

เอกสารขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน  
บริษัท เช้าเทิร์นไทยคอนสัลติ้ง จำกัด

ที่ อก ๐๓๒๒/ ๑๗๕๖๕



กรมโรงงานอุตสาหกรรม  
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท  
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

๒๘ ธ.ค. ๒๕๖๖

เรื่อง ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท เข้าเทิร์นไทยคอนซัลติ้ง จำกัด

อ้างถึง คำขอต่ออายุของห้องปฏิบัติการวิเคราะห์เอกชน ลงวันที่ ๑๐ พฤศจิกายน ๒๕๖๖

สิ่งที่ส่งมาด้วย เอกสารแนบท้ายหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน  
บริษัท เข้าเทิร์นไทยคอนซัลติ้ง จำกัด จำนวน ๑ แผ่น

ตามหนังสือที่อ้างถึง บริษัท เข้าเทิร์นไทยคอนซัลติ้ง จำกัด ขอต่ออายุหนังสือรับขึ้นทะเบียน  
ห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ว-๑๗๖ สถานที่ตั้ง เลขที่ ๕๙/๔๕ หมู่ที่ ๕ ตำบลศรีสุนทร อำเภอถลาง  
จังหวัดภูเก็ต ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท เข้าเทิร์นไทยคอนซัลติ้ง จำกัด ต่ออายุหนังสือ  
รับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน โดยมีองค์ประกอบดังนี้

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์

๑) นายพิมุข สอนมี

ทะเบียนเลขที่ ว-๑๗๖-ค-๐๐๐๑

๒) นายศิริพงศ์ พะสริ

ทะเบียนเลขที่ ว-๑๗๖-ค-๐๐๐๒

๓) นางเพ็ญญา จันทรเพ็ญ

ทะเบียนเลขที่ ว-๑๗๖-ค-๐๐๐๓

๔) นางสาวพรวิษา จินรัตน์

ทะเบียนเลขที่ ว-๑๗๖-ค-๐๐๐๔

ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์

๑) นางสาวกรรณิกา แก้วสามเขียว

ทะเบียนเลขที่ ว-๑๗๖-จ-๐๐๐๑

๒) นางสาวศิริรัตน์ นิเทศนพกุล

ทะเบียนเลขที่ ว-๑๗๖-จ-๐๐๐๒

๓) นางสาวจุฑาทิพย์ ชูถึง

ทะเบียนเลขที่ ว-๑๗๖-จ-๐๐๐๓

๔) นางสาวปรีชญา หมุกแก้ว

ทะเบียนเลขที่ ว-๑๗๖-จ-๐๐๐๔

๕) นางสาวบุษยา ประกอบแสง

ทะเบียนเลขที่ ว-๑๗๖-จ-๐๐๐๕

๖) นางสาวจุฑาภรณ์ จุฑามาศย์

ทะเบียนเลขที่ ว-๑๗๖-จ-๐๐๐๖

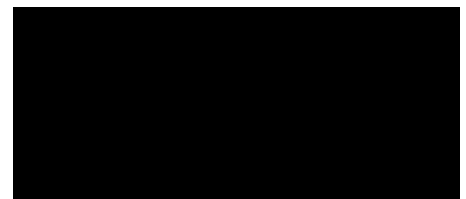
๗) นางสาวกรรณนิการ์ ประทุมเพชร

ทะเบียนเลขที่ ว-๑๗๖-จ-๐๐๐๗

๘) นางสาวสุธาสินี ละเมาะ

ทะเบียนเลขที่ ว-๑๗๖-จ-๐๐๐๘

ค. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย ตามสิ่งที่ส่งมาด้วย



หนังสือ....



หนังสือฉบับนี้จะหมดอายุในวันที่ ๑ ธันวาคม ๒๕๖๙ หากประสงค์จะต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอต่อกรมโรงงานอุตสาหกรรม ภายใน ๓๐ วัน ก่อนวันสิ้นอายุของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ทั้งนี้สามารถยื่นคำขอผ่านระบบอิเล็กทรอนิกส์ได้ที่หน้าเว็บไซต์กรมโรงงานอุตสาหกรรม

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

h.

(นายณเรศวร์ ตริยงค์)

ผู้อำนวยการศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคใต้  
ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคใต้

โทร. ๐ ๗๔๓๒ ๕๐๒๙, ๐ ๗๔๘๙ ๐๖๓๔ ต่อ ๕๒๐๑

ไปรษณีย์อิเล็กทรอนิกส์ sirw@diw.mail.go.th

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน  
บริษัท เช่าเทิร์นไทยคอนสตรัคติ้ง จำกัด เลขทะเบียน ว-๑๗๖  
ที่ กก ๐๓๒๒/ ลงวันที่

ขอข่ายสารมลพิษที่ได้รับการขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๙ รายการ  
น้ำเสีย จำนวน 9 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Biochemical Oxygen Demand	5-Day BOD Test, Azide Modification Method
2	Chemical Oxygen Demand	Closed Reflux, Titrimetric Method
3	Oil & Grease	Liquid-Liquid, Partition-Gravimetric Method
4	pH	Electrometric Method
5	Sulfide	Iodometric Method
6	Temperature	Laboratory and Field Method
7	Total Dissolved Solids	Dried at 180 °C
8	Total Kjeldahl Nitrogen	Macro-Kjeldahl, Titrimetric Method
9	Total Suspended Solids	Dried at 103-105 °C

#### เอกสารอ้างอิง

APHA, AWWA, WEF. Standard Methods for the Examination of Water and Wastewater. 24<sup>th</sup> ed.  
Washington, DC: APHA, 2023.

นางสาว วิทัญญา  
(นางสาวบุษยา รัตนสุภา)  
นักวิทยาศาสตร์ชำนาญการ



ภาคผนวกที่ 40

เอกสารสอบเทียบอุปกรณ์เครื่องมือห้องปฏิบัติการ  
บริษัท เซ้าเทิร์นไทยคอนสตรัค จำกัด

# Certificate of Calibration

Number of Page(s)

1 of 3

**Certificate No.** BSCC-UV-437/23  
**Equipment** UV/Vis Spectrophotometer  
**Model** UV-1800  
**Manufacturer** SHIMADZU  
**Serial No.** A11635305233CD  
**ID No.** UV-03  
**Date of receipt** 6 November 2023  
**Date of calibration** 6 November 2023  
**Date of issue** 10 November 2023

**Customer name** Southern Thai Consulting Co., Ltd.

**Address** 59/45 Moo 5, Srisoontorn, Talang, Phuket 83110

**Temperature** (26.9-27.2) °C (On site)  
**Humidity** (60.1-63.1) %RH (On site)

**Equipment condition** Good Operation

**Calibration Location** Laboratory

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

**Traceability** Wavelength Accuracy is traceable to certificate No. 99394 and 99395  
Photometric Accuracy is traceable to certificate No. 99380 and 99387  
Stray Light is traceable to certificate No. 99385  
The above certificate are traceable to SI unit through Sarna Scientific Ltd.  
(UKAS accredited calibration laboratory NO. 0659)

**Calibrated by** Mr.Sarunkorn Pukaothong



**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.

# Certificate of Calibration

Certificate No.

BSCC-UV-437/23

Number of Page(s)

2 of 3

## Calibration Results:

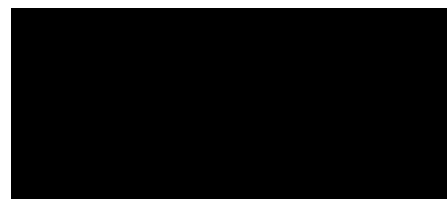
### 1.Wavelength Accuracy

Certified Wavelength (nm)	UUC (nm)	Error (nm)	Uncertainty ( $\pm$ nm)
360.89	360.79	-0.10	0.18
418.53	418.50	-0.03	0.18
513.39	513.40	0.01	0.18
572.99	573.10	0.11	0.18
879.41	879.40	-0.01	0.18

### 2.Photometric Accuracy (UV)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty ( $\pm$ A)
235	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
257	0.0000	0.0000	0.0000	0.0075
	0.8579	0.8547	-0.0032	0.0075
313	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
350	0.0000	0.0000	0.0000	0.0075
	0.6376	0.6362	-0.0014	0.0075

\*CNR = Customer not request



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# Certificate of Calibration

Certificate No. **BSCC-UV-437/23**

Number of Page(s)

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## Calibration Results:

### 3. Photometric Accuracy (Visible)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty ( $\pm A$ )
420.0	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
440.0	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
465.0	0.0000	0.0000	0.0000	0.0042
	0.4894	0.4891	-0.0003	0.0042
	0.6798	0.6795	-0.0003	0.0042
	0.9691	0.9681	-0.0010	0.0042
546.1	0.0000	0.0000	0.0000	0.0042
	0.5042	0.5026	-0.0016	0.0042
	0.6899	0.6882	-0.0017	0.0042
	0.9822	0.9801	-0.0021	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
	0.5181	0.5163	-0.0018	0.0042
	0.6878	0.6860	-0.0018	0.0042
	0.9751	0.9725	-0.0026	0.0042

\*CNR = Customer not request

### 4. Stray Light\*

Standard cut-off wavelength (nm)	Unit Under Calibration(UU)	
	Wavelength (nm)	Transmission (%T)
200.98 $\pm$ 0.11nm	201.00	0.9400
		2.0269

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

\*Stray Light not NSC-ONSC Accredited.

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

\*\*\*End of Certificate\*\*\*

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.  
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PREMIER SYSTEM ENGINEERING CO., LTD.

123 Moo 8 Kanjanavanit Rd., Banpru, Hatyai, Songkhla 90250

E-mail : pse-cal@sriranggroup.com ,Fax. : (074)222912 Tel. : 084-2148162, 084-2148165, 074-222900-9



NSC-TISI-TIS 17025  
CALIBRATION 0024

## CALIBRATION CERTIFICATE

CERTIFICATE No. : T23-3234

CSR No. : 231381

Page: 1 of 4

Customer : Southern Thai Consulting Co., Ltd.  
59/45 Moo5 Srisoontorn, Talang, Phuket  
83110

Equipment : Refrigerator

Manufacturer : Senden Intercool

Model : SEA-0405

Serial No. : SEA0405-191200194

ID. No. : -

Resolution : 0.1 °C

Instrument Condition : Good Condition

Location of Calibration : Customer Laboratory

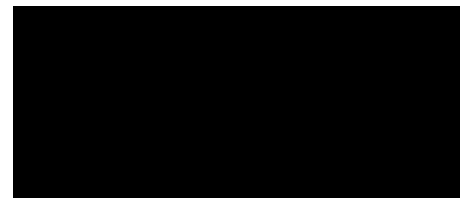
Ambient Temperature : (30 ± 15) °C

Relative Humidity : (60 ± 20) %

Date of Received : 16-Nov-2023

Date of Calibration : 16-Nov-2023

Date of Issued : 20-Nov-2023



APPROVED BY :

Calibrated By : Mr. Athiwat Supacheewa  
(Temperature Supervisor)

APPROVED SIGNATORY

( / ) MR. PIYAPONG RATTANAKAN / Calibration Manager  
( ) MR. METHA CHUAIBUN / Quality Manager  
( ) MR. BUNPOT SUWANNARAT / Technical Manager

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



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CERTIFICATE No. : T23-3234

CSR No. : 231381

Page : 2 of 4

Equipment : Refrigerator  
Manufacturer : Senden Intercool  
Model : SEA-0405  
Serial No. : SEA0405-191200194  
ID. No. : -  
Date of Received : 16-Nov-2023  
Date of Calibration : 16-Nov-2023

REFERENCE STANDARD INSTRUMENT :

Instrument Type	Model	Serial No.	Cert. No.	Due Date	Traceability
Digital Thermometer with Sensor	34970 A	MY 44042662	DAT003/0823	01-08-2024	PSE

CALIBRATION METHOD :

In-house method : CA.WI.11.160 based on ASTM E145 : 1994 (re-approved 2011)

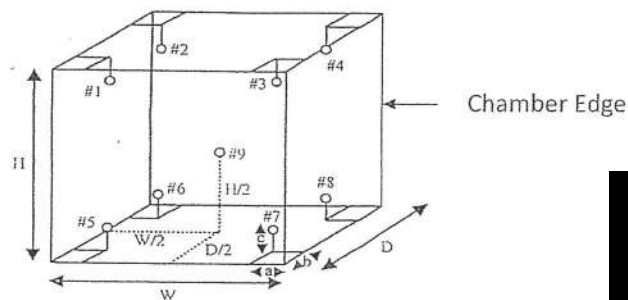
TRACEABILITY :

This Calibration Certificate is traceable to national standards which realize the unit of measurement according to the International System of Unit ( SI ) through :

PSE : Premier System Engineering Co., Ltd. ,(NSC-TISI-TIS 17025 CALIBRATION 0024)

CALIBRATION RESULTS :

Sensor Installation Diagram



Dimension of the chamber :  $W \times H \times D = 55 \times 164 \times 43$  cm

Sensor Installation :  $a \times b \times c = 5 \times 5 \times 5$  cm

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

The above results are valid exclusively for calibration sample as mentioned in the report.

