due Date
Data Acquisition With Sensor (RTD-Pt100)	LB-DA-08 (RTD-239 to RTD-247)	22-077888	09 August 2023

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

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

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

6. Condition of calibration item : Normal

Calibrated by Mr. Sarawoot Thammo
Scientist

Approved by

(Mr. Somchai Neampunt)

Signed for Director

Issue date 24 April 2023

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

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

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

361 Soi Ladprao 122, Ladprao Road,
Phlabphla, Wang Thonglang, Bangkok 10310
FM-CL-114

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FAX 02-516-6949
Rev 01

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

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CALIBRATION 0152

Page 2 of 3

REPORT OF CALIBRATION

Certificate No. : 23-040768

Sample Code : 23-16178-002

Results of Calibration

Resolution : 0.1 °C

1. Reporting of Temperature

Calibration point (°C)	UUC* setting (°C)	UUC* reading (°C)	Measured temperature at each positions (°C)									Uncertainty ± (°C)	Coverage factor k
			# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	# 9 ^{Ref}		
20	20.0	20.0	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

(Mr. Somchai Neampunt)
Signed for Director
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Effective Date 15/10/21

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REPORT OF CALIBRATION

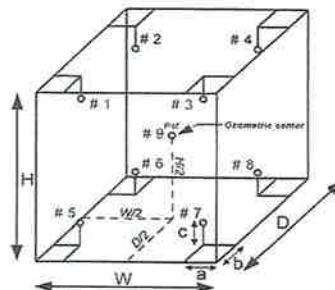
Certificate No. : 23-040768

Sample Code : 23-16178-002

Results of Calibration

Notes

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

Figure: Example of sensor
installation Positions

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

End of Report

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DO

Model : YSI 5000

Serial No. : 18E101961



Harikul Science Co.,Ltd.
694 Soi Ratchadaniwet 24, Pracharatbampnen,
Samsaennok, Huaikhwang, Bangkok 10310
Tel: 0-2274-2456 Fax: 0-2274-2443
Email: info@harikul.com www.harikul.com

CERT.No.: HS-T055H

Certificate of Calibration

Calibration Date : 23 Aug 22

Submitted by : Eastern Thai Consulting 1992 Company Limited
683 Moo.11 Sukaphibal8 Rd., Nongkham, Sriracha,
Chonburi 20230

Model : YSI 5000
S/N : 18E101961
Probe : YSI 5010
S/N : 18A100724
ID NO. :
Air Temp ref : S/N. E00522
Barometric ref : S/N. E00522
Water Temp ref : S/N. 11431

Avg Room Temp : 20 °C

Avg Water Temp : 20 °C

Air Pressure : 760.00 mmHg

Salinity : 0 ppt

Technician : Kittipong M.

Calibration Details

Calibration Point	100% air sat. (@20 °C, DO = 9.09 mg/l)	(status)	(status)
Measurement 1 (mg/l)	9.08	(PASS)	-
Measurement 2 (mg/l)	9.08	(PASS)	-
Measurement 3 (mg/l)	9.09	(PASS)	-
Measurement 4 (mg/l)	9.10	(PASS)	-
Measurement 5 (mg/l)	9.10	(PASS)	-
Measurement 6 (mg/l)	9.09	(PASS)	-
Measurement 7 (mg/l)	9.09	(PASS)	-
Measurement 8 (mg/l)	9.08	(PASS)	-
Measurement 9 (mg/l)	9.09	(PASS)	-
Measurement 10 (mg/l)	9.08	(PASS)	-

Mean Measurement	9.09	mg/l	-	-
Inaccuracy	0.00	mg/l	-	-

Overall Status (PASS)

Manufacturer Specification

Accuracy = +/- 0.02 mg/l

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

Technician Signature

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CONDUCTIVITY METER

Type : SevenCompactTM Conductivity meter S230

Serial No. : B744909989

Certificate Number CCP-2407-23

Calibration Certificate SevenCompact™ Conductivity Meter S230

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

Instrument

Type SevenCompact™ S230 Instrument serial number B744909989
Internal identification LABE 13/2 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) 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 Tools

Certified conductivity resistors Manufacturer METTLER TOLEDO Serial number S260
Type 51302861 Certificate number 62619
Date of certification February 15, 2022

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

Certified temperature resistors Manufacturer METTLER-TOLEDO Serial number A275
Type 51302410 Certificate number 62591
Date of certification February 14, 2022

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

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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	Sensor recognition	The sensor was recognized correctly by the meter	Passed
---	--------------------	--	--------

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

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Mettler-Toledo (Thailand) Limited

METTLER TOLEDO

Performance Test

Attachment to Certificate No. CCP-2407-23

Conductivity Sensor

Type: InLab 731-ISM S/N: 5821041078

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 ⁻¹)	New (cm ⁻¹)
1413 uS/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	uS/cm	26.5 °C	1316	-97		1413	uS/cm	27.5 °C	1405	-8	
12.88	mS/cm	26.9 °C	12.14	-0.74		12.88	mS/cm	27.4 °C	12.68	-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:

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Hot Air Oven

Model. : UM 400

Serial No. : 900982

NSC-TISI-TIS17025
CALIBRATION 0152

Page 1 of 3

CERTIFICATE OF CALIBRATION

Certificate No. : 23-018635

Sample Code : 23-07651-001

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.
(Hot Lab)

Equipment : Temperature controlled enclosures (Hot air oven)

Manufacturer : Memmert Model : UM 400

Serial No. : 900982 ID No. : LABE 17/1

Date of Receipt : 21 February 2023 Date of Calibration : 21 February 2023

Condition of Calibration

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

2. Calibration method

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

3. Reference standard instrument

Instrument	ID No.	Certificate No.	Due Date
Data acquisition with sensor (RTD-Pt100)	LB-DA-12 (RTD-158 to RTD-166)	22-040312	02 May 2023

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

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

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

6. Condition of calibration item : Normal

Calibrated by Mr. Sarawoot Thammo
Scientist

Approved by

(Mr. Somchai Neampunt)

Signed for Director

Issue date 24 February 2023

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

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

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

NSC-TISI-TIS17025
CALIBRATION 0152

Page 2 of 3

REPORT OF CALIBRATION

Certificate No. : 23-018635

Sample Code : 23-07651-001

Results of Calibration

Resolution : 0.1 °C

1. Reporting of Temperature

Calibration point (°C)	UUC* setting (°C)	UUC* reading (°C)	Measured temperature at each positions (°C)									Uncertainty ± (°C)	Coverage factor k
			# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	# 9 ^{Ref}		
85	85.0	85.0	85.18	85.04	84.62	84.82	85.03	85.04	85.00	84.96	85.08	0.25	2.00

2. Characterization results

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

Notes

- UUC* = Unit Under Calibration

95

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NSC-TISI-TIS17025
CALIBRATION 0152

Page 3 of 3

REPORT OF CALIBRATION

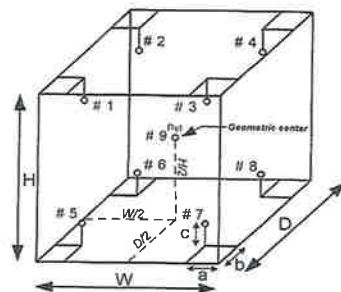
Certificate No. : 23-018635

Sample Code : 23-07651-001

Results of Calibration

Notes

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

Figure: Example of sensor
installation Positions

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

- End of Report -

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INDUCTIBELY COUPLED PLASMA SPECTROMETER

Model : Prodigy 7

Serial No. : P70177



บริษัท แอปพลิเคชัน ดีฟายน์ จำกัด
Application Define Company Limited
133/318 ถนนหทัยราษฎร์ แขวงมีนบุรี เขตมีนบุรี กรุงเทพมหานคร 10510
133/318 Hatahrath Road., Minburi Sub-district Minburi District, Bangkok 10510
Tel: (66)64456-5191 E-mail: support@apdefine.co.th Website : http://www.apdefine.co.th
เลขประจำตัวผู้เสียภาษี 0105556032491

CERTIFICATE OF INSTRUMENT PERFORMANCE

INSTRUMENT: INDUCTIVELY COUPLED PLASMA SPECTROMETER
BRAND: Telendyne Leeman Labs
MODEL: Prodigy 7
SERIAL NO. P70177
CUSTOMER: บริษัท อีเทิร์นไทย คอนซัลติ้ง 1992 จำกัด