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



CERTIFICATE NO. : T23-3234

CSR No. : 231381

Page : 3 of 4

Equipment : Refrigerator  
Manufacture : Senden Intercool  
Model : SEA-0405  
Serial No. : SEA0405-191200194  
ID. No. : -  
Date of Received : 16-Nov-2023  
Date of Calibration : 16-Nov-2023

## CALIBRATION RESULTS : ( Cont.)

( / ) Without Adjustment

( ) After Adjustment

## Temperature Measurement Accuracy Test

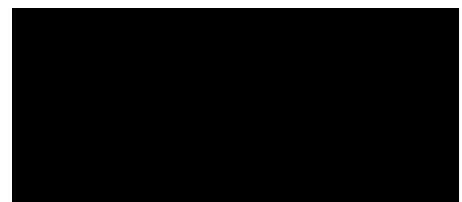
The measurement results of the refrigerator and associates are reported in the manner as shown below

Cal Point (°C)	Measured Standard Temperature (°C) at Spread Locations									Uncertainty ( ± °C )
	#1	#2	#3	#4	#5	#6	#7	#8	Ref. 9	
4	4.78	4.58	4.20	4.01	4.57	4.79	4.37	4.23	4.23	1.2

## Refrigerator Performance Result

The performance of the refrigerator are reported as shown below

Cal Point (°C)	UUC Setting (°C)	UUC Reading (°C)	Chamber Stability ( ± °C )	Chamber Uniformity ( ± °C )	Overall Variation ( ± °C )
4	4.0	4.0	0.97	1.35	2.48



UUC : Unit Under Calibration

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

The above results are valid exclusively for calibration sample as mentioned in the report.

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

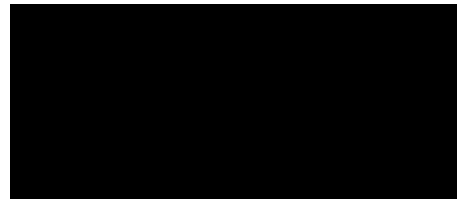
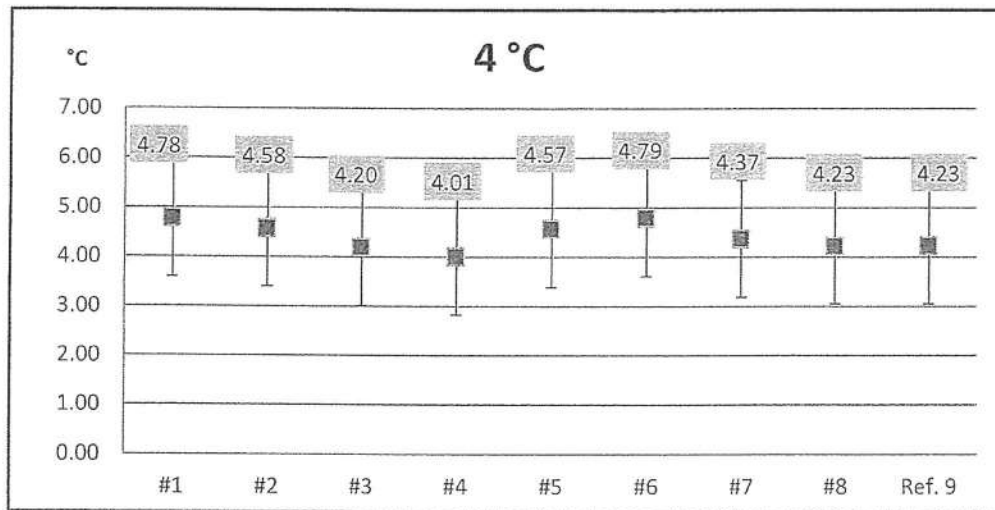


CERTIFICATE NO. : T23-3234

CSR No. : 231381

Page : 4 of 4

### Report Graph



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-- End --





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NSC-TISI-TIS 17025  
CALIBRATION 0024

## CALIBRATION CERTIFICATE

CERTIFICATE No. : T23-3236

CSR No. : 231381

Page : 1 of 4

Customer : Southern Thai Consulting Co., Ltd.  
59/45 Moo5 Srisoontorn, Talang, Phuket  
83110

Equipment : Incubator

Manufacturer : ACCUPLUS

Model : EC8500

Serial No. : 0408-0415-0034

ID. No. : -

Resolution : 0.1 °C

Instrument Condition : Good Condition

Location of Calibration : Customer Laboratory

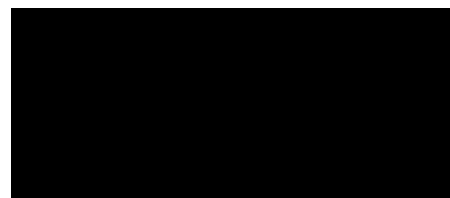
Ambient Temperature : (30 ± 15) °C

Relative Humidity : (60 ± 20) %

Date of Received : 16-Nov-2023

Date of Calibration : 16-Nov-2023

Date of Issued : 20-Nov-2023



APPROVED BY :

Calibrated By : Mr. Athiwat Supacheewa  
( Temperature Supervisor )

APPROVED SIGNATORY

(✓) MR. PIYAPONG RATTANAKAN / Calibration Manager  
( ) MR. METHA CHUAIBUN / Quality Manager  
( ) MR. BUNPOT SUWANNARAT / Technical Manager

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



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CERTIFICATE No. : T23-3236

CSR No. : 231381

Page : 2 of 4

Equipment : Incubator  
Manufacturer : ACCUPLUS  
Model : EC8500  
Serial No. : 0408-0415-0034  
ID. No. : -  
Date of Received : 16-Nov-2023  
Date of Calibration : 16-Nov-2023

REFERENCE STANDARD INSTRUMENT :

Instrument Type	Model	Serial No.	Cert. No.	Due Date	Traceability
Digital Thermometer with Sensor	34970 A	MY 44042662	DAT003/0823	01-08-2024	PSE

CALIBRATION METHOD :

In-house method : CA.WI.11.160 based on ASTM E145 : 1994 (re-approved 2011)

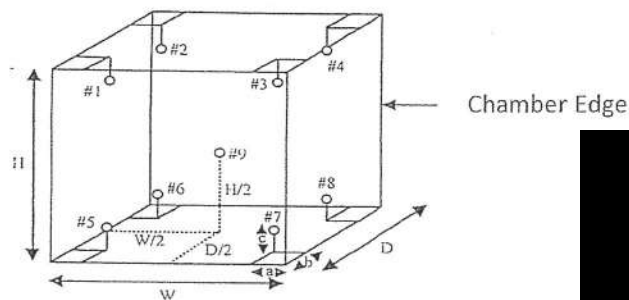
TRACEABILITY :

This Calibration Certificate is traceable to national standards which realize the unit of measurement according to the International System of Unit ( SI ) through :

PSE : Premier System Engineering Co., Ltd. ,(NSC-TISI-TIS 17025 CALIBRATION 0024)

CALIBRATION RESULTS :

Sensor Installation Diagram



Dimension of the chamber :  $W \times H \times D = 56 \times 168 \times 60$  cm

Sensor Installation :  $a \times b \times c = 5 \times 5 \times 5$  cm

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

The above results are valid exclusively for calibration sample as mentioned in the report.

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



CERTIFICATE NO. : T23-3236

CSR No. : 231381

Page : 3 of 4

Equipment : Incubator  
Manufacture : ACCUPLUS  
Model : EC8500  
Serial No. : 0408-0415-0034  
ID. No. : -  
Date of Received : 16-Nov-2023  
Date of Calibration : 16-Nov-2023

## CALIBRATION RESULTS : ( Cont.)

( / ) Without Adjustment

( ) After Adjustment

## Temperature Measurement Accuracy Test

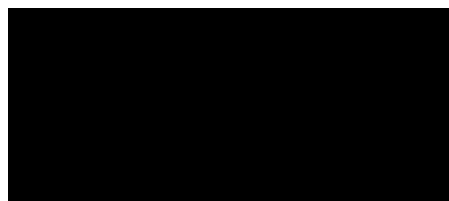
The measurement results of the incubator and associates are reported in the manner as shown below

Cal Point (°C)	Measured Standard Temperature (°C) at Spread Locations									Uncertainty (± °C)
	#1	#2	#3	#4	#5	#6	#7	#8	Ref. 9	
20	20.27	20.22	20.28	20.25	20.10	20.24	20.14	19.95	20.20	0.71

## Incubator Performance Result

The performance of the incubator are reported as shown below

Cal Point (°C)	UUC Setting (°C)	UUC Reading (°C)	Chamber Stability (± °C)	Chamber Uniformity (± °C)	Overall Variation (± °C)
20	20.0	20.0	0.16	0.37	0.58



UUC : Unit Under Calibration

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

The above results are valid exclusively for calibration sample as mentioned in the report.

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

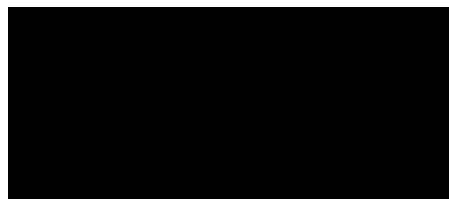
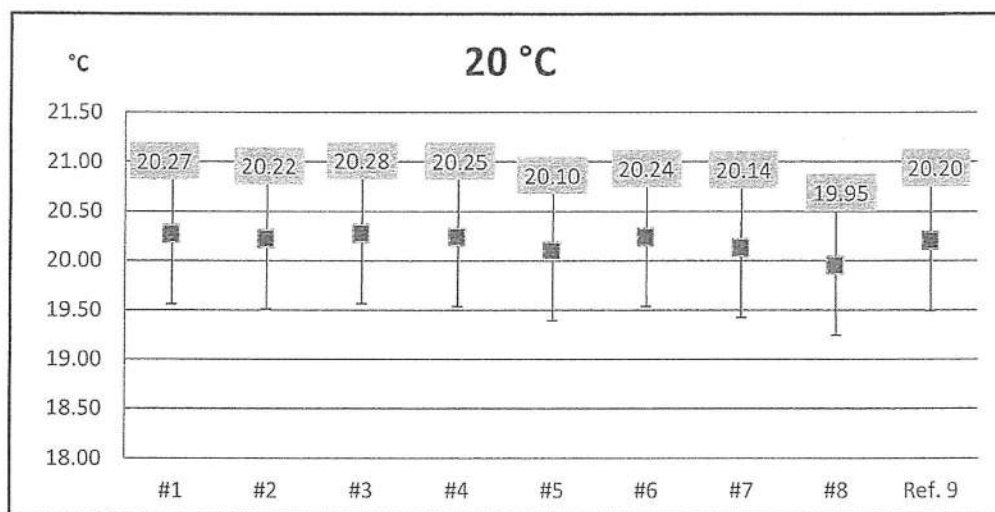


CERTIFICATE NO. : T23-3236

CSR No. : 231381

Page : 4 of 4

### Report Graph



The above results are valid exclusively for calibration sample as mentioned in the report.