CHECKING:	SPECTROMETER	STATUS
Wavelength Accuracy check by use emission line of Hg Lamp		ok
Mercury line 253.652 nm.		ok
Plasma View (Dual View)		ok
CMOS Detector check		ok
Align View by Mn line 257.610 nm.		ok
RF GENERATOR		ok
Incident Power 1,200 \pm 10 Watt Reading = 1200 Watt		ok
SAMPLE INTRODUCTION		ok
Plasma Torch, Injector, Spray chamber, Nebulizer		ok
Peristaltic pump & Tubing		ok
EXHAUSTING & COOLING SYSTEM		ok
Safety Interlock Switch (Door, Argon pressure, Water pressure)		ok
Cooling System, water flowrate & low pressure switch		ok
Flowrate of Air blower		ok
COMPUTER & SOFTWARE		ok
Plasma Ignition software & Analytical Software		ok
ANALYTICAL TEST		ok
Full Frame Capture & Echellogram check		ok
Calibration Cuve & QC Test		ok

DATE : Dec 12, 2022

Mr. Somchai Churnyaung
Engineer Sign

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PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

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

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

Gas system: ตรวจสอบแรงดันแก๊สและการรั่วซึม 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 4 Dec 2024 เปลี่ยนตัววัดความชื้นดีไฮเดรเตอร์ ทุก 1 ปี	
Water Chiller: RF generator flow rate 1.14 LPM Temperature 24 °C ตรวจสอบอุณหภูมิ Leak inspected (✓) No leak ตรวจสอบการรั่วซึม	
Water Chiller : Camera (✓) check water level and refill ตรวจสอบระดับน้ำและเติมน้ำ (✓) change water เปลี่ยนถ่ายน้ำ Temperature -31 °C ตรวจสอบอุณหภูมิ	
Exhaust Hood Flow rate 700 CFM (system request > 150)	

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PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

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

2. Computer & Software Check

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

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PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

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

3. Instrument Control

Description	Status
<u>Optical view position</u> : ตรวจสอบตำแหน่งฟิสิกส์ที่ติดตั้งในแต่ละมุมมอง	
<u>Hg Lamp Deltas</u>	
X <u>2</u> Y <u>-9</u>	ok
XUV <u>0</u>	ok
Axial peak positions X <u>3325</u> Y <u>1225</u>	ok
Radial peak positions X <u>1151</u> Y <u>1225</u>	ok
Hg lamp peak positions X <u>2220</u> Y <u>2630</u>	ok
<u>Plasma Control</u> : ตรวจสอบการทำงานของพลาสมาและดับพลาสมา	
(✓) Auto Start	ok
(✓) Extinguish	ok
(✓) RF power setting	ok
(✓) Igniter	ok
(✓) Air Knife	ok
<u>Torch Gas</u> : ตรวจสอบการทำงานของระบบแก๊สที่ใช้ในพลาสมา	
(✓) Coolant/Plasma Flow control	ok
(✓) Aux Flow	ok
(✓) Nebulizer Flow	ok
(✓) Optimize sample introduction function	ok
(✓) Peristaltic pump control	ok
(✓) Auto sampler Control	ok
(✓) Camera Support Module	ok
(✓) Diagnostic	ok

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PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท อีสเทิร์นไทย คอนซัลติ้ง 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 คอนซัลติ้ง 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)	-13.756	ok
+12 VDC (11 - 14.5 VDC)	+12.012	ok
+3.3VDC	3.286	ok
+5.0 VDC	4.995	ok
+13.5 VDC	13.489	ok

Plasma Generator	Value	Status
ICP Current 0.500A = 1kW	0.949	ok
ICP Ref 5.0Vdc = 1kW	5.469	ok
ICP Current 0.00 Vdc = 0kW	0	ok
ICP Ref 0.00Vdc = 0kW	0	ok
RF Water (Hz) OFF	0	ok
RF Water (Hz) ON	23	ok
Air Knife Pres. (0.00V) OFF	0	ok
Air Knife Pres. (3.0 - 7.0 V) ON	4.054	ok
Neb 25 @ setting of 25 PSI	25	ok
Cool 18 @ setting of 18 LPM	18	ok
Aux 0.6 @ setting of 6 LPM	0.6	ok
Camera Water pump		
Pump Current (0.000 A) OFF	0	ok
Pump Voltage (0.000 V) OFF	0	ok
Pump Current (0.8 to 4.0A) ON	1.09	ok
Pump Voltage (8 to 13 V) ON	12.52	ok

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

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PREVENTIVE MAINTENANCE / CALIBRATION REPORT FOR PRODIGY7

Customer: บริษัท อีสเทิร์นไทย คอนสตรัคชั่น 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 LSI	ok
Pump Speed	25 RPM	25	ok
Integration time	15 s Axial , 5 s Radial	10 s , 5 s	ok
Nebulizer Type	Seaspray, Conikal, Meinbard	Seaspray	ok
Intensity first performance	1 ppm \geq 4,000,000 5 ppm \geq 15,000,000 10ppm \geq 50,000,000	~ 65,000,000	ok

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

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LIQUID IN GLASS THERMOMETER

Model : Total immersion

Serial No. : 43560

Calibration Certificate

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

Page 1 of 3

Equipment: Liquid-in-Glass Thermometer

Manufacturer: Precision

Model / Type: Total Immersion

Serial No.: 43560

ID No.: LABE 16/1

Order No.: 2300368

Operation No.: 2300368-001

Date of Receipt: 7 November 2022

Date of Calibration: 15 November 2022

Calibrated by Mr.Nuttapol Niyomchat
 Specialist

Approved by

(Mr.Pheraphat Tuanjit)

Manager, Division of Calibration Laboratory

Responsible for the Technical Management Team

Date of Issue: 18 November 2022

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

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

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



Calibration Report

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

Date of Calibration: 15 November 2022

Page 2 of 3

Location: Temperature Calibration Laboratory, National Food Institute

Environment Condition: Ambient Temperature 23 °C ± 3 °C,
 Relative Humidity 55 % ± 15 %.

Condition of this results of Calibration:

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

2. Reference Standard Instrument :

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

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

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

- This certificate is traceable to International System of Units (SI Units).
- This certificate was certified only for the instrument we calibrated.
- This result of calibration was found accurate as shown on date and place of calibration only.
- Condition of Calibrated item : Good
- Result of Calibration : ☒ Without adjustment ☐ After adjustment

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



Calibration Report

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

Date of Calibration: 15 November 2022 Page 3 of 3

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

Reporting of ice-point or reference point

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

Reporting of temperature calibration point

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

Note

* UUC* : Unit Under Calibration

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

----- End -----



pH Meter

Model. : SevenCompact S220

Serial No. : B448305208



Page 1 of 3

CERTIFICATE OF CALIBRATION

Certificate No. : 23-011524

Sample Code : 23-04833-001

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.

683 Moo 11, Sukhapiban 8 Rd., Nongkham,

Sriracha, 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.	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 LotN 04.06.2021 ; BIM RefN HI-28 LotN 28.05.2021 ; BIM RefN HI-27 LotN 04.06.2021 ; BIM RefN HI-28 LotN 28.05.2021 Accredited laboratory ISO/IEC 17025 and ISO/IEC 17034).

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

6. Condition of calibration item : Normal

Calibrated by Mr.Anupong Lakawin

Scientist

Approved by

(Ms. Pawana Pan-on)

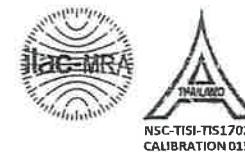
Signed for Director

Issue date 03 February 2023

The uncertainties are for a confidence probability of approximately 95%

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

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



Page 2 of 3

REPORT OF CALIBRATION

Certificate No. : 23-011524

Sample Code : 23-04833-001

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

Results of Calibration

Part 1. DC Voltage measurement

pH Meter Serial No. : B448305208

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

Part 2. Performance of Electrode system

Electrode Manufacturer : METTLER TOLEDO Model : InLab Expert Pro-ISM

Electrode Serial No. : 2365921

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

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



REPORT OF CALIBRATION

NSC-TISI-TIS17025
CALIBRATION 0152

Page 3 of 3

Certificate No. : 23-011524

Sample Code : 23-04833-001

Equipment : pH Meter (Digital Thermometer with sensor)

Thermometer readout

Manufacturer : METTLER TOLEDO Model : SevenCompact S220
 Serial No. : B448305208 ID No. : LABE 11/4
 Resolution : 0.1 °C Range : -5.0 °C to 130.0 °C

Thermometer sensor

Manufacturer : METTLER TOLEDO Model : InLab Expert Pro-ISM
 Serial No. : 2365921 ID No. : N/A

Condition of Calibration

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

2. Calibration method

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

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-TH-33	22-107027	02 October 2023

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

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

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

6. Condition of Calibration item : Normal

Results of Calibration

Calibration point °C	Average of standard reading °C	Unit under calibration			Expanded uncertainty °C	Coverage factor k
		Immersion depth mm	Average reading °C	Correction value °C		
25	25.002	120	25.0	+ 0.002	± 0.13	2.00

Notes

- Calibration results without adjustment

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

- End of report -

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STANDARD WEIGHT 50 g



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

CERTIFICATE OF CALIBRATION

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

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

Equipment : Standard Weight 50 g

Manufacturer : METTLER TOLEDO

Class : F1

Serial No. : N/A

ID No. : LABE 10/1

Date of Receipt : 18 May 2022

Date of Calibration : 30 May 2022

Calibrated by : Mr. Somwang Sangdee
Scientist

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

Issue date : 31 May 2022

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

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

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



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

REPORT OF CALIBRATION

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

Result of Calibration : ☒ Without adjustment ☐ Adjustment

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

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

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

COPY

Certificate No. : 22-052238

Sample Code : 22-19150-003

Page 3 of 3

REPORT OF CALIBRATION

Condition of Calibration:

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

2. Calibration Method : Direct comparison weighing according to OIML R111-1 : 2004(E)

3. Reference standard instrument

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

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

Asia Medical and Agricultural Laboratory and Research Center Public Company Limited

(Instrument number 1).

5. Condition of Calibration item: Normal

6. Description of Calibrated Item :

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

- End of Report -

COPY

STANDARD WEIGHT 100 g



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

CERTIFICATE OF CALIBRATION

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

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

Equipment : Standard Weight 100 g

Manufacturer : N/A

Class : N/A

Serial No. : N/A

ID No. : LABE 10/2

Date of Receipt : 18 May 2022

Date of Calibration : 30 May 2022

Calibrated by : Mr. Somwang Sangdee
Scientist

Approved by

(Mr. Somchai Neampunt)

Signed for Director

Issue date : 31 May 2022

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

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

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



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

REPORT OF CALIBRATION

Equipment : Standard Weight 100 g
Manufacturer : N/A
Class : N/A
Serial No. : N/A
ID No. : LABE 10/2

Result of Calibration :

☒ Without adjustment

☐ Adjustment

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

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

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

COPY



Certificate No. : 22-052239

Sample Code : 22-19150-004

REPORT OF CALIBRATION

Condition of Calibration

1. Ambient Conditions : Temperature $20^{\circ}\text{C} \pm 1.5^{\circ}\text{C}$, Relative humidity $50\% \pm 10\%$ and air density 1.18 kg/m^3

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

3. Reference standard instrument

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

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

Asia Medical and Agricultural Laboratory and Research Center Public Company Limited

(Instrument number 1).

5. Condition of Calibration item: Normal

6. Description of Calibrated Item :

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

- End of Report -

COPY

STANDARD WEIGHT 50 g



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

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
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 : N/A

Class : N/A

Serial No. : N/A

ID No. : LABE 10/4

Date of Receipt : 18 May 2022

Date of Calibration : 30 May 2022

Calibrated by : Mr. Somwang Sangdee
Scientist

Approved by

(Mr. Somchai Neampunt)

Signed for Director

Issue date : 31 May 2022

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

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

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



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

REPORT OF CALIBRATION

Equipment : Standard Weight 50 g
Manufacturer : N/A
Class : N/A
Serial No. : N/A
ID No. : LABE 10/4

Result of Calibration :

☒ Without adjustment

☐ Adjustment

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

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

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

COPY



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 -

COPY

THERMO-HYGROMETER

Model : 608-H1

Serial No. : 45106737

NSC-TISI-TIS17025
CALIBRATION 0152

Page 1 of 2

CERTIFICATE OF CALIBRATION

Certificate No. : 23-055203

Sample Code : 23-21440-001

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.

683 Moo 11, Sukhapibarn 8 Rd., Nongkham,

Sriracha, Chonburi 20230

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

Equipment : Digital thermo-hygrometer

Manufacturer : testo

Model : 608-H1

Serial No. : 45106737

ID No. : LABE 09/7

Date of Receipt : 25 May 2023

Date of Calibration : 29 May 2023

Condition of Calibration

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

2. Calibration method

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

3. Reference standard instrument

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

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

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

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

6. Condition of calibration item : Normal

Calibrated by : Miss Pornsuda Lohabal

Scientist

Approved by

(Mr. Somchai Neampunt)

Signed for Director

Issue date

31 May 2023

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

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

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

NSC-TISI-TIS17025
CALIBRATION 0152

Page 2 of 2

REPORT OF CALIBRATION

Certificate No. : 23-055203

Sample Code : 23-21440-001

Results of Calibration

Temperature measurement

Resolution : 0.1 °C

Range : 0 °C to 50 °C

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

Humidity measurement

Resolution : 0.1 %RH

Range : 10 %RH to 95 %RH

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

Notes

- Calibration results without adjustment.

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

- End of Report -

COPY

Area Heat Stress Monitor

Model : HD32.2

Serial No. : 22004318



63/14-15,67/35-36, Soi Petchkasem7,7/1, Petchkasem Rd,
Wattapra, Bangkokyai, Bangkok 10600 Thailand.
Tel.: (66) 02-8680812#13 Fax.: (66) 02-8680860 www.jiranatee.com



63/14-15,67/35-36, Soi Petchkasem7,7/1, Petchkasem Rd,
Wattapra, Bangkokyai, Bangkok 10600 Thailand.
Tel.: (66) 02-8680812#13 Fax.: (66) 02-8680860 www.jiranatee.com



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

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 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

Calibrated by
☐ Mr. Sorawit Thachalad
☒ Miss Jitraporn Lertsomphol



Approved Signatory:
Mr. Parinya Booncharoen
Calibration Department Manager

COPY

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 *



COPY

Area Heat Stress Monitor

Model : HD32.2

Serial No. : 22004316



63/14-15,67/35-36, Soi Petchkasem7,7/1, Petchkasem Rd,
Watthapra, Bangkokyai, Bangkok 10600 Thailand.
Tel: (66) 02-8680812#13 Fax: (66) 02-8680860 www.jiranatee.com



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

Calibrated by
☐ Mr. Sorawit Thachalad
☒ Miss Jitraporn Lertsomphol



Approved Signatory:
Mr. Parinya Booncharoen
Calibration Department Manager

COPY



63/14-15,67/35-36, Soi Petchkasem7,7/1, Petchkasem Rd,
Watthapra, Bangkokyai, Bangkok 10600 Thailand.
Tel: (66) 02-8680812#13 Fax: (66) 02-8680860 www.jiranatee.com



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%.



COPY

Area Heat Stress Monitor

Model : HD32.2

Serial No. : 22004320



63/14-15,67/35-36, Soi Petchkasem 7,7/1, Petchkasem Rd,
Wattthapra, Bangkokyai, Bangkok 10600 Thailand.
Tel: (66) 02-8680812#13 Fax: (66) 02-8680860 www.jiranatee.com



63/14-15,67/35-36, Soi Petchkasem 7,7/1, Petchkasem Rd,
Wattthapra, Bangkokyai, Bangkok 10600 Thailand.
Tel: (66) 02-8680812#13 Fax: (66) 02-8680860 www.jiranatee.com



CERTIFICATE OF CALIBRATION

Certificate No. : CL-056-66
Page 1 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,
Sriracha, 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
☐ Mr. Sorawit Thachalad
☒ Miss Jittraporn Lertsomphol



Approved Signatory:

Mr. Parinya Booncharoen
Calibration Department Manager

COPY

Certificate No. : CL-056-66
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: 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%.



COPY

Area Heat Stress Monitor

Model : QUESTemp 34

Serial No. : TEU080012



MIRACLE INTERNATIONAL TECHNOLOGY CO.,LTD

214 Bangwack Rd. Bangpai Bangkoe Bangkok 10160
Tel.: 0-2865-4647-8 Fax: 0-2865-4649 http://www.mit.in.th



CALIBRATION CERTIFICATE

Certificate No. : L202306315-002

Date Issued : 04-Jul-23

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

Equipment : Area Heat Stress Monitor

Manufacturer : TSI

Model : QUESTemp 34

Serial No. : TEU080012

ID No./Tag No. : NO.11

Date Received : 30-Jun-23

Date Calibrated : 02-Jul-23

Calibrated by : Mr. Apiwat Peanrungrot

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.

Approved by:

Sarayuth T.
(Mr. Sarayuth Tochua)



Page 1 of 2

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Certificate No. : L202306315-002

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		
37.99	WET 37.9	-	-0.09	0.35
37.99	DRY 37.9	-	-0.09	0.35
37.99	GLOBE 37.9	-	-0.09	0.35
45.01	WET 45.3	-	0.29	0.35
45.01	DRY 45.2	-	0.19	0.35
45.01	GLOBE 45.1	-	0.09	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

COPY

Area Heat Stress Monitor

Model : QUESTemp 34

Serial No. : TEU080011



MIRACLE INTERNATIONAL TECHNOLOGY CO.,LTD

214 Bangwaek Rd. Bangpai Bangae Bangkok 10160
Tel.: 0-2865-4647-8 Fax: 0-2865-4649 http://www.mit.in.th



CALIBRATION CERTIFICATE

Certificate No. : L202306315-001

Date Issued : 04-Jul-23

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

Equipment : Area Heat Stress Monitor

Manufacturer : TSI
Model : QUESTemp 34

Serial No. : TEU080011

ID No./Tag No. : NO.10

Date Received : 30-Jun-23

Date Calibrated : 02-Jul-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.