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

-- End --



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## CALIBRATION CERTIFICATE

CERTIFICATE No. : T23-3490

CSR No. : 231425

Page : 1 of 2

Customer : Southern Thai Consulting Co., Ltd.  
59/45 Moo5 Srisoontorn, Talang, Phuket  
83110

Equipment : Liquid in Glass Thermometer

Manufacture : PRECISION

Model : -

Serial No. : 5319

ID. No. : -

Range : -10 ~ 420 °C °C

Resolution : 1 °C

Instrument Condition : Good Condition

Location of Calibration : PSE Laboratory

Ambient Temperature : (25 ± 3) °C

Relative Humidity : (55 ± 15) %

Received Date : 20-Nov-2023

Calibration Date : 24-Nov-2023

Date of Issue : 27-Nov-2023

APPROVED BY :

Calibrated By : Mr. Athiwat Supacheewa  
(Temperature Supervisor)

APPROVED SIGNATORY

( / ) MR. PIYAPONG RATTANAKAN / Calibration Manager  
( ) MR. METHA CHUAIBUN / Quality Manager  
( ) MR. BUNPOT SUWANNARAT / Technical Manager

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



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CERTIFICATE No. : T23-3490

CSR No. : 231425

Page : 2 of 2

Equipment : Liquid in Glass Thermometer  
Manufacture : PRECISION  
Model : -  
Serial No. : 5319  
ID. No. : -  
Received Date : 20-Nov-2023  
Calibration Date : 24-Nov-2023

REFERENCE STANDARD INSTRUMENT :

Instrument Type	Model	Serial No.	Cert. No.	Due Date	Traceability
Digital Thermometer With Sensor	1529	B17472	23I257	02-03-2024	TPA

CALIBRATION METHOD :

In-house method : CA.WI.11.043 (ASTM E77-14)

TRACEABILITY :

This Calibration Certificate is traceable to national standards which realize the unit of measurement according to the International System of Unit ( SI ) through :

TPA : Technology Promotion Association (Thailand-Japan), (NSC-TISI-TIS 17025 CALIBRATION 0008)

CALIBRATION RESULTS :

( / ) Without Adjustment ( ) After Adjustment  
Immersion : Total Type of Liquid : Alcohol  
Ice Point Reading : -1.50 °C

Cal Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Correction (°C)	Uncertainty (±°C)
4	5.202	4.0	1.202	0.58
25	26.042	25.0	1.042	0.58

Readability of UUC : 0.5 °C

UUC\* : Unit Under Calibration

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

The above results are valid exclusively for calibration sample as mentioned in the report.

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

-- End --



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## CALIBRATION CERTIFICATE

CERTIFICATE No. : M23-1727

CSR No. : 231381

Page : 1 of 3

Customer : Southern Thai Consulting Co., Ltd.  
59/45 Moo5 Srisoontorn, Talang, Phuket  
83110

Equipment : Analytical Balance

Manufacturer : SARTORIUS

Model : PRACTUM224-IS

Serial No. : 0035106544

ID. No. : -

Capacity : 220 g

Resolution : 0.0001 g

Instrument Condition : Good Condition

Location of Calibration : Customer Laboratory

Ambient Temperature :  $(30 \pm 10)$  °C

Relative Humidity :  $(50 \pm 20)$  %

Barometric Pressure :  $(1010 \pm 10)$  hPa

Date of Received : 16-Nov-2023

Date of Calibration : 16-Nov-2023

Date of Issued : 20-Nov-2023

APPROVED BY :

APPROVED SIGNATORY

Calibrated By : Mr. Piyapol Rongsawat  
( Calibration Technician )

( / ) MR. PIYAPONG RATTANAKAN / Calibration Manager  
( ) MR. METHA CHUAIBUN / Quality Manager  
( ) MR. BUNPOT SUWANNARAT / Technical Manager

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



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CERTIFICATE No. : M23-1727

CSR No. : 231381

Page : 2 of 3

Equipment : Analytical Balance  
Manufacturer : SARTORIUS  
Model : PRACTUM224-IS  
Serial No. : 0035106544  
ID. No. : -  
Date of Received : 16-Nov-2023  
Date of Calibration : 16-Nov-2023

## REFERENCE STANDARD INSTRUMENT :

Instrument Type	Nominal Value	Serial No.	Cert. No.	Due Date	Traceability
Standard Weight Set	100 mg ~ 500g	-	C02230001,2	03-01-2024	DKSH

## CALIBRATION METHOD :

In-house method : CA.WI.11.015 based on UKAS LAB 14 : 2019

## TRACEABILITY :

This Calibration Certificate is traceable to national standards which realize the unit of measurement according to the International System of Unit ( SI ) through :  
DKSH : DKSH Technology Limited. (NSC-TISI-TIS 17025 CALIBRATION 0087)

## CALIBRATION RESULTS :

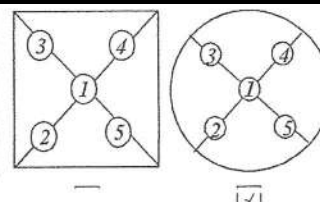
( / ) Without Adjustment ( ) After Adjustment

## DETERMINATION OF THE STANDARD DEVIATION OF WEIGHT MACHINE (N=10)

Nominal Value ( g )	Standard Deviation ( g )
200	0.00008

EFFECT OF OFF CENTER LOADING AT 100 g

Position					Maximum Difference ( g )
1	2	3	4	5	
100.0000	100.0001	100.0001	100.0001	99.9999	0.0001



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





CERTIFICATE NO. : M23-1727

CSR No. : 231381

Page : 3 of 3

Equipment : Analytical Balance  
Manufacturer : SARTORIUS  
Model : PRACTUM224-IS  
Serial No. : 0035106544  
ID. No. : -  
Date of Received : 16-Nov-2023  
Date of Calibration : 16-Nov-2023

## CALIBRATION RESULTS : ( Cont.)

( / ) Without Adjustment

( ) After Adjustment

EFFECT OF TARE AT 100 g

Nominal Value ( g )	UUC* Reading ( g )	Correction ( g )
20	20.0000	-0.00002
40	40.0000	-0.00003
60	60.0000	0.00000
80	79.9999	0.00009
100	99.9998	0.00018

## ERROR OF INDICATION FROM NOMINAL VALUE

Nominal Value ( g )	UUC* Reading ( g )	Correction ( g )	Uncertainty ( $\pm$ g )	Coverage Factor ( k )
* Unload	0.0000	0.00000	0.00020	2.20
0.01	0.0100	0.00000	0.00020	2.20
0.05	0.0500	0.00000	0.00020	2.20
0.1	0.1000	0.00000	0.00020	2.20
0.5	0.5000	0.00000	0.00020	2.20
1	1.0000	-0.00001	0.00020	2.20
2	2.0000	-0.00002	0.00020	2.20
5	5.0000	-0.00002	0.00020	2.20
10	10.0000	0.00001	0.00020	2.18
20	20.0000	-0.00002	0.00020	2.18
40	40.0000	-0.00003	0.00020	2.14
60	60.0000	0.00000	0.00021	2.12
80	79.9999	0.00009	0.00023	2.08
100	100.0000	-0.00002	0.00023	2.08
120	120.0000	-0.00003	0.00026	2.05
140	140.0000	-0.00005	0.00027	2.04
160	160.0001	-0.00012	0.00028	2.03
180	180.0001	-0.00014	0.00031	2.02
200	200.0000	-0.00010	0.00032	2.02

UUC : Unit Under Calibration

The table as per (\*) marked are not NSC-ONSC accreditation scope.

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

The above results are valid exclusively for calibration sample as mentioned in the report

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

-- End --



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NSC-TISI-TIS 17025  
CALIBRATION 0024

## CALIBRATION CERTIFICATE

CERTIFICATE No. : V23-1972

CSR No. : 231381

Page : 1 of 2

Customer : Southern Thai Consulting Co., Ltd.  
59/45 Moo5 Srisoontorn, Talang, Phuket  
83110

Equipment : Conductivity

Manufacturer : APERA

Model : EC 8500

Serial No. : EC85001323271005

ID. No. : -

Resolution : 0.1 $\mu$ S/cm, 1 $\mu$ S/cm, 0.01mS/cm

Instrument Condition : Good Condition

Location of Calibration : Customer Laboratory

Ambient Temperature : (25  $\pm$  3)  $^{\circ}$ C

Relative Humidity : (55  $\pm$  15) %

Date of Received : 16-Nov-2023

Date of Calibration : 16-Nov-2023

Date of Issued : 20-Nov-2023

APPROVED BY :

Calibrated By : Mr. Alongkorn Chewaisarakul  
( Calibration Technician )

APPROVED SIGNATORY

( / ) MR. PIYAPONG RATTANAKAN / Calibration Manager  
( ) MR. METHA CHUAIBUN / Quality Manager  
( ) MR. BUNPOT SUWANNARAT / Technical Manager

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



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CERTIFICATE NO. : V23-1972

CSR No. : 231381

Page : 2 of 2

Equipment : Conductivity  
Manufacturer : APERA  
Model : EC 8500  
Serial No. : EC85001323271005  
ID. No. : -  
Date of Received : 16-Nov-2023  
Date of Calibration : 16-Nov-2023

## REFERENCE STANDARD INSTRUMENT :

Instrument Type	Nominal Value/Model	Lot No.	Batch. No.	Due Date	Traceability
Conductivity Standard	84 uS/cm	879340	879340	14-03-2024	CPA Chem
Conductivity Standard	1413.0uS/cm	879342	879342	13-03-2024	CPA Chem
Conductivity Standard	12.88 mS/cm	879343	879343	14-03-2024	CPA Chem

## CALIBRATION METHOD :

In-house method : CA.WI.11.181 based on direct measurement by using certified reference material (CRM)

## TRACEABILITY :

This Calibration Certificate is traceable to national standards which realize the unit of measurement according to the International System of Unit ( SI ) through :

CPA Chem : CPA chem Ltd. (ANAB Cert No. AR-1835)

## CALIBRATION RESULTS :

( / ) Without Adjustment

( ) After Adjustment

Function : Chemical Measurement

Standard Buffer Solutions ( $\mu\text{S/cm}$ )	UUC Reading ( $\mu\text{S/cm}$ )	Correction ( $\mu\text{S/cm}$ )	Uncertainty ( $\pm\mu\text{S/cm}$ )	Coverage Factor ( k )
* 84.0	82.7	1.28	1.2	2.01
1413.0	1410	3.4	19	2.00

Standard Buffer Solutions ( $\text{mS/cm}$ )	UUC Reading ( $\text{mS/cm}$ )	Correction ( $\text{mS/cm}$ )	Uncertainty ( $\pm\text{mS/cm}$ )	Coverage Factor ( k )
12.88	12.94	-0.06	0.18	2.00

UUC : Unit Under Calibration

The table as per (\*) marked are not NSC-ONSC accreditation scope.

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

The above results are valid exclusively for calibration sample as mentioned in the report.