Approved by:

Saroyuth T.

(Mr. Sarayuth Tochua)



Page 1 of 2

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Certificate No. : L202306315-001

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		
37.99	WET 37.9	-	-0.09	0.35
37.99	DRY 37.7	-	-0.29	0.35
37.99	GLOBE 37.9	-	-0.09	0.35
45.01	WET 44.9	-	-0.11	0.35
45.01	DRY 44.8	-	-0.21	0.35
45.01	GLOBE 45.0	-	-0.01	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

COPY

Area Heat Stress Monitor

Model : QUESTemp 34

Serial No. : TEU080014



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CALIBRATION CERTIFICATE

Certificate No. : L202307241-0002

Date Issued : 24-Jul-23

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

Equipment : Area Heat Stress Monitor

Manufacturer : QUEST TECHNOLOGY

Model : QUESTEMP 34

Serial No. : TEU080014

ID No./Tag No. : No.13

Date Received : 21-Jul-23

Date Calibrated : 22-Jul-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.

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Approved by:

Sarayu Th

(Mr. Sarayuth Tochua)



Page 1 of 2

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Certificate No. : L202307241-0002

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		
38.00	WET 38.1	-	0.10	0.35
38.00	DRY 38.2	-	0.20	0.35
38.00	GLOBE 38.0	-	0.00	0.35
44.99	WET 45.0	-	0.01	0.35
44.99	DRY 45.1	-	0.11	0.35
44.99	GLOBE 44.9	-	-0.09	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

Page 2 of 2

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Area Heat Stress Monitor

Model : QUESTemp 34

Serial No. : TEU080015



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CALIBRATION CERTIFICATE

Certificate No. : L202307241-0001

Date Issued : 24-Jul-23

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

Equipment : Area Heat Stress Monitor

Manufacturer : QUEST TECHNOLOGY

Model : QUESTEMP 34

Serial No. : TEU080015

ID No./Tag No. : No.14

Date Received : 21-Jul-23

Date Calibrated : 22-Jul-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.

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Approved by:

Sarayuth T.

(Mr. Sarayuth Tochua)



Page 1 of 2

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Certificate No. : L202307241-0001

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

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

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		
38.00	WET 38.0	-	0.00	0.35
38.00	DRY 38.1	-	0.10	0.35
38.00	GLOBE 37.9	-	-0.10	0.35
44.99	WET 44.7	-	-0.29	0.35
44.99	DRY 44.8	-	-0.19	0.35
44.99	GLOBE 44.6	-	-0.39	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

Page 2 of 2

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Area Heat Stress Monitor

Model : QUESTemp 34

Serial No. : TEU080013



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CALIBRATION CERTIFICATE

Certificate No. : L202306315-003

Date Issued : 04-Jul-23

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

Equipment : Area Heat Stress Monitor

Manufacturer : TSI

Model : QUESTemp 34

Serial No. : TEU080013

ID No./Tag No. : NO.12

Date Received : 30-Jun-23

Date Calibrated : 02-Jul-23

Calibrated by : Mr. Apiwat Peanrungrot

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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Approved by:

Sarayuth T.
(Mr. Sarayuth Tochua)



Page 1 of 2

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Certificate No. : L202306315-003

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

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

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		
37.99	WET 37.8	-	-0.19	0.35
37.99	DRY 38.0	-	0.01	0.35
37.99	GLOBE 38.2	-	0.21	0.35
45.01	WET 45.1	-	0.09	0.35
45.01	DRY 45.3	-	0.29	0.35
45.01	GLOBE 45.1	-	0.09	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

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Area Heat Stress Monitor

Model : QUESTemp 32

Serial No. : TPL060039



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Tel.: 0-2865-4647-8 Fax: 0-2865-4649 http://www.mit.in.th



CALIBRATION CERTIFICATE

Certificate No. : L202305299-009

Date Issued : 07-Jun-23

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. : NO.4

Date Received : 29-May-23

Date Calibrated : 05-Jun-23

Calibrated by : Mr. Apiwat Peanrungrot

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.

Approved by:

Sarayuth T.

(Mr. Sarayuth Tochua)



Page 1 of 2

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Certificate No. : L202305299-009

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

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

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		
38.00	WET 38.0	-	0.00	0.35
38.00	DRY 38.1	-	0.10	0.35
38.00	GLOBE 38.0	-	0.00	0.35
44.99	WET 45.2	-	0.21	0.35
44.99	DRY 45.3	-	0.31	0.35
44.99	GLOBE 45.0	-	0.01	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

Page 2 of 2

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DIGITAL LIGHT METER

Model : LX-72

Serial No. : Q606371


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



CALIBRATION CERTIFICATE

Issued date: 23 July 2023

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

Address : 683 Moo.11, Sukhaphibarn 8 Rd., Nongkham, Siracha, Chonburi 20230.

 Request No : **C-2307 - 306**

 Laboratory No.: **CAL- 306**

Date of Request: 19 July 2023.

Date of Calibration: 20 July 2023.

1. Unit Under Calibration (UUC) :

Nomenclature : Digital Light Meter

Serial No.: Q 606371

Maker : DIGICON

Model : LX-72

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.: 504011, which was calibrated on 5 October 2022, can be traceable to International System of Unit (SI) through National Institute of Metrology (Thailand), Certificate No.: TP-1024-22.

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 INSTRUK.
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 a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95 %.

Page 1 of 2

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

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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


 Request No: **C-2307 - 306**

Serial No.: Q 606371

 Laboratory No.: **CAL - 306**
Results :

UUC Range	Standard (lx)	UUC Reading (lx)		Correction (lx)	Uncertainty of Measurement (\pm lx)
		Before adjust	After adjust		
400	0	---	---	---	0.60
	50	49.2	50.1	- 0.1	2.0 % of Reading
	100	99.3	100.2	- 0.2	
	200	198.7	200.0	0.0	
	300	295.0	296.8	+ 3.2	
	400	388.4	390.8	+ 9.2	
4000	500	485	501	- 1	
	1000	970	1002	- 2	
	2000	1933	1994	+ 6	
	3000	2858	2970	+ 30	
(x10)	4000	3783	3920	+ 80	
	5000	470	488	+ 120	

- Note : 1. The results relate only to the items calibrated.
 2. The UUC is not read out at zero lux.
 3. 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

(Mr. Yuttana Tholueng)



(Mr. Pichit Vivat-Anant)

Managing Director

Page 2 of 2

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

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ANALYTICAL BALANCE (DU)

Model. : XS205DU

Serial No. : 1126323724



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

CERTIFICATE OF CALIBRATION

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

Approved by

(Mr. Somchai Neampunt)
Signed for Director

Issue date : 25 January 2023

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

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

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



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

REPORT OF CALIBRATION

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

Result of Calibration

1. Test weight and repeatability of reading

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

Unit : g	Range : 80	<input type="checkbox"/> Before adjustment	<input type="checkbox"/> After adjustment
<input checked="" type="checkbox"/> No adjustment	Nominal value	40	90
<input type="checkbox"/> Adjustment	Standard weight	40.000042	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	0.00004	0.00008

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

Test Point	Sensitivity, S
0	0.99800
40	0.99800
80	0.99800

Range : 200

Test Point	Sensitivity, S
0	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	0.00000	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	20.000016	20.00011	-0.00009	0.000036	2.00
50	50.000029	50.00013	-0.00010	0.000067	2.00
100	100.000022	100.0001	-0.0001	0.00016	2.00
150	150.000051	150.0001	0.0000	0.00023	2.00
200	200.000199	200.0003	-0.0001	0.00028	2.00

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

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

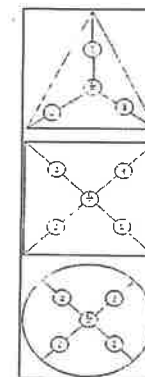
REPORT OF CALIBRATION

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	Range	Test weight
<input type="radio"/> Circle	80	50 and 100
<input type="radio"/> Triangular		
<input checked="" type="radio"/> Rectangular		
Position	Reading of indicator	Reading of indicator
1	50.00014	100.0001
2	50.00014	99.9998
3	50.00006	100.0000
4	50.00010	100.0001
5	50.00017	100.0001
6	50.00014	100.0001
Maximum difference	0.00008	0.0003



Condition of Calibration

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

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 Bangwack Rd. Bangpai Bangkoe Bangkok 10160
Tel.: 0-2865-4647-8 Fax: 0-2865-4649 http://www.mit.in.th



CALIBRATION CERTIFICATE

Certificate No. : L202305085-002

Date Issued : 16-May-23

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

Equipment : Analog Barometer

Manufacturer : Barigo

Model : -

Serial No. : -

ID No./Tag No. : BM001/41

Date Received : 11-May-23

Date Calibrated : 15-May-23

Calibrated by : Mr. Jame Khaothong

Calibration Method or Calibration Procedure Used

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

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

Result of Calibration

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

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

Approved by:

Sarayuth T.