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

-- End --



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## CALIBRATION CERTIFICATE

CERTIFICATE No. : M24-0704

CSR No. : 240617

Page : 1 of 3

Customer : Southern Thai Consulting Co., Ltd.  
59/45 Moo5 Srisoontorn, Talang, Phuket  
83110

Equipment : Analytical Balance

Manufacturer : SATORIUS

Model : BCA224I-1S

Serial No. : 39506504

ID. No. : -

Capacity : 220 g

Resolution : 0.0001 g

Instrument Condition : Good Condition

Location of Calibration : Customer Laboratory

Ambient Temperature :  $(30 \pm 10)$  °C

Relative Humidity :  $(50 \pm 20)$  %

Barometric Pressure :  $(1010 \pm 10)$  hPa

Date of Received : 24-May-2024

Date of Calibration : 24-May-2024

Date of Issued : 27-May-2024

APPROVED BY : 

APPROVED SIGNATORY

( ) MR. PIYAPONG RATTANAKAN / Calibration Manager  
(✓) MR. BUNPOT SUWANNARAT / Technical Manager

Calibrated By : Mr. Piyapol Rongsawat  
( Calibration Technician )

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The uncertainties are for a confidence probability of approxin



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CERTIFICATE No. : M24-0704

CSR No. : 240617

Page : 2 of 3

Equipment : Analytical Balance  
Manufacturer : SATORIUS  
Model : BCA224I-1S  
Serial No. : 39506504  
ID. No. : -  
Date of Received : 24-May-2024  
Date of Calibration : 24-May-2024

## REFERENCE STANDARD INSTRUMENT :

Instrument Type	Norminal Value	Serial No.	Cert. No.	Due Date	Traceability
Standard Weight Set	1 mg ~ 500 g	-	M2311155S	29-11-2024	TCS

## CALIBRATION METHOD :

In-house method : CA.WI.11.015 based on UKAS LAB 14 : 2022

## TRACEABILITY :

This Calibration Certificate is traceable to national standards which realize the unit of measurment according to the International System of Unit ( SI ) through :  
TCS : Thai Calibration Services Co.,Ltd. , (NSC-TISI-TIS 17025 CALIBRATION 0189)

## CALIBRATION RESULTS :

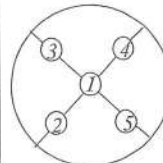
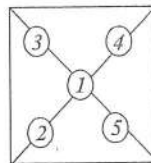
( / ) Without Adjustment ( ) After Adjustment

## DETERMINATION OF THE STANDARD DEVIATION OF WEIGHT MACHINE (N=10)

Nominal Value ( g )	Standard Deviation ( g )
200	0.00005

EFFECT OF OFF CENTER LOADING AT 100 g

Position					Maximum Difference ( g )
1	2	3	4	5	
100.0001	100.0003	100.0003	100.0002	100.0001	0.00020



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



CERTIFICATE NO. : M24-0704

CSR No. : 240617

Page : 3 of 3

Equipment : Analytical Balance  
Manufacturer : SATORIUS  
Model : BCA224I-1S  
Serial No. : 39506504  
ID. No. : -  
Date of Received : 24-May-2024  
Date of Calibration : 24-May-2024

## CALIBRATION RESULTS : ( Cont.)

( / ) Without Adjustment

( ) After Adjustment

EFFECT OF TARE AT 100 g

Nominal Value ( g )	UUC* Reading ( g )	Correction ( g )
20	20.0000	-0.00002
40	40.0000	-0.00003
60	60.0000	0.00000
80	79.9999	0.00009
100	100.0000	-0.00002

## ERROR OF INDICATION FROM NOMINAL VALUE

Nominal Value ( g )	UUC* Reading ( g )	Correction ( g )	Uncertainty ( $\pm$ g )	Coverage Factor ( k )
* Unload	0.0000	0.00000	0.00014	2.11
0.1	0.1000	0.00000	0.00014	2.11
0.5	0.5000	0.00000	0.00014	2.11
1	1.0000	-0.00001	0.00014	2.11
2	2.0000	-0.00002	0.00014	2.11
5	5.0001	-0.00012	0.00014	2.11
10	10.0001	-0.00009	0.00014	2.11
20	20.0000	-0.00002	0.00014	2.10
40	40.0000	-0.00003	0.00015	2.07
60	60.0001	-0.00010	0.00016	2.05
80	80.0002	-0.00021	0.00018	2.03
100	100.0001	-0.00012	0.00019	2.03
120	120.0000	-0.00003	0.00026	2.02
140	140.0001	-0.00015	0.00026	2.01
160	160.0000	-0.00002	0.00026	2.01
180	180.0001	-0.00014	0.00028	2.01
200	200.0000	-0.00010	0.00029	2.00

UUC : Unit Under Calibration

The table as per (\*) marked are not NSC-ONSC accreditation scope.

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

The above results are valid exclusively for calibration sample as mentioned in the report

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

-- End --





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NSC-TISI-TIS 17025  
CALIBRATION 0024

## CALIBRATION CERTIFICATE

CERTIFICATE No. : T24-1545

CSR No. : 240617

Page : 1 of 4

Customer : Southern Thai Consulting Co., Ltd.  
59/45 Moo5 Srisoontorn, Talang, Phuket  
83110

Equipment : Water Bath

Manufacturer : Memmert

Model : WNB 22

Serial No. : L519.1143

ID. No. : -

Resolution : 0.1 °C

Instrument Condition : Good Condition

Location of Calibration : Customer Laboratory

Ambient Temperature : (30 ± 10) °C

Relative Humidity : (50 ± 20) %

Date of Received : 24-May-2024

Date of Calibration : 24-May-2024

Date of Issued : 27-May-2024

APPROVED BY :

Calibrated By : Mr. Attapol Juntasurat  
( Calibration Engineer )

APPROVED SIGNATORY

( ) MR. PIYAPONG RATTANAKAN / Calibration Manager  
(/ ) MR. BUNPOT SUWANNARAT / Technical Manager

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The uncertainties are for a confidence probability of approx



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CERTIFICATE No. : T24-1545

CSR No. : 240617

Page : 2 of 4

Equipment : Water Bath  
Manufacturer : Memmert  
Model : WNB 22  
Serial No. : L519.1143  
ID. No. : -  
Date of Received : 24-May-2024  
Date of Calibration : 24-May-2024

REFERENCE STANDARD INSTRUMENT :

Instrument Type	Model	Serial No.	Cert. No.	Due Date	Traceability
Digital Thermometer with Sensor	34970 A	MY 44042662	DAT003W/0822	01-08-2024	PSE

CALIBRATION METHOD :

In-house method : CA.WI.11.161 based on ASTM E715 : 80 (re-approved 2022)

TRACEABILITY :

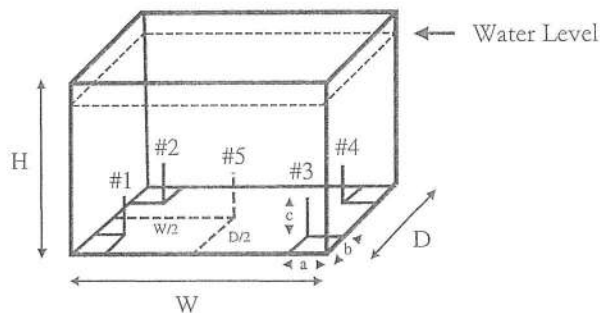
This Calibration Certificate is traceable to national standards which realize the unit of measurement according to the International System of Unit ( SI ) through :

PSE : Premier System Engineering Co., Ltd. ,(NSC-TISI-TIS 17025 CALIBRATION 0024)

CALIBRATION RESULTS :

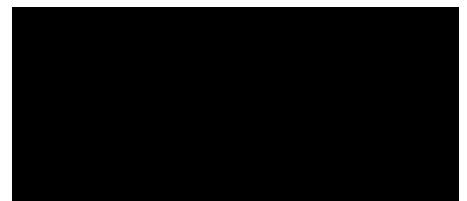
( / ) Without Adjustment ( ) After Adjustment

Sensor Installation Diagram



Dimension of the chamber :  $W \times H \times D = 35 \times 29 \times 22$  cm  
Sensor Installation :  $a \times b \times c = 5 \times 5 \times 5$  cm

The uncertainties are for a confidence probability of approximately 95 % .  
The above results are valid exclusively for calibration sample as mentioned in the report.  
This result of calibration was found accurate as shown on date and place of calibration only.







CERTIFICATE NO. : T24-1545

CSR No. : 240617

Page : 3 of 4

Equipment : Water Bath  
Manufacture : Memmert  
Model : WNB 22  
Serial No. : L519.1143  
ID, No. : -  
Date of Received : 24-May-2024  
Date of Received : 24-May-2024

## CALIBRATION RESULTS : ( Cont.)

( / ) Without Adjustment

( ) After Adjustment

## Temperature Measurement Accuracy Test

The measurement results of the water bath and associates are reported in the manner as shown below

Cal Point (°C)	Measured Standard Temperature (°C) at Spread Locations					Uncertainty (± °C)
	#1	#2	#3	#4	#5	
95	94.68	94.89	94.82	94.87	94.71	0.35

95.03      95.24      95.17      95.22      95.02  
94.33      94.54      94.47      94.49      94.56

## Water Bath Performance Result

The performance of the water bath are reported as shown below

Cal Point (°C)	UUC Setting (°C)	UUC Reading (°C)	Water Bath Stability (± °C)	Water Bath Uniformity (± °C)	Overall Variation (± °C)
95	95.0	95.0	0.100	0.26	0.45

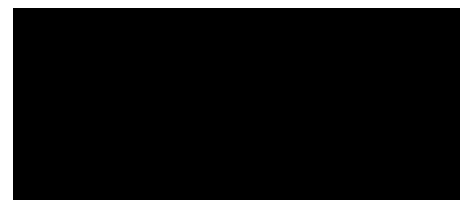
UUC : Unit Under Calibration

The uncertainty is not combine uniformity of the water bath

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

The above results are valid exclusively for calibration sample as mentioned in the report.

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



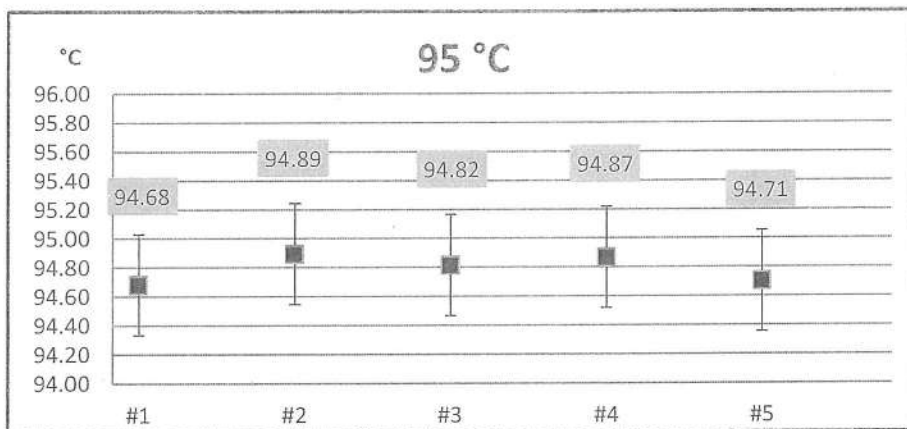


CERTIFICATE NO. : T24-1545

CSR No. : 240617

Page : 4 of 4

### Report Graph



The above results are valid exclusively for calibration sample as mentioned in the report.

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

-- End --



PREMIER SYSTEM ENGINEERING CO., LTD.