(Mr. Sarayuth Tochua)



Page 1 of 2

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Certificate No : L202305085-002

Environment Ambient Temperature : $(25 \pm 2)^{\circ}\text{C}$
Relative Humidity : $(50 \pm 15)\%\text{RH}$

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

STD = Standard

UUC = Unit Under Calibration

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

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

Condition As-Received : Used Item

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

Measurement Standards Used & Traceability :

The International System of Units (SI) through

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

End of Certificate

Page 2 of 2

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Hot Air Oven

Model : UFE 500

Serial No. : G511.0182

NSC-TISI-TIS17025
CALIBRATION 0152

Page 1 of 3

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

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.
(Hot Lab)

Equipment : Temperature controlled enclosures (Hot air oven)
Manufacturer : Memmert Model : UFE 500
Serial No. : G511.0182 ID No. : LABE 17/4
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-P1100)	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

Approved by

(Mr. Somchai Nearpunt)
Signed for Director

Issue date

24 January 2023

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

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

361 Soi Ladprao 122, Ladprao Road,
Phlabphla, Wang Thonglang, Bangkok 10310TEL 02-516-2422
FAX 02-516-6949
Rev 01CONTACT@AMARC.CO.TH
WWW.AMARC.CO.TH
Effective Date 15/10/21NSC-TISI-TIS17025
CALIBRATION 0152

Page 2 of 3

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

REPORT OF CALIBRATION

Results of Calibration

Resolution : 0.5 °C

1. Reporting of Temperature

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 ^{Ref}		
104	103.5	103.5	104.10	104.08	103.87	103.99	104.08	104.08	103.96	104.01	103.84	0.47	2.00

2. Characterization results

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

Notes

UUC* = Unit Under Calibration

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

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.

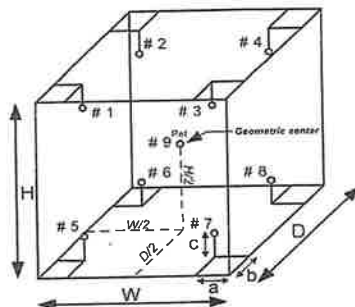
8. Overall variation - the difference of the maximum and the minimum measured temperatures throughout observation time.

9. UUC* reading - the average reading of indicating device that forms the integral part of the enclosure.

10. Calibration results without adjustment.

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

- End of Report -

Figure: Example of sensor
installation positions

COPY

Primary Flow Calibrator
Serial No. : 110619 , 207510

Certificate of Calibration

Customer

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

Certificate No : 23-AFM-022

Request No : Req-2023-0128

Unit Under Calibration Details

Measurement Item : Primary Flow Calibrator
Manufacturer : BIOS
Model : Defender 510-L
Serial Number : 110619
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 : 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 %.

Calibration By :

Mr. Noppadon Luangart
Service Calibration Engineer

Approved By :

Mr. Pacit Mathavorn

Calibration Engineer Supervisor

Issue Date :

6 February 2023

COPY

Certificate No : 23-AFM-022

Request No : Req-2023-0128

Result of Calibration :

Flow Setting	STD Flow Reading	UUC Flow Reading	Correction Flow	Uncertainty
(L/min)	(L/min)	(L/min)	(L/min)	(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

COPY

Certificate of Calibration

Customer

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

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 : -
 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	Traceble	Due Calibration
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 %.

Calibration By : Mr. Noppadon Luangart
 Service Calibration Engineer

Approved By : Mr. Pacit Mathavorn
 Calibration Engineer Supervisor

Issue Date : 6 February 2023

COPY

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

STD : Standard

UUC : Unit Under Calibration

End of Certificate

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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
Hunmanby
North Yorkshire
YO14 0PH
United Kingdom

Page 1 of 2

Approved signatory
N.Smith
Electronically signed:

N.D. Smith

Dosimeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer: Cirrus Research plc
Model: CR:110A
Serial number: CA8889
Firmware version: 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

CERTIFICATE OF CALIBRATION

Certificate Number:
185795

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: 36.7 %
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

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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
Hunmanby
North Yorkshire
YO14 0PH
United Kingdom

Page 1 of 2

Approved signatory
N.Smith
Electronically signed:

N.D. Smith

Dosemeter : 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

CERTIFICATE OF CALIBRATION

Certificate Number:

185804

Page 2 of 2

Environmental conditions

The following conditions were recorded at the time of the test:

Before Pressure: 98.96 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

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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: Cirrus Research plc
Model: CR:110A
Serial number: CB0643
Firmware version: 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	TTi	TG4001	395851
Attenuator	Cirrus Research	ZE:952	52200
Environmental Monitor	Comet	T7510	16966334
doseBadge Reader	Cirrus Research plc	RC:110A	79620

Notes

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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

COPY

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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: Cirrus Research plc

Notes:

Model: CR:110A

Serial number: CA8888

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:

185817

Page 2 of 2

Environmental conditions

The following conditions were recorded at the time of the test:

Before Pressure: 98.94 kPa Temperature: 21.5 °C Humidity: 38.4 %

After Pressure: 98.93 kPa Temperature: 21.5 °C Humidity: 38.4 %

Test results summary

Test	Result
Absolute Acoustic Sensitivity	Complies
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies

COPY

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

Page 1 of 2
Approved signatory
N.Smith
Electronically signed:

Dosimeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer: Cirrus Research plc
Model: CR:110A
Serial number: CB0644
Firmware version: 5.4

Notes:

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

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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

COPY

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
Model: CR:110A
Serial number: CB0640
Firmware version: 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	TTi	TG4001	395851
Attenuator	Cirrus Research	ZE:952	52200
Environmental Monitor	Comet	T7510	16966334
doseBadge Reader	Cirrus Research plc	RC:110A	79620

Notes

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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

COPY

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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
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: Cirrus Research plc
Model: CR:110A
Serial number: CA8886
Firmware version: 5.4

Notes:

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

CERTIFICATE OF CALIBRATION

Certificate Number:

185797

Page 2 of 2

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

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NOISE DOSI METER

MODEL : CR:110A

SERIAL No. : CB0642

CERTIFICATE OF CALIBRATION

ISSUED BY Cirrus Research plc

DATE OF ISSUE 12 January 2023 CERTIFICATE NUMBER 185806

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: Cirrus Research plc Notes:
Model: CR:110A
Serial number: CB0642
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

CERTIFICATE OF CALIBRATION

Certificate Number:
185806

Page 2 of 2

Environmental conditions

The following conditions were recorded at the time of the test:

Before Pressure: 99.14 kPa Temperature: 22.4 °C Humidity: 43.1 %
After Pressure: 99.12 kPa Temperature: 22.4 °C Humidity: 43.3 %

Test results summary

Test	Result
Absolute Acoustic Sensitivity	Complies
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies

COPY

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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

Page 1 of 2

Approved signatory
N.Smith
Electronically signed:



Dosemeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer: Cirrus Research plc
Model: CR:110A
Serial number: CA8879
Firmware version: 5.4

Notes:

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

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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

COPY

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

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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

COPY

NOISE DOSI METER

MODEL : CR:110A

SERIAL No. : CB0955

CERTIFICATE OF CALIBRATION

ISSUED BY Cirrus Research plc

DATE OF ISSUE 12 January 2023 CERTIFICATE NUMBER 185816

Cirrus Research plc
Acoustic House
Bridlington Road
Hunmanby
North Yorkshire
YO14 0PH
United Kingdom

Page 1 of 2

Approved signatory
N.Smith
Electronically signed:

N.D. Smith

Dosemeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer: Cirrus Research plc Notes:
Model: CR:110A
Serial number: CB0955
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

CERTIFICATE OF CALIBRATION

Certificate Number:
185816

Page 2 of 2

Environmental conditions

The following conditions were recorded at the time of the test:

Before Pressure: 99.11 kPa Temperature: 22.4 °C Humidity: 43.3 %
After Pressure: 99.13 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

COPY

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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+A1:2000

Instrument information

Manufacturer: Cirrus Research plc
Model: CR:110A
Serial number: CB0956
Firmware version: 5.4

Notes:

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

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CERTIFICATE OF CALIBRATION

Certificate Number:
185821

Page 2 of 2

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

COPY

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

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Bridlington Road
Hunmanby
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YO14 0PH
United Kingdom

Page 1 of 2

Approved signatory
N.Smith
Electronically signed:

N.D. Smith

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 Thai Consulting 1992 Co.,Ltd. 683 Moo.11 , Sukaphibal 8 Rd., Nongkham , Sriracha , Chonburi 20230

Handwritten signature
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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