123 Moo 8 Kanjanavanit Rd., Banpru, Hatyai, Songkhla 90250

E-mail : pse-cal@sriranggroup.com ,Fax : (074)222912 Tel. : 084-2148162, 084-2148165, 074-222900-9



## CALIBRATION CERTIFICATE

CERTIFICATE No. : T24-1541

CSR No. : 240613

Page : 1 of 2

Customer : Southern Thai Consulting Co., Ltd.  
59/45 Moo5 Srisoontorn, Talang, Phuket  
83110

Equipment : Digital Thermo Hygrometer

Manufacturer : DIGICON

Model : TH-03A

Serial No. : 395038423

ID. No. : -

Resolution : 0.1 °C 1 %RH

Instrument Condition : Good Condition

Location of Calibration : PSE Laboratory

Ambient Temperature : (25 ± 3) °C

Relative Humidity : (55 ± 15) %

Date of Received : 20-May-2024

Date of Calibration : 21-May-2024

Date of Issue : 24-May-2024

APPROVED BY :

Calibrated By : Mr. Attapol Juntasurat  
( Calibration Engineer )

APPROVED SIGNATORY

( / ) MR. PIYAPONG RATTANAKAN / Calibration Manager  
( ) MR. BUNPOT SUWANNARAT / Technical Manager

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written approval of PREMIER SYSTEM ENGINEERING CO., LTD  
The uncertainties are for a confidence probability of approximately 95 %



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CERTIFICATE No. : T24-1541

CSR No. : 240613

Page : 2 of 2

Equipment : Digital Thermo Hygrometer  
Manufacturer : DIGICON  
Model : TH-03A  
Serial No. : 395038423  
ID. No. : -  
Date of Received : 20-May-2024  
Date of Calibration : 21-May-2024

## REFERENCE STANDARD INSTRUMENT :

Instrument Type	Model	Serial No.	Cert. No.	Due Date	Traceability
Relative Hygrometer	DewMaster	53740	TH-0117-23	03/12/2024	NIMT
Digital Thermometer with probe	DewMaster	53740	TT-0134-23	11/12/2024	NIMT

## CALIBRATION METHOD :

In-house method : CA.WI.11.174 by comparison with standard thermometer comparison with relative humidity standard

## TRACEABILITY :

This Calibration Certificate is traceable to national standards which realize the unit of measurement according to the International System of Unit (SI) through :

NIMT : National Institute of Metrology (Thailand) Ministry of Science and Technology (NSC-TISI-TIS 17025 CALIBRATION 0144)

## CALIBRATION RESULTS :

Function : Humidity Measurement

( / ) Without Adjustment ( ) After Adjustment

Reference (°C)	STD Humidity (%RH)	UUC* Reading (%RH)	Correction (%RH)	Uncertainty (±%RH)
25	60.41	59.0	1.41	1.8

Function : Temperature Measurement

( / ) Without Adjustment ( ) After Adjustment

Cal Point (°C)	STD Temperature (°C)	UUC* Reading (°C)	Correction (°C)	Uncertainty (±°C)
25	24.94	24.7	0.24	0.62

UUC\* : Unit Under Calibration

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

The above results are valid exclusively for calibration sample as mentioned in the report.

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

-End-



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NSC-TISI-TIS 17025  
CALIBRATION 0024

## CALIBRATION CERTIFICATE

CERTIFICATE No. : T24-1542

CSR No. : 240613

Page : 1 of 2

Customer : Southern Thai Consulting Co., Ltd.  
59/45 Moo5 Srisoontorn, Talang, Phuket  
83110

Equipment : Digital Thermo Hygrometer

Manufacturer : ThermoPro

Model : TP-50

Serial No. : 11039

ID. No. : -

Resolution : 0.1 °C 1 %RH

Instrument Condition : Good Condition

Location of Calibration : PSE Laboratory

Ambient Temperature : (25 ± 3) °C

Relative Humidity : (55 ± 15) %

Date of Received : 20-May-2024

Date of Calibration : 21-May-2024

Date of Issue : 24-May-2024

APPROVED BY :

APPROVED SIGNATORY

( / ) MR. PIYAPONG RATTANAKAN / Calibration Manager  
( ) MR. BUNPOT SUWANNARAT / Technical Manager

Calibrated By : Mr. Attapol Juntasurat  
( Calibration Engineer )

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The uncertainties are for a confidence probability of approximately 95%



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CERTIFICATE No. : T24-1542

CSR No. : 240613

Page : 2 of 2

Equipment : Digital Thermo Hygrometer  
Manufacturer : ThermoPro  
Model : TP-50  
Serial No. : 11039  
ID. No. : -  
Date of Received : 20-May-2024  
Date of Calibration : 21-May-2024

## REFERENCE STANDARD INSTRUMENT :

Instrument Type	Model	Serial No.	Cert. No.	Due Date	Traceability
Relative Hygrometer	DewMaster	53740	TH-0117-23	03/12/2024	NIMT
Digital Thermometer with probe	DewMaster	53740	TT-0134-23	11/12/2024	NIMT

## CALIBRATION METHOD :

In-house method : CA.WI.11.174 by comparison with standard thermometer comparison with relative humidity standard

## TRACEABILITY :

This Calibration Certificate is traceable to national standards which realize the unit of measurement according to the International System of Unit ( SI ) through :

NIMT : National Institute of Metrology (Thailand) Ministry of Science and Technology (NSC-TISI-TIS 17025 CALIBRATION 0144)

## CALIBRATION RESULTS :

Function : Humidity Measurement

( / ) Without Adjustment ( ) After Adjustment

Reference (°C)	STD Humidity (%RH)	UUC* Reading (%RH)	Correction (%RH)	Uncertainty (±%RH)
25	60.41	61.0	-0.59	1.8

Function : Temperature Measurement

( / ) Without Adjustment ( ) After Adjustment

Cal Point (°C)	STD Temperature (°C)	UUC* Reading (°C)	Correction (°C)	Uncertainty (±°C)
25	24.94	24.8	0.14	0.62

UUC\* : Unit Under Calibration

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

The above results are valid exclusively for calibration sample as mentioned in the report.

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

-End-



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NSC-TISI-TIS 17025  
CALIBRATION 0024

## CALIBRATION CERTIFICATE

CERTIFICATE No. : M24-0703

CSR No. : 240613

Page : 1 of 2

Customer : Southern Thai Consulting Co., Ltd.  
59/45 Moo5 Srisoontorn, Talang, Phuket  
83110

Equipment : Weight Set

Manufacturer : Mettler Toledo

Norminal Value : 1g - 200g

Serial No. : -

ID. No. : PK-LB-48014

Instrument Condition : Good Condition

Location of Calibration : PSE Laboratory

Ambient Temperature :  $(20 \pm 2) ^\circ\text{C}$

Relative Humidity :  $(50 \pm 10) \%$

Barometric Pressure :  $(1010 \pm 10)$  hPa

Date of Received : 20-May-2024

Date of Calibration : 20-May-2024

Date of Issued : 23-May-2024

APPROVED BY :

APPROVED SIGNATORY

( / ) MR. PIYAPONG RATTANAKAN / Calibration Manager  
( ) MR. BUNPOT SUWANNARAT / Technical Manager

Calibrated By : Mr. Piyapol Rongsawat  
( Calibration Technician )

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The uncertainties are for a confidence probability of approximately 95%



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CERTIFICATE No. : M24-0703

CSR No. : 240613

Page : 2 of 2

Equipment : Weight Set  
Manufacturer : Mettler Toledo  
Nominal Value : 1g - 200g  
Serial No. : -  
ID. No. : PK-LB-48014  
Date of Received : 20-May-2024  
Date of Calibration : 20-May-2024

## REFERENCE STANDARD INSTRUMENT :

Instrument Type	Nominal Value/Model	Serial No.	Cert. No.	Due Date	Traceability
Standard Weight Set	1 mg ~ 1 kg	31930467	M2403147S	19-03-2025	TCS

## CALIBRATION METHOD :

In-house method : CA.WI.11.052 based on OIML R 111-1 : 2004

## TRACEABILITY :

This Calibration Certificate is traceable to national standards which realize the unit of measurement according to the International System of Unit ( SI ) through :

TCS : Thai Calibration Services Co.,Ltd. , (NSC-TISI-TIS 17025 CALIBRATION 0189)

## CALIBRATION RESULTS :

( / ) Without Adjustment ( ) After Adjustment

Nominal Value	Marking	Conventional Mass	Uncertainty ( $\pm$ mg )	MPE Class F1
1 g	none	1 g + 0.00 mg	0.03	$\pm$ 0.10 mg
2 g	none	2 g + 0.02 mg	0.04	$\pm$ 0.12 mg
2 g	.	2 g + 0.02 mg	0.04	$\pm$ 0.12 mg
5 g	none	5 g + 0.02 mg	0.05	$\pm$ 0.16 mg
10 g	none	10 g + 0.10 mg	0.06	$\pm$ 0.20 mg
20 g	none	20 g + 0.07 mg	0.08	$\pm$ 0.25 mg
20 g	.	20 g + 0.03 mg	0.08	$\pm$ 0.25 mg
50 g	none	50 g + 0.08 mg	0.10	$\pm$ 0.3 mg
100 g	none	100 g - 0.12 mg	0.16	$\pm$ 0.5 mg
200 g	none	200 g + 0.38 mg	0.30	$\pm$ 1.0 mg

MPE : Maximum permissible errors for weights

The calibration was calibrated by comparison with standard weights at an average air density of  $1.2 \text{ kg/m}^3$  and material density for weight of  $8,000 \text{ kg/m}^3$

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

The above results are valid exclusively for calibration sample as mentioned in the report.

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

-- End --





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## CALIBRATION CERTIFICATE

CERTIFICATE No. : T24-1743

CSR No. : 240790

Page : 1 of 4

Customer : Southern Thai Consulting Co., Ltd.  
59/45 Moo5 Srisoontorn, Talang, Phuket  
83110

Equipment : Hot Air Oven

Manufacturer : Binder

Model : FD56

Serial No. : 20220000017352

ID. No. : -

Resolution : 1 °C

Instrument Condition : Good Condition

Location of Calibration : Customer Laboratory

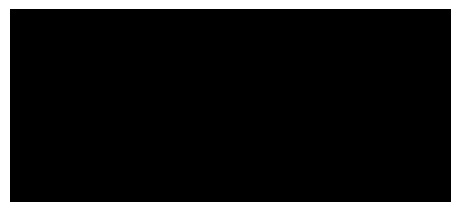
Ambient Temperature : (30 ± 15) °C

Relative Humidity : (60 ± 20) %

Date of Received : 5-Jul-2024

Date of Calibration : 5-Jul-2024

Date of Issued : 8-Jul-2024



APPROVED BY :

Calibrated By : Mr. Attapol Juntasurat  
( Calibration Engineer )

APPROVED SIGNATORY  
( / ) MR. PIYAPONG RATTANAKAN / Calibration Manager  
( ) MR. BUNPOT SUWANNARAT / Technical Manager



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

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CERTIFICATE No. : T24-1743

CSR No. : 240790

Page : 2 of 4

Equipment : Hot Air Oven  
Manufacturer : Binder  
Model : FD56  
Serial No. : 20220000017352  
ID. No. : -  
Date of Received : 5-Jul-2024  
Date of Calibration : 5-Jul-2024

REFERENCE STANDARD INSTRUMENT :

Instrument Type	Model	Serial No.	Cert. No.	Due Date	Traceability
Digital Thermometer with Sensor	34970 A	MY 44042662	DAT003/0823	01-08-2024	PSE

CALIBRATION METHOD :

In-house method : CA.WI.11.160 based on ASTM E145 : 1994 (re-approved 2011)

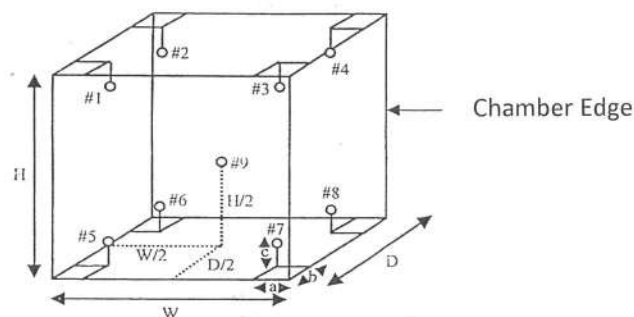
TRACEABILITY :

This Calibration Certificate is traceable to national standards which realize the unit of measurement according to the International System of Unit ( SI ) through :

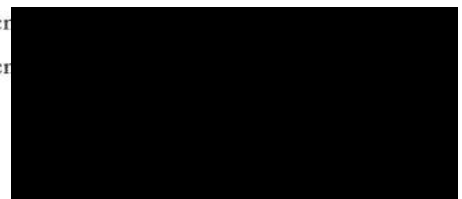
PSE : Premier System Engineering Co., Ltd. ,(NSC-TISI-TIS 17025 CALIBRATION 0024)

CALIBRATION RESULTS :

Sensor Installation Diagram



Dimension of the chamber :  $W \times H \times D = 40 \times 44 \times 34$  cm  
Sensor Installation :  $a \times b \times c = 5 \times 5 \times 5$  cm



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

The above results are valid exclusively for calibration sample as mentioned in the report.

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



CERTIFICATE NO. : T24-1743

CSR No. : 240790

Page : 3 of 4

Equipment : Hot Air Oven  
Manufacture : Binder  
Model : FD56  
Serial No. : 20220000017352  
ID. No. : -  
Date of Received : 5-Jul-2024  
Date of Calibration : 5-Jul-2024

**CALIBRATION RESULTS : ( Cont.)**

( / ) Without Adjustment

( ) After Adjustment

**Temperature Measurement Accuracy Test**

The measurement results of the hot air oven and associates are reported in the manner as shown below

Cal Point (°C)	Measured Standard Temperature (°C) at Spread Locations									Uncertainty ( ± °C )
	#1	#2	#3	#4	#5	#6	#7	#8	Ref. 9	
104	104.27	103.92	103.99	103.76	104.00	104.27	103.80	103.78	103.89	0.63

**Hot Air Oven Performance Result**

The performance of the hot air oven are reported as shown below

Cal Point (°C)	UUC Setting (°C)	UUC Reading (°C)	Chamber Stability ( ± °C )	Chamber Uniformity ( ± °C )	Overall Variation ( ± °C )
104	104	104	0.11	0.43	0.60

UUC : Unit Under Calibration

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

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

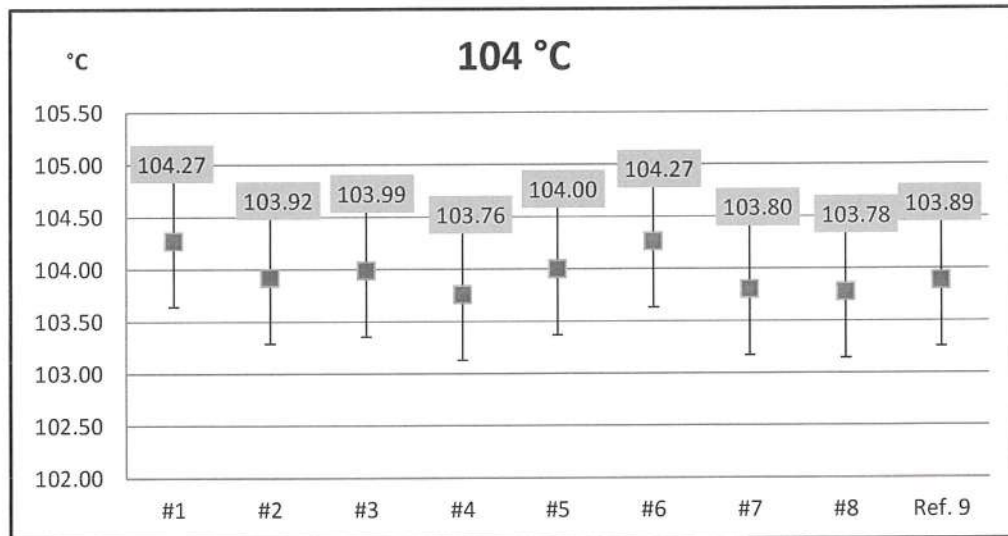


CERTIFICATE NO. : T24-1743

CSR No. : 240790

Page : 4 of 4

## Report Graph



The above results are valid exclusively for calibration sample as mentioned in the report.

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

-- End --



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## CALIBRATION CERTIFICATE

CERTIFICATE No. : V24-1309

CSR No. : 240790

Page : 1 of 3

Customer : Southern Thai Consulting Co., Ltd.  
59/45 Moo5 Srisoontorn, Talang, Phuket  
83110

Equipment : pH Meter

Manufacturer : SI Analytics

Model : lab 845

Serial No. : 21021943

ID. No. : -

Resolution : 0.01 pH

Instrument Condition : Good Condition

Location of Calibration : Customer Laboratory

Ambient Temperature :  $(25 \pm 3)^{\circ}\text{C}$

Relative Humidity :  $(55 \pm 15) \%$

Date of Received : 5-Jul-2024

Date of Calibration : 5-Jul-2024

Date of Issued : 8-Jul-2024

APPROVED BY :

APPROVED SIGNATORY

( / ) MR. PIYAPONG RATTANAKAN / Calibration Manager  
( ) MR. BUNPOT SURYANARAT / Technical Manager

Calibrated By : Mr. Alongkorn Chewaisarakul  
( Calibration Technician )

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



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CERTIFICATE NO. : V24-1309

CSR No. : 240790

Page : 2 of 3

Equipment : pH Meter  
Manufacturer : SI Analytics  
Model : lab 845  
Serial No. : 21021943  
ID. No. : -  
Date of Received : 5-Jul-2024  
Date of Calibration : 5-Jul-2024

## REFERENCE STANDARD INSTRUMENT :

Instrument Type	Nominal Value/Model	Serial No.	Cert. No.	Due Date	Traceability
pH Calibration Standard	4.00	1001753	1001753	07-06-2025	CPA Chem
pH Calibration Standard	6.87	930376	930376	24-09-2025	CPA Chem
pH Calibration Standard	10.01	1001755	1001755	16-06-2025	CPA Chem
Temperature/Electrical Calibrator	MC2-TE	10548	CAL0252-24P0028	06-02-2025	RKT

## CALIBRATION METHOD :

In-house method : CA.WI.11.117 based on direct measurement by using standard voltage calibrator

In-house method : CA.WI.11.117 based on direct measurement by using certified reference material (CRM)

## TRACEABILITY :

This Calibration Certificate is traceable to national standards which realize the unit of measurement according to the International System of Unit ( SI ) through :

CPA Chem : CPA chem Ltd. (ANAB Cert No. AR-1835)

TPA : Technology Promotion Association (Thailand-Japan), (NSC-TISI-TIS 17025 CALIBRATION 0008)

## CALIBRATION RESULTS :

Function : Electrical Measurement

Applied Voltage (mV)	pH meter Reading (mV)	Correction (mV)	Uncertainty ( ± mV )	Coverage Factor ( k )
177.48	178	-0.52	0.60	2.00
0.00	0	0.00	0.59	2.00
-177.48	-177	-0.48	0.60	2.00

Function : Chemical Measurement

Standard Buffer Solutions (pH)	pH meter Reading (pH)	Correction (pH)	Uncertainty ( ± pH )	Coverage Factor ( k )
4.007	3.95	0.057	0.016	2.28
6.865	6.98	-0.115	0.019	2.01
10.010	9.93	0.080	0.058	2.00

Calibration curve - % off set - mV

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

The above results are valid exclusively for calibration sample as mentioned in the report.

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



CERTIFICATE No. : V24-1309

CSR No. : 240790

Page : 3 of 3

Equipment : pH Meter  
Manufacture : SI Analytics  
Model : lab 845  
Serial No. : 21021943  
ID. No. : -  
Received Date : 5-Jul-2024  
Calibration Date : 5-Jul-2024

**REFERENCE STANDARD INSTRUMENT :**

Instrument Type	Model	Serial No.	Cert. No.	Due Date	Traceability
Digital Thermometer with Sensor	375	170209021	Q24020409	27-02-2025	CLC

**CALIBRATION METHOD :**

In-house method : CA.WI.11.008

**TRACEABILITY :**

This Calibration Certificate is traceable to national standards which realize the unit of measurement according to the International System of Unit ( SI ) through :

CLC : Calibration Laboratory Co.,Ltd. (NSC-TISI-TIS 17025 CALIBRATION 0059)

**CALIBRATION RESULTS : ( Cont.)**

( / ) Without Adjustment

( ) After Adjustment

Setting Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Correction (°C)	Uncertainty (±°C)
* 25	24.96	24.8	0.16	0.19

UUC\* : Unit Under Calibration

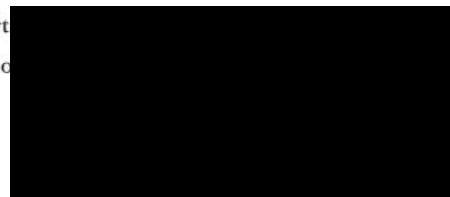
The table as per (\*) marked are not NSC-ONSC accreditation scope.

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

The above results are valid exclusively for calibration sample as mentioned in the report

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

-- End --



เอกสารขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน  
บริษัท อีสเทิร์นไทยคอนสัลต์ติ้ง 1992 จำกัด



ที่ อก ๐๓๒๐/๑๑๓๔๒



กรมโรงงานอุตสาหกรรม  
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท  
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๒๗ กรกฎาคม ๒๕๖๖

เรื่อง ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท อีสเทิร์น ไทย คอนซัลติ้ง 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 คอนซัลติ้ง ๑๙๙๒ จำกัด ขอต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ว-๐๐๓ สถานที่ตั้งเลขที่ ๖๘๓ หมู่ที่ ๑๑ ถนนสุขาภิบาล ๘ ตำบลหนองขาม อำเภอสรีราชา จังหวัดชลบุรี ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท อีสเทิร์น ไทย คอนซัลติ้ง 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 ๕๕ รายการ รวมทั้งสิ้นจำนวน ๒๙๒ รายการ ตามสิ่งที่ส่งมาด้วย ๓

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

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายทวี อำพาพันธ์)

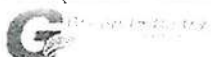
ผู้อำนวยการศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก

ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก

โทร. ๐ ๓๓๑๓ ๖๐๕๕ ต่อ ๕๐๐๓-๒

ไปรษณีย์อิเล็กทรอนิกส์ [eirw@diw.mail.go.th](mailto:eirw@diw.mail.go.th)



"อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว"



เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท อีสเทิร์น ไทย คอนกรีตติ้ง ๑๙๙๒ จำกัด เลขทะเบียน ๖-๐๐๓

ที่ อก ๐๓๒๐/๑๑๓๕๒

ลงวันที่ ๒๗ กรกฎาคม ๒๕๖๖

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๔๐ ราย

๑) นางสาวมาลีเกษ เลขะวัจกุล	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๐๑
๒) นายวัฒนา โคตรหล้า	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๐๒
๓) นางวรรณเพ็ญ เหลาจินดาวัฒน์	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๐๓
๔) นายกะวีร์ สุทธทรัพย์	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๐๔
๕) นางสาวนันท์ณภัส แบบขุนทด	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๐๕
๖) นางสาวพรนภา หลงคำหงษ์	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๐๖
๗) นางสาวอภิรดี ชื่นอารมย์	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๐๗
๘) นางสาวอัจฉรี จิตตะยโสธร	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๐๘
๙) นางสาวจิรพร ปานคง	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๐๙
๑๐) นายสุทธา สองธนี	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๑๐
๑๑) นางสาวนันท์ประภา อูยสูงเนิน	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๑๑
๑๒) นายธงไชย บุญศักดิ์	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๑๒
๑๓) นางสาวธนัชพร กลิ่นโสภณ	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๑๓
๑๔) นายธีระพงษ์ นวลอินทร์	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๑๔
๑๕) นางสาวแพรว พลแสน	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๑๕
๑๖) นายทรงพล ผิวอ้วน	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๑๖
๑๗) นายภาคภูมิ บัวสวัสดิ์	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๑๗
๑๘) นางสาวจันทน์ สายพันธ์	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๑๘
๑๙) นายภาณุพงศ์ บำรุงรส	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๑๙
๒๐) นางสาวปภาณิน จันตะสอน	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๒๐
๒๑) นายวรากร ไวยะเสวี	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๒๑
๒๒) นางสาววรรณภา ไชยศิริ	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๒๒
๒๓) นางสาวพรพิมล ภูมิคอนสาร	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๒๓
๒๔) นางสาวธมลวรรณ ผลอ้อ	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๒๔
๒๕) นางสาวบุญเรือง บุญถม	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๒๕
๒๖) นางสาวกัสนันท์ ป้อมน้อย	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๒๖
๒๗) นายขานวัฒน์ โชติวงค์	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๒๗
๒๘) นางสาวพจณีย์ งามวิสัย	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๒๘
๒๙) นายวิญญ์วัล สิงห์โต	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๒๙
๓๐) นางสาวนุกูล อารศรี	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๓๐
๓๑) นายศุภฤกษ์ พาดกลาง	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๓๑
๓๒) นายนิชพล ทองหล่อ	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๓๒
๓๓) นายธรรมรัตน์ โพธิ์ตันคำ	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๓๓
๓๔) นายโอชา ขวัญศิริมงคล	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๓๔
๓๕) นายเมธี สุขประเสริฐ	ทะเบียนเลขที่