COPY
Handwritten signature

NOISE DOSI METER

MODEL : CR:110A

SERIAL No. : CB0955

CERTIFICATE OF CALIBRATION

ISSUED BY Cirrus Research plc

DATE OF ISSUE 12 January 2023 CERTIFICATE NUMBER 185816

Cirrus Research plc
Acoustic House
Bridlington Road
Hunmanby
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YO14 0PH
United Kingdom

Page 1 of 2

Approved signatory
N.Smith
Electronically signed:



Dosemeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer: Cirrus Research plc Notes:
Model: CR:110A
Serial number: CB0955
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

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CERTIFICATE OF CALIBRATION

Certificate Number:

185816

Page 2 of 2

Environmental conditions

The following conditions were recorded at the time of the test:

Before Pressure: 99.11 kPa Temperature: 22.4 °C Humidity: 43.3 %
After Pressure: 99.13 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

COPY

COPY

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
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Bridlington Road
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YO14 0PH
United Kingdom

Page 1 of 2

Approved signatory
N.Smith
Electronically signed:



Dosemeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer: Cirrus Research plc
Model: CR:110A
Serial number: CB0956
Firmware version: 5.4

Notes:

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

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CERTIFICATE OF CALIBRATION

Certificate Number:
185821

Page 2 of 2

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

COPY

NOISE DOSI METER

MODEL : CR:110A

SERIAL No. : CB1499

CERTIFICATE OF CALIBRATION

ISSUED BY Cirrus Research plc

DATE OF ISSUE 13 February 2023 CERTIFICATE NUMBER 187449



Cirrus Research plc
Acoustic House
Bridlington Road
Hunmanby
North Yorkshire
YO14 0PH
United Kingdom

Page 1 of 2

Approved signatory
R. Thomas
Electronically signed:

Dosimeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer: Cirrus Research plc
Model: CR:110A
Serial number: CB1499
Firmware version: 5.4

Notes: Eastern Thai Consulting 1992 Co., Ltd.
683 Moo 11, Sukaphibal 8 Rd.
NongKham
Sriracha, Chonburi 20230

Test summary

Date of calibration: 10 February 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

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CERTIFICATE OF CALIBRATION

Certificate Number:

187449

Page 2 of 2

Environmental conditions

The following conditions were recorded at the time of the test:

Before	Pressure: 102.26 kPa	Temperature: 22.4 °C	Humidity: 37.0 %
After	Pressure: 102.25 kPa	Temperature: 22.6 °C	Humidity: 36.6 %

Test results summary

Test	Result
Absolute Acoustic Sensitivity	Complies
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies

COPY

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NOISE DOSI METER

MODEL : CR:110A

SERIAL No. : CB1500

CERTIFICATE OF CALIBRATION

ISSUED BY Cirrus Research plc

DATE OF ISSUE 13 February 2023 CERTIFICATE NUMBER 187451



Cirrus Research plc
Acoustic House
Bridlington Road
Hunmanby
North Yorkshire
YO14 0PH
United Kingdom

Page 1 of 2

Approved signatory

R.Thomas

Electronically signed:

Dosemeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer: Cirrus Research plc

Model: CK:110A

Serial number: CB1500

Firmware version: 5.4

Notes: Eastern Thai Consulting 1992 Co., Ltd.
683 Moo 11, Sukaphibal 8 Rd.
NongKham
Sriracha, Chonburi 20230

Test summary

Date of calibration: 10 February 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

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CERTIFICATE OF CALIBRATION

Certificate Number:

187451

Page 2 of 2

Environmental conditions

The following conditions were recorded at the time of the test:

Before Pressure: 102.25 kPa Temperature: 22.7 °C Humidity: 37.1 %

After Pressure: 102.24 kPa Temperature: 22.6 °C Humidity: 37.4 %

Test results summary

Test	Result
Absolute Acoustic Sensitivity	Complies
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies

COPY

ภาคผนวก ง : หนังสืออนุญาตขึ้นทะเบียน
ห้องปฏิบัติการวิเคราะห์เอกชน



ที่ อก ๐๓๒๐/๑๑๓๔๒

กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๒๗ กรกฎาคม ๒๕๖๖

เรื่อง ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท อีสเทิร์น ไทย คอนซัลติง ๑๙๙๒ จำกัด

อ้างถึง คำขอต่ออายุของห้องปฏิบัติการวิเคราะห์เอกชน ลงวันที่ ๗ มิถุนายน ๒๕๖๖

สิ่งที่ส่งมาด้วย เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

๑. รายชื่อผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๔๐ ราย
๒. รายชื่อเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๒๕ ราย
๓. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๒๙๒ รายการ
จำนวน ๑๙ แผ่น

ตามหนังสือที่อ้างถึง บริษัท อีสเทิร์น ไทย คอนซัลติง ๑๙๙๒ จำกัด ขอต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ว-๐๐๓ สถานที่ตั้งเลขที่ ๖๘๓ หมู่ที่ ๑๑ ถนนสุขาภิบาล ๘ ตำบลหนองขาม อำเภอศรีราชา จังหวัดชลบุรี ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท อีสเทิร์น ไทย คอนซัลติง ๑๙๙๒ จำกัด ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน โดยมีองค์ประกอบดังนี้

- ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๔๐ ราย ตามสิ่งที่ส่งมาด้วย ๑
- ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๒๕ ราย ตามสิ่งที่ส่งมาด้วย ๒
- ค. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย จำนวน ๔๗ รายการ
อากาศเสีย (ปล่องระบาย) จำนวน ๒๑ รายการ น้ำใต้ดิน จำนวน ๑๑๑ รายการ สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว
จำนวน ๑๘ รายการ และดิน จำนวน ๙๕ รายการ รวมทั้งสิ้นจำนวน ๒๙๒ รายการ ตามสิ่งที่ส่งมาด้วย ๓

หนังสือฉบับนี้จะหมดอายุในวันที่ ๕ กรกฎาคม ๒๕๖๙ หากประสงค์จะต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอต่อกรมโรงงานอุตสาหกรรม ภายใน ๓๐ วัน ก่อนวันสิ้นอายุของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ทั้งนี้ สามารถยื่นคำขอผ่านระบบอิเล็กทรอนิกส์ได้ที่หน้าเว็บไซต์กรมโรงงานอุตสาหกรรม

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

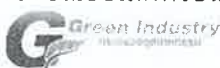
(นายทวี อำพาพันธ์)

ผู้อำนวยการศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก
ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก

โทร. ๐ ๓๓๑๓ ๖๐๕๕ ต่อ ๕๐๐๑-๒

ไปรษณีย์อิเล็กทรอนิกส์ eirw@diw.mail.go.th



“อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว”



เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท อีสเทิร์น ไทย คอนซัลติง ๑๙๙๒ จำกัด เลขทะเบียน ว-๐๐๓

ที่ อก ๐๓๒๐/๑๑๓๔๒

ลงวันที่ ๒๗ กรกฎาคม ๒๕๖๖

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๔๐ ราย

๑) นางสาวมาลีเกษ เลขะวัจกุล	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๐๑
๒) นายวัฒนา โคตรหล้า	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๐๒
๓) นางวรรณเพ็ญ เหลาจินดาว์ฒน์	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๐๓
๔) นายกะวีร์ สุธาทรัพย์	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๐๔
๕) นางสาวนันท์ณภัส แบนขุนทด	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๐๕
๖) นางสาวพรนภา หลงคำหงษ์	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๐๖
๗) นางสาวอภิรดี ชื่นอารมย์	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๐๗
๘) นางสาวอัจฉรี จิตตะยโสธร	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๐๘
๙) นางสาวจิรพร ปานคง	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๐๙
๑๐) นายสุทธา สองธินัย	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๑๐
๑๑) นางสาวนันท์ประภา อู๋สูงเนิน	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๑๑
๑๒) นายธงไชย บุญศักดิ์	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๑๒
๑๓) นางสาวธนิชพร กลิ่นโสภณ	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๑๓
๑๔) นายธีระพงษ์ นวลอินทร์	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๑๔
๑๕) นางสาวแพรว พลเสน	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๑๕
๑๖) นายทรงพล ผิวอ้วน	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๑๖
๑๗) นายภาคภูมิ บัวสวัสดิ์	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๑๗
๑๘) นางสาวจันทน์ สายพันธ์	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๑๘
๑๙) นายภาณุพงศ์ บำรุงรส	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๑๙
๒๐) นางสาวภาณิน จันดีสอน	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๒๐
๒๑) นายวรกร ไวทยะเสวี	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๒๑
๒๒) นางสาววรรณภา ไชยศิริ	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๒๒
๒๓) นางสาวพรพิมล ภูมิคอนสาร	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๒๓
๒๔) นางสาวธมลวรรณ ผลอ้อ	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๒๔
๒๕) นางสาวบุญเรือง บุญถม	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๒๕
๒๖) นางสาวภัสนันท์ ป้อมน้อย	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๒๖
๒๗) นายชานวัฒน์ โชติวงค์	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๒๗
๒๘) นางสาวพจณีย์ งามวิสัย	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๒๘
๒๙) นายวิญญ์วัช สิงห์โต	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๒๙
๓๐) นางสาวนุกูล อามรศรี	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๓๐
๓๑) นายศุภฤกษ์ พาดกลาง	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๓๑
๓๒) นายณิขพล ทองหล่อ	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๓๒
๓๓) นายธรรมรัตน์ โพธิ์ตันคำ	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๓๓
๓๔) นายโอชา ขวัญศิริมงคล	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๓๔
๓๕) นายเมธี สุขประเสริฐ	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๓๕

๓๖) นางสาวพรพินันท์...