๓๖) นางสาวพรพินันท์ วิริยกุลกุล	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๓๖
๓๗) นางสาวอาภาภรณ์ เสริมสนธิ	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๓๗
๓๘) นางสาวนภัทร์ธมมภ์ ประดิษฐ์นุช	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๓๘
๓๙) นางสาวสุนิษา เอ็งเล็ง	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๓๙
๔๐) นางสาวระพีณ อ้นขัน	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) นางสาวกัญจน์ถวิกา จันทร์ชอดแก้ว	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๐๓
๔) นางสาวฉัตรสุตา มงคลโกชน์	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๐๔
๕) นางสาวณัฐวดี อำนวยทัศน	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๐๕
๖) นางสาวนิอรอุมา 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) นายนาธิป สงวนศิลป์	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๑๐
๑๑) นายวีระชัย พอใจ	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๑๑
๑๒) นายอัญชลี ทะพงษ์	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๑๒
๑๓) นางสาวสมิตตรา มีแก่น	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๑๓
๑๔) นางสาวสวรรยา เพชรประไพ	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๑๔
๑๕) นางสาวจุฑามาศ เจริญพรหม	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๑๕
๑๖) นางสาวนิภาพร คำขมภู	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) นางสาวปวีรศา 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) นางสาวดวงสุตา แสนวันดี	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๒๕

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท อีสเทิร์น ไทย คอนซัลติ้ง ๑๙๙๒ จำกัด เลขทะเบียน ๖-๐๐๓


ที่ อก 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 <sup>[4]</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>[4]</sup>
2	Arsenic	1) Continuous Hydride Generation/Atomic Absorption Spectrometric Method <sup>[4]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>
3	Barium	Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>
4	$\alpha$ -BHC	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[4]</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>[4]</sup>
5	$\beta$ -BHC	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[4]</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>[4]</sup>
6	$\delta$ -BHC	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[4]</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>[4]</sup>
7	$\gamma$ -BHC	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[4]</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>[4]</sup>
8	Biochemical Oxygen Demand	1) 5-Day BOD Test, Membrane Electrode Method <sup>[4]</sup> 2) 5-Day BOD Test, Azide Modification Method <sup>[4]</sup>
9	Cadmium	Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>
10	Chemical Oxygen Demand	Closed Reflux, Titrimetric Method <sup>[4]</sup>
11	cis-Chlordane	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[4]</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>[4]</sup>
12	trans-Chlordane	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[4]</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>[4]</sup>
13	Chromium	1) Digestion, Direct Air-Acetylene Flame Method <sup>[4]</sup> 2) D Method <sup>[4]</sup>

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

29 Heptachlor...

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

อากาศเสีย (ปล่องระบาย) จำนวน 21 รายการ

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

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

น้ำใต้ดิน จำนวน 111 รายการ

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



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

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

Dieldrin...

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

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

Phenol...


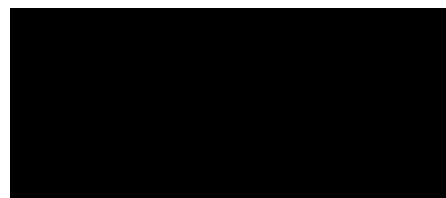
ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
89	Phenol	1) Distillation, Direct Photometric Method <sup>[4]</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[4]</sup>
90	Pyrene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[4]</sup>
91	Selenium	Digestion,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

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

สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน 18 รายการ

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


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



ดิน จำนวน 95 รายการ

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



nyl phthalate...



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



1,2-Dichloroethane...

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


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

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

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

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ที่ อก ๐๓๒๐/ ๕๖๐๕ 1

กรมโรงงานอุตสาหกรรม  
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท  
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

๑๕ พฤษภาคม ๒๕๖๗

เรื่อง เปลี่ยนแปลงเอกสารอ้างอิงวิธีวิเคราะห์สารมลพิษ เปลี่ยนแปลงสารมลพิษในดิน และเปลี่ยนแปลงบุคลากร  
ของห้องปฏิบัติการวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท อีสเทิร์น ไทย คอนซัลติ้ง ๑๙๙๒ จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน  
ลงวันที่ ๔ มีนาคม ๒๕๖๗

สิ่งที่ส่งมาด้วย เอกสารแนบท้ายหนังสือเปลี่ยนแปลงเอกสารอ้างอิงวิธีวิเคราะห์สารมลพิษ และเปลี่ยนแปลง  
สารมลพิษบริษัท อีสเทิร์น ไทย คอนซัลติ้ง ๑๙๙๒ จำกัด จำนวน ๑๒ แผ่น

ตามคำขอฯ ที่อ้างถึง บริษัท อีสเทิร์น ไทย คอนซัลติ้ง ๑๙๙๒ จำกัด ห้องปฏิบัติการวิเคราะห์  
เอกชน เลขทะเบียน ๖-๐๐๓ สถานที่ตั้งเลขที่ ๖๘๓ หมู่ที่ ๑๑ ถนนสุขาภิบาล ๘ ตำบลหนองขาม  
อำเภอศรีราชา จังหวัดชลบุรี แจ้งขอเปลี่ยนแปลงเอกสารอ้างอิงวิธีวิเคราะห์สารมลพิษในน้ำเสีย น้ำใต้ดิน  
เปลี่ยนแปลงสารมลพิษในดิน และเปลี่ยนแปลงบุคลากร นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว มีความเห็นดังนี้

๑. ให้ยกเลิกผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๑ ราย

นายวัฒนา โคตรหล้า ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๐๐๒

๒. ให้ยกเลิกเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๓ ราย

๑) นางสาวอัญชลี ทะพงษ์ ทะเบียนเลขที่ ๖-๐๐๓-จ-๐๐๑๐๒

๒) นางสาวจุฑามาศ เจริญพรหม ทะเบียนเลขที่ ๖-๐๐๓-จ-๐๐๑๑๕

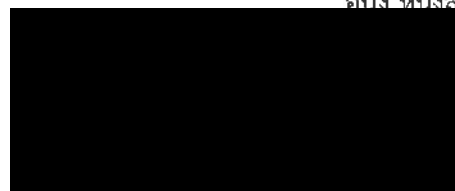
๓) นางสาวณัฐนิช นนตานอก ทะเบียนเลขที่ ๖-๐๐๓-จ-๐๐๒๑๔

๓. ให้ยกเลิกขอขยายรายการสารมลพิษในน้ำเสีย และน้ำใต้ดินตามรายการเอกสารแนบท้าย  
หนังสือต่ออายุรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชนที่ อก ๐๓๒๐/๑๑๓๔๒ ลงวันที่ ๒๗ กรกฎาคม ๒๕๖๖

๔. ให้วิเคราะห์สารมลพิษตามขอขยายที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย จำนวน ๔๗ รายการ  
และน้ำใต้ดิน จำนวน ๑๑๑ รายการ รวมทั้งสิ้นจำนวน ๑๕๘ รายการ ตามเอกสารแนบท้ายหนังสือเปลี่ยนแปลง  
เอกสารอ้างอิงวิธีวิเคราะห์สารมลพิษ เปลี่ยนแปลงสารมลพิษในดิน และเปลี่ยนแปลงบุคลากร ดังสิ่งที่ส่งมาด้วย

๕. ให้วิเคราะห์สารมลพิษตามขอขยายที่ได้รับขึ้นทะเบียนให้วิเคราะห์เพิ่มเติมในดิน จำนวน  
๑๒ รายการ ตามเอกสารแนบท้ายหนังสือเปลี่ยนแปลงเอกสารอ้างอิงวิธีวิเคราะห์สารมลพิษเปลี่ยนแปลงสารมลพิษ  
ในดิน และเปลี่ยนแปลงบุคลากร ดังสิ่งที่ส่งมาด้วย

ลงชื่อ หนังสือ ....



อนึ่ง หนังสือฉบับนี้จะหมดอายุพร้อมหนังสือต่ออายุรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์  
เอกชนในวันที่ ๕ กรกฎาคม ๒๕๖๙

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ



(นายพริต กลั่นกรอง)

รองอธิบดี ปฏิบัติราชการแทน

อธิบดีกรมโรงงานอุตสาหกรรม

ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก

โทร. ๐ ๓๓๑๓ ๖๐๕๙ ต่อ ๕๐๐๑-๒

ไปรษณีย์อิเล็กทรอนิกส์ [airw@diw.mail.go.th](mailto:airw@diw.mail.go.th)





เอกสารแนบท้ายหนังสือเปลี่ยนแปลงเอกสารอ้างอิงวิธีวิเคราะห์สารมลพิษ

บริษัท อีสเทิร์น ไทย คอนซัลติ้ง ๑๙๙๒ จำกัด

เลขทะเบียน ๖-๐๐๓

ที่ ออก ๐๓๒๐/

ลงวันที่

ขอข่ายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๑๗๐ รายการ

น้ำเสีย จำนวน 47 รายการ

ลำดับ ที่	สารมลพิษ	วิธีวิเคราะห์
1	Aldrin	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(1)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
2	Arsenic	1) Continuous Hydride Generation/Atomic Absorption Spectrometric Method <sup>(1)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(1)</sup>
3	Barium	Digestion, Inductively Coupled Plasma Method <sup>(1)</sup>
4	$\alpha$ -BHC	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(1)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
5	$\beta$ -BHC	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(1)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
6	$\delta$ -BHC	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(1)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
7	$\gamma$ -BHC	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(1)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
8	Biochemical Oxygen Demand	1) 5-Day BOD Test, Membrane Electrode Method <sup>(1)</sup> 2) 5-Day BOD Test, Azide Modification Method <sup>(1)</sup>
9	Cadmium	Digestion, Inductively Coupled Plasma Method <sup>(1)</sup>
10	Chemical Oxygen Demand	Closed Reflux, Titrimetric Method <sup>(1)</sup>
11	cis-Chlordane	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(1)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>

ns-Chlordane ...

ลำดับ ที่	สารมลพิษ	วิธีวิเคราะห์
12	trans-Chlordane	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(1)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
13	Chromium	1) Digestion, Direct Air-Acetylene Flame Method <sup>(1)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(1)</sup>
14	Color	ADMI Weighted-Ordinate Spectrophotometric Method <sup>(1)</sup>
15	Copper	1) Digestion, Direct Air-Acetylene Flame Method <sup>(1)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(1)</sup>
16	Cyanide	Distillation, Colorimetric Method <sup>(1)</sup>
17	4,4'-DDD	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(1)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
18	4,4'-DDE	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(1)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
19	DDT	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
20	Dieldrin	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(1)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
21	Endosulfan I	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(1)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
22	Endosulfan II	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(1)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
23	Endosulfan sulfate	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(1)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
24	Endrin	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>

n aldehyde ...

ลำดับ ที่	สารมลพิษ	วิธีวิเคราะห์
25	Endrin aldehyde	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(1)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
26	Endrin ketone	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(1)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
27	Formaldehyde	Distillation, Colorimetric Method <sup>(4)</sup>
28	Free Chlorine	1) Iodometric Method <sup>(1)</sup> 2) Colorimetric Method <sup>(1)</sup>
29	Heptachlor	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(1)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
30	Heptachlor Epoxide	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(1)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
31	Hexavalent Chromium	Filtration, Colorimetric Method <sup>(1)</sup>
32	Lead	1) Digestion, Direct Air-Acetylene Flame Method <sup>(1)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(1)</sup>
33	Manganese	Digestion, Inductively Coupled Plasma Method <sup>(1)</sup>
34	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>(1)</sup>
35	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method <sup>(1)</sup>
36	Nickel	1) Digestion, Direct Air-Acetylene Flame Method <sup>(1)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(1)</sup>
37	Oil and Grease	Liquid-Liquid, Partition-Gravimetric Method <sup>(1)</sup>
38	pH	Electrometric Method <sup>(1)</sup>
39	Phenols	Distillation, Direct Photometric Method <sup>(1)</sup>
40	Selenium	Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>(1)</sup>

sulfide ...