๓๖) นางสาวพรพินันท์ วิริยกุลกุล	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๓๖
๓๗) นางสาวอาภาภรณ์ เสริมสนธิ	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๓๗
๓๘) นางสาวนภัทร์ธมณต์ ประดิษฐ์นุช	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๓๘
๓๙) นางสาวสุนิษา เอ็งเส้ง	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๓๙
๔๐) นางสาวระพีณ อินัน	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๔๐

ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๒๕ ราย

๑) นางสาวดวงกมล เนื้อทอง	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๐๑
๒) นางสาววัชรภรณ์ อินทสุข	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๐๒
๓) นางสาวกัญจน์ธวิภา จันทร์ขอดแก้ว	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๐๓
๔) นางสาวฉัตรสุดา มงคลโกชน	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๐๔
๕) นางสาวณัฐวดี อำมาตย์ตัน	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๐๕
๖) นางสาวนอรอมา ปาระ	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๐๖
๗) นางสาวธัญลักษณ์ ชันโต	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๐๗
๘) นางสาวสุทธิดา สร้างแก้ว	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๐๘
๙) นายอุดมทรัพย์ เจนจบจริง	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๐๙
๑๐) นายนราธิป สงวนศิลป์	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๑๐
๑๑) นายวีระชัย พอใจ	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๑๑
๑๒) นายอัญชลี ทะพงษ์	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๑๒
๑๓) นางสาวสุมลิตรา มีแก่น	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๑๓
๑๔) นางสาวสวริยา เพชรประไพ	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๑๔
๑๕) นางสาวจุฑามาศ เจริญพรหม	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๑๕
๑๖) นางสาวนิภาพร คำชมภู	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๑๖
๑๗) นางสาวอรชา พันธุ์เมือง	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๑๗
๑๘) นายกิตติ ไพโรจน์	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๑๘
๑๙) นายชาญณรงค์ ตั้งธรรมรักษ์	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๑๙
๒๐) นางสาวปวีศา เอสันเทียะ	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๒๐
๒๑) นางสาวจุฑาทิพย์ กิจดี	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๒๑
๒๒) นางสาวสุภาวดี ศรีละออง	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๒๒
๒๓) นางสาวณัฐชยา บรรพบุตร	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๒๓
๒๔) นางสาวณัฐนิช นนตานอก	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๒๔
๒๕) นางสาวดวงสุดา แสนวันดี	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๒๕

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท อีสเทิร์น ไทย คอนซัลติ้ง ๑๙๙๒ จำกัด เลขทะเบียน ว-๐๐๓

ที่ ออก ๐๓๒๐/๑๑๓๔๒

ลงวันที่ ๒๗ กรกฎาคม ๒๕๖๖

ขอขยายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๒๙๒ รายการ

น้ำเสีย จำนวน 47 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Aldrin	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[4]
2	Arsenic	1) Continuous Hydride Generation/Atomic Absorption Spectrometric Method ^[4] 2) Digestion, Inductively Coupled Plasma Method ^[4]
3	Barium	Digestion, Inductively Coupled Plasma Method ^[4]
4	α -BHC	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[4]
5	β -BHC	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[4]
6	δ -BHC	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[4]
7	γ -BHC	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[4]
8	Biochemical Oxygen Demand	1) 5-Day BOD Test, Membrane Electrode Method ^[4] 2) 5-Day BOD Test, Azide Modification Method ^[4]
9	Cadmium	Digestion, Inductively Coupled Plasma Method ^[4]
10	Chemical Oxygen Demand	Closed Reflux, Titrimetric Method ^[4]
11	cis-Chlordane	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[4]
12	trans-Chlordane	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[4]
13	Chromium	1) Digestion, Direct Air-Acetylene Flame Method ^[4] 2) Digestion, Inductively Coupled Plasma Method ^[4]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
14	Color	ADMI Weighted-Ordinate Spectrophotometric Method ^[4]
15	Copper	1) Digestion, Direct Air-Acetylene Flame Method ^[4] 2) Digestion, Inductively Coupled Plasma Method ^[4]
16	Cyanide	Distillation, Colorimetric Method ^[4]
17	4,4'-DDD	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[4]
18	4,4'-DDE	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[4]
19	DDT	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[4]
20	Dieldrin	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[4]
21	Endosulfan I	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[4]
22	Endosulfan II	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[4]
23	Endosulfan sulfate	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[4]
24	Endrin	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[4]
25	Endrin aldehyde	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[4]
26	Endrin ketone	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[4]
27	Formaldehyde	Distillation, Colorimetric Method ^[3]
28	Free Chlorine	1) Iodometric Method ^[4] 2) Colorimetric Method ^[4]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
29	Heptachlor	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[4]
30	Heptachlor Epoxide	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[4]
31	Hexavalent Chromium	Filtration, Colorimetric Method ^[4]
32	Lead	1) Digestion, Direct Air-Acetylene Flame Method ^[4] 2) Digestion, Inductively Coupled Plasma Method ^[4]
33	Manganese	Digestion, Inductively Coupled Plasma Method ^[4]
34	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[4]
35	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[4]
36	Nickel	1) Digestion, Direct Air-Acetylene Flame Method ^[4] 2) Digestion, Inductively Coupled Plasma Method ^[4]
37	Oil and Grease	Liquid-Liquid, Partition-Gravimetric Method ^[4]
38	pH	Electrometric Method ^[4]
39	Phenols	Distillation, Direct Photometric Method ^[4]
40	Selenium	Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[4]
41	Sulfide	ZnS Precipitation, Iodometric Method ^[4]
42	Temperature	Field Method ^[4]
43	Trivalent Chromium	1) Digestion, Direct Air-Acetylene Flame Method; Filtration, Colorimetric Method; Calculation ^[4] 2) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation ^[4]
44	Total Dissolved Solids	Dried at 180 °C ^[4]
45	Total Kjeldahl Nitrogen	Macro Kjeldahl Method ^[4]
46	Total Suspended Solids	Dried at 103-105 °C ^[4]
47	Zinc	Digestion, Inductively Coupled Plasma Method ^[4]

อากาศเสีย (ปล่อยระบาย) จำนวน 21 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Antimony	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
2	Arsenic	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
3	Cadmium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
4	Carbon Monoxide	1) Bag, Non-Dispersive Infrared Method ^[5] 2) Instrumental Analyzer Method ^[5]
5	Chromium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
6	Cobalt	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
7	Copper	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
8	Hydrogen Sulfide	Absorption Sampling, Iodometric Method ^[5]
9	Lead	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
10	Manganese	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
11	Mercury	Isokinetic Sampling, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[5]
12	Nickel	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
13	Opacity	Ringelmann's Method ^[1,5]
14	Oxides of Nitrogen	1) Absorption Sampling, Phenoldisulfonic Acid Method ^[8] 2) Instrumental Analyzer Method ^[7]
15	Selenium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
16	Sulfur Dioxide	1) Absorption Sampling , Barium-Thorin Titrimetric Method ^[5] 2) Instrumental Analyzer Method ^[5]
17	Sulfuric Acid	Isokinetic Sampling, Barium-Thorin Titrimetric Method ^[6]
18	Tin	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
19	Total Suspended Particulate	Isokinetic Sampling, Gravimetric Method ^[6]
20	Vanadium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
21	Xylene	Adsorption Sampling, Gas Chromatographic Method ^[6]

น้ำใต้ดิน จำนวน 111 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
2	Acetone	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
3	Aldrin	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
4	Anthracene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
5	Antimony	Digestion, Inductively Coupled Plasma Method ^[4]
6	Arsenic	1) Continuous Hydride Generation/Atomic Absorption Spectrometric Method ^[4] 2) Digestion, Inductively Coupled Plasma Method ^[4]
7	Barium	Digestion, Inductively Coupled Plasma Method ^[4]
8	Benz(a)anthracene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
9	Benzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
10	Benzo(b)fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
11	Benzo(k)fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
12	Benzo(a)pyrene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
13	Benzo[g,h,i]perylene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
14	Beryllium	Digestion, Inductively Coupled Plasma Method ^[4]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
15	Bis(2-chloroethyl)ether	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
16	Bis(2-ethylhexyl)phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
17	Bromodichloromethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
18	Bromoform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
19	Butanol	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
20	Butyl benzyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
21	Cadmium	Digestion, Inductively Coupled Plasma Method ^[4]
22	Carbazole	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
23	Carbon disulfide	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
24	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
25	Chlordane	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
26	p-Chloroaniline	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
27	Chlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
28	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
29	Chloroform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
30	2-Chlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
31	Chromium	1) Digestion, Direct Air-Acetylene Flame Method ^[4] 2) Digestion, Inductively Coupled Plasma Method ^[4]
32	Chromium (III)	1) Digestion, Direct Air-Acetylene Flame Method; Filtration, Colorimetric Method; Calculation ^[4] 2) Digestion, Inductively Coupled Plasma Method; Filtration, Colorimetric Method; Calculation ^[4]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
33	Chromium (VI)	Filtration, Colorimetric Method ^[4]
34	Chrysene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
35	Cyanide	Distillation, Colorimetric Method ^[4]
36	DDD	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
37	DDE	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
38	DDT	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
39	Dibenz(a,h)anthracene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
40	Di-n-butyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
41	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
42	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
43	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
44	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
45	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
46	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
47	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
48	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
49	2,4-Dichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
50	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
51	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
52	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
53	Diethyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
54	2,4-Dimethylphenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
55	2,4-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
56	2,6-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
57	Di-n-octyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
58	Endosulfan	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
59	Endrin	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
60	Ethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
61	Fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
62	Fluorene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
63	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
64	Heptachlor epoxide	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
65	Hexachlorobenzene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
66	Hexachloro-1,3-butadiene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
67	n-Hexane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
68	α -HCH	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
69	β -HCH	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
70	γ -HCH	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
71	Hexachlorocyclopentadiene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
72	Hexachloroethane	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
73	Indeno(1,2,3-cd)pyrene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
74	Isophorone	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
75	Lead	1) Digestion, Direct Air-Acetylene Flame Method ^[4] 2) Digestion, Inductively Coupled Plasma Method ^[4]
76	Manganese	Digestion, Inductively Coupled Plasma Method ^[4]
77	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[4]
78	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
79	Methylene chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
80	2-Methylphenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
81	2-Methylnaphthalene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
82	Methyl tert-butyl ether	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
83	Naphthalene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
84	Nickel	Digestion, Inductively Coupled Plasma Method ^[4]
85	Nitrobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
86	N-Nitrosodi-n-propylamine	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
87	pH	Electrometric Method ^[4]
88	Phenanthrene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
89	Phenol	1) Distillation, Direct Photometric Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
90	Pyrene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
91	Selenium	Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[4]
92	Silver	Digestion, Inductively Coupled Plasma Method ^[4]
93	Styrene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
94	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
95	Trichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
96	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
97	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
98	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
99	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
100	Toluene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
101	2,4,5-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
102	2,4,6-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
103	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
104	Vanadium	Digestion, Inductively Coupled Plasma Method ^[4]
105	Vinyl acetate	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
106	Vinyl chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
107	m-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
108	o-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
109	p-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
110	Xylene (Total)	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
111	Zinc	Digestion, Inductively Coupled Plasma Method ^[4]

สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน 18 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Antimony	Digestion, Inductively Coupled Plasma Method ^[9,10]
2	Arsenic	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[2,9,10] 2) Digestion, Inductively Coupled Plasma Method ^[9,10]
3	Barium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[2,9,10] 2) Digestion, Inductively Coupled Plasma Method ^[9,10]
4	Beryllium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[2,9,10] 2) Digestion, Inductively Coupled Plasma Method ^[9,10]
5	Cadmium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[2,9,10] 2) Digestion, Inductively Coupled Plasma Method ^[9,10]
6	Chromium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[2,9,10] 2) Digestion, Inductively Coupled Plasma Method ^[9,10]
7	Chromium (VI)	1) Waste Extraction, Digestion, Colorimetric Method ^[2,13] 2) Alkaline Digestion, Colorimetric Method ^[9,13]
8	Cobalt	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[2,9,10] 2) Digestion, Inductively Coupled Plasma Method ^[9,10]
9	Copper	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[2,9,10] 2) Digestion, Inductively Coupled Plasma Method ^[9,10]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
10	Lead	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[2,9,10]
11	Mercury	2) Digestion, Inductively Coupled Plasma Method ^[9,10] 1) Waste Extraction, Digestion, Cold Vapor Atomic Absorption Spectrometric Method ^[2,11] 2) Digestion, Cold vapor Atomic Absorption Spectrometric Method ^[9,11]
12	Nickel	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[2,9,10] 2) Digestion, Inductively Coupled Plasma Method ^[9,10]
13	Molybdenum	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[2,9,10] 2) Digestion, Inductively Coupled Plasma Method ^[9,10]
14	Selenium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[2,9,10] 2) Digestion, Inductively Coupled Plasma Method ^[9,10]
15	Silver	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[2,9,10] 2) Digestion, Inductively Coupled Plasma Method ^[9,10]
16	Thallium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[2,9,10] 2) Digestion, Inductively Coupled Plasma Method ^[9,10]
17	Vanadium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[2,9,10] 2) Digestion, Inductively Coupled Plasma Method ^[9,10]
18	Zinc	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[2,9,10] 2) Digestion, Inductively Coupled Plasma Method ^[9,10]

ดิน จำนวน 95 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
2	Acetone	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
3	Anthracene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
4	Antimony	Digestion, Inductively Coupled Plasma Method ^[9,10]
5	Arsenic	Digestion, Inductively Coupled Plasma Method ^[9,10]
6	Barium	Digestion, Inductively Coupled Plasma Method ^[9,10]
7	Benz(a)anthracene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
8	Benzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
9	Benzo(b)fluoranthene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
10	Benzo(k)fluoranthene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
11	Benzo(a)pyrene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
12	Benzo[g,h,i]perylene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
13	Beryllium	Digestion, Inductively Coupled Plasma Method ^[9,10]
14	Bis(2-chloroethyl)ether	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
15	Bis(2-ethylhexyl)phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
16	Bromodichloromethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
17	Bromoform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
18	Butanol	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]

19 Butyl benzyl phthalate...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
19	Butyl benzyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
20	Cadmium	Digestion, Inductively Coupled Plasma Method ^[9,10]
21	Carbazole	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
22	Carbon disulfide	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
23	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
24	p-Chloroaniline	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
25	Chlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
26	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
27	Chloroform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
28	2-Chlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
29	Chromium	Digestion, Inductively Coupled Plasma Method ^[9,10]
30	Chromium (III)	Digestion, Inductively Coupled Plasma Method; Filtration, Colorimetric Method; Calculation ^[9,10]
31	Chromium (VI)	Alkaline Digestion, Colorimetric Method ^[12,13]
32	Chrysene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
33	Dibenz(a,h)anthracene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
34	Di-n-butyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
35	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
36	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
37	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]

38 1,1-Dichloroethane...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
38	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
39	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
40	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
41	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
42	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
43	2,4-Dichlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
44	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
45	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
46	Diethyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
47	2,4-Dimethylphenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
48	2,4-Dinitrotoluene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
49	2,6-Dinitrotoluene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
50	Di-n-octyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
51	Ethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
52	Fluoranthene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
53	Fluorene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
54	Hexachlorobenzene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
55	Hexachloro-1,3-butadiene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
56	n-Hexane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
57	Hexachlorocyclopentadiene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
58	Hexachloroethane	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
59	Indeno(1,2,3-cd)pyrene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
60	Isophorone	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
61	Lead	Digestion, Inductively Coupled Plasma Method ^[9,10]
62	Manganese	Digestion, Inductively Coupled Plasma Method ^[9,10]
63	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[9,11]
64	Methylene chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
65	2-Methylphenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
66	2-Methylnaphthalene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
67	Methyl tert-butyl ether	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
68	Naphthalene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
69	Nickel	Digestion, Inductively Coupled Plasma Method ^[9,10]
70	Nitrobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
71	N-Nitrosodi-n-propylamine	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
72	Phenanthrene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
73	Phenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
74	Pyrene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
75	Selenium	Digestion, Inductively Coupled Plasma Method ^[9,10]
76	Silver	Digestion, Inductively Coupled Plasma Method ^[9,10]
77	Styrene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
78	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
79	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
80	Toluene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
81	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
82	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
83	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
84	Trichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
85	2,4,5-Trichlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
86	2,4,6-Trichlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
87	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
88	Vanadium	Digestion, Inductively Coupled Plasma Method ^[9,10]
89	Vinyl acetate	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
90	Vinyl chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
91	m-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
92	o-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
93	p-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]



ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
94	Xylene (Total)	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
95	Zinc	Digestion, Inductively Coupled Plasma Method ^[9,10]

เอกสารอ้างอิง

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