ลำดับ ที่	สารมลพิษ	วิธีวิเคราะห์
41	Sulfide	ZnS Precipitation, Iodometric Method <sup>(1)</sup>
42	Temperature	Field Method <sup>(1)</sup>
43	Trivalent Chromium	1) Digestion, Direct Air-Acetylene Flame Method; Filtration, Colorimetric Method; Calculation <sup>(1)</sup> 2) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation <sup>(1)</sup>
44	Total Dissolved Solids	Dried at 180 °C <sup>(1)</sup>
45	Total Kjeldahl Nitrogen	Macro Kjeldahl Method <sup>(1)</sup>
46	Total Suspended Solids	Dried at 103-105 °C <sup>(1)</sup>
47	Zinc	Digestion, Inductively Coupled Plasma Method <sup>(1)</sup>

น้ำใต้ดิน จำนวน 111 รายการ

ลำดับ ที่	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
2	Acetone	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
3	Aldrin	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
4	Anthracene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
5	Antimony	Digestion, Inductively Coupled Plasma Method <sup>(1)</sup>
6	Arsenic	1) Continuous Hydride Generation/Atomic Absorption Spectrometric Method <sup>(1)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(1)</sup>
7	Barium	Digestion, Inductively Coupled Plasma Method <sup>(1)</sup>
8	Benz(a)anthracene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>

ลำดับ ที่	สารมลพิษ	วิธีวิเคราะห์
9	Benzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
10	Benzo(b)fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
11	Benzo(k)fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
12	Benzo(a)pyrene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
13	Benzo[g,h,i]perylene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
14	Beryllium	Digestion, Inductively Coupled Plasma Method <sup>(1)</sup>
15	Bis(2-chloroethyl)ether	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
16	Bis(2-ethylhexyl)phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
17	Bromodichloromethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
18	Bromoform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
19	Butanol	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
20	Butyl benzyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
21	Cadmium	Digestion, Inductively Coupled Plasma Method <sup>(1)</sup>
22	Carbazole	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
23	Carbon disulfide	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
24	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>

ลำดับ ที่	สารมลพิษ	วิธีวิเคราะห์
25	Chlordane	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
26	p-Chloroaniline	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
27	Chlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
28	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
29	Chloroform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
30	2-Chlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
31	Chromium	1) Digestion, Direct Air-Acetylene Flame Method <sup>(1)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(1)</sup>
32	Chromium (III)	1) Digestion, Direct Air-Acetylene Flame Method; Filtration, Colorimetric Method; Calculation <sup>(1)</sup> 2) Digestion, Inductively Coupled Plasma Method; Filtration, Colorimetric Method; Calculation <sup>(1)</sup>
33	Chromium (VI)	Filtration, Colorimetric Method <sup>(1)</sup>
34	Chrysene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
35	Cyanide	Distillation, Colorimetric Method <sup>(1)</sup>
36	DDD	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
37	DDE	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
38	DDT	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
39	Dibenz(a,h)anthracene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>

ลำดับ ที่	สารมลพิษ	วิธีวิเคราะห์
40	Di-n-butyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
41	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
42	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
43	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
44	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
45	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
46	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
47	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
48	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
49	2,4-Dichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
50	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
51	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
52	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
53	Diethyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
54	2,4-Dimethylphenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>

ลำดับ ที่	สารมลพิษ	วิธีวิเคราะห์
55	2,4-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
56	2,6-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
57	Di-n-octyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
58	Endosulfan	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
59	Endrin	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
60	Ethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
61	Fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
62	Fluorene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
63	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
64	Heptachlor epoxide	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
65	Hexachlorobenzene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
66	Hexachloro-1,3-butadiene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
67	n-Hexane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
68	$\alpha$ -HCH	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
69	$\beta$ -HCH	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>


 γ-HCH ...



ลำดับ ที่	สารมลพิษ	วิธีวิเคราะห์
70	$\gamma$ -HCH	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
71	Hexachlorocyclopentadiene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
72	Hexachloroethane	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
73	Indeno(1,2,3-cd)pyrene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
74	Isophorone	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
75	Lead	1) Digestion, Direct Air-Acetylene Flame Method <sup>(1)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(1)</sup>
76	Manganese	Digestion, Inductively Coupled Plasma Method <sup>(1)</sup>
77	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>(1)</sup>
78	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
79	Methylene chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
80	2-Methylphenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
81	2-Methylnaphthalene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
82	Methyl tert-butyl ether	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
83	Naphthalene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>
84	Nickel	Digestion, Inductively Coupled Plasma Method <sup>(1)</sup>
85	Nitrobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(1)</sup>

86 N-Nitrosodi-n-propylamine ...

ลำดับ ที่	สารมลพิษ	วิธีวิเคราะห์
86	N-Nitrosodi-n-propylamine	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[1]</sup>
87	pH	Electrometric Method <sup>[4]</sup>
88	Phenanthrene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[4]</sup>
89	Phenol	1) Distillation, Direct Photometric Method <sup>[4]</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[4]</sup>
90	Pyrene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[4]</sup>
91	Selenium	Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>[4]</sup>
92	Silver	Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>
93	Styrene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[4]</sup>
94	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[4]</sup>
95	Trichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[4]</sup>
96	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[4]</sup>
97	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[4]</sup>
98	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[4]</sup>
99	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[4]</sup>
100	Toluene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[4]</sup>
101	2,4,5-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[4]</sup>

ลำดับ ที่	สารมลพิษ	วิธีวิเคราะห์
102	2,4,6-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[4]</sup>
103	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[4]</sup>
104	Vanadium	Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>
105	Vinyl acetate	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[4]</sup>
106	Vinyl chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[4]</sup>
107	m-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[4]</sup>
108	o-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[4]</sup>
109	p-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[4]</sup>
110	Xylene (Total)	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>[4]</sup>
111	Zinc	Digestion, Inductively Coupled Plasma Method <sup>[4]</sup>

ดิน จำนวน 12 รายการ

ลำดับ ที่	สารมลพิษ	วิธีวิเคราะห์
1	$\alpha$ -HCH	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>
2	$\beta$ -HCH	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>
3	$\gamma$ -HCH	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>
4	Heptachlor	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>

ลำดับ ที่	สารมลพิษ	วิธีวิเคราะห์
5	Aldrin	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>
6	Heptachlor epoxide	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>
7	Chlordane	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>
8	Dieldrin	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>
9	Endrin	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>
10	DDD	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>
11	DDT	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>
12	Methoxychlor	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[2,3]</sup>

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2. United States Environment Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. **Ultrasonic Extraction. SW-846 Method 3550C**, 2007
3. United States Environment Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. **Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry. SW-846 Method 8270E**, 2018
4. สมาคมวิศวกรรมสิ่งแวดล้อมแห่งประเทศไทย. คู่มือวิเคราะห์น้ำเสีย. พิมพ์ครั้งที่ 4. กรุงเทพฯ: เรือนแก้วการพิมพ์, 2547.

เอกสารสอบเทียบอุปกรณ์เครื่องมือห้องปฏิบัติการ  
บริษัท อีสเทิร์นไทยคอนกรีตตั้ง 1992 จำกัด

**ANALYTICAL BALANCE (DU)**

**Model : XS205DU**

**Serial No. : 1126323724**



Certificate No. :

23-148799

Sample Code :

23-56200-001

Page 1 of 4

## CERTIFICATE OF CALIBRATION

Customer

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

Location of Calibration

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

Equipment

: ELECTRONIC BALANCE

Manufacturer

: METTLER TOLEDO

Model

: XS205DU

Serial No.

: 1126323724

ID No.

: LABE 05/1

Date of Receipt

: 22 December 2023

Date of Calibration

: 22 December 2023

Calibrated by

Mr. Somwang Sangdee  
Scientist

Approved by

(Mr. Somchai Neamratt)

Issue date

25 December 2023

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

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

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Board (TLAB) to the Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC). The measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement of the international system of units (SI) are confirmed by the TLAB. This certificate may not be reproduced other than in full except with the prior written approval of the Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

361 Soi Ladprao 122, Ladprao Road,

Phlabphla, Wang Thonglang, Bangkok 10310

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FAX 02-516-6949

REV 05

CONTACT@AMARC.CO.TH

WWW.AMARC.CO.TH

Effective date: 15/10/21



Page 2 of 4

## 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 checked="" type="checkbox"/> Before adjustment	<input checked="" type="checkbox"/> After adjustment
<input type="checkbox"/> No adjustment	Nominal value	40 80 40 80	
<input checked="" type="checkbox"/> Adjustment	Standard weight	40.000054 80.000048 40.000054 80.000048	
	Average reading of indicator	40.000026 80.000037 40.000017 80.000017	
	Standard deviation	0.000015 0.000016 0.000008 0.000009	
Unit : g	Range : 200	<input checked="" type="checkbox"/> Before adjustment	<input checked="" type="checkbox"/> After adjustment
<input type="checkbox"/> No adjustment	Nominal value	100 200 100 200	
<input checked="" type="checkbox"/> Adjustment	Standard weight	100.000042 200.000041 100.000042 200.000041	
	Average reading of indicator		
	Standard deviation		

361 Soi Ladprao 122, Ladprao Road,

Phlabphla, Wang Thonglang, Bangkok 10310

TEL

FAX

AMARC.CO.TH

AMARC.CO.TH

Date: 15/10/21





**ATOMIC ABSORPTION SPECTROPHOTOMETER**


**Model : PinAAcle 900F**

**Serial No. : PFBS22080801**

PinAAcle 900F Preventive Maintenance (PM)

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

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



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

**General Instructions:**  
The customer must provide the engineer operational data to demonstrate recent instrument performance prior to starting the PM.  
Always check with the customer before making any changes that may affect the customer's analysis or calibration, including a current back-up of system software and/or data files.  
The completed document should be signed by an authorized PerkinElmer and customer representative and left with the customer.  
Update the PM sticker and instrument logbook as required.

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Component List

Component / Specific Model	Serial #	Configuration Notes
FIAS100		

Parts Lists

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

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

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

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

## Procedure Checklist

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

### 1. General:

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

### 2. PC Instrument Software:

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

### 3. Mechanical:

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

### 4. Electrical:

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

### 5. Optics:

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

### 6. Gasses:

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

7. Flame Interlock Check:

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

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

8. After PM Performance tests:

8.1 Detector Linearity with Barium

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

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

8.2 Baseline Noise at 1.0 Absorbance with Barium

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

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

8.3 AA Baseline Noise with Copper

Description: Check baseline noise.

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

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

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

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

8.5 AA-BG Baseline Noise with Copper

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

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

8.6 AA-BG Baseline Noise with Arsenic

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

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

8.7 Flame Sensitivity

Description: Instrument Sensitivity checked against Copper standard.

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

10. Review:

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

Additional Comments

Additional Comments Regarding the PM

Review

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

## **BAROMETER**

**Equipment : Analog Barometer**

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

# CALIBRATION CERTIFICATE



Certificate No. : L202405022-0013  
 Date Issued : 08-May-24

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

**Equipment** : Analog Barometer

**Manufacturer** : Barigo  
**Model** : -  
**Serial No.** : -  
**ID No./Tag No.** : BM001/41  
**Date Received** : 03-May-24  
**Date Calibrated** : 06-May-24

**Calibrated by** : Mr. Saruth Srirachikul

**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: *Saroyuth T.*  
 (Mr. Sarayuth Toehua)



Certificate No : L202405022-0013  
 Environment Ambient Temperature : (25 ± 2)°C  
 Relative Humidity : (50 ± 15)%RH

STD Reading	UUC Reading (mbar)	UUC Reading (mbar)	UUC Error	Uncertainty	MPE	Pass / Fail
mbar	Before Adjusted	After Adjusted	mbar	± mbar	± mbar	with Guard Band
990.00	990	-	0.00	0.59	10.3	Pass
1000.00	1000	-	0.00	0.59	10.3	Pass
1010.00	1010	-	0.00	0.59	10.3	Pass
1020.00	1020	-	0.00	0.59	10.3	Pass
1030.00	1030	-	0.00	0.59	10.3	Pass

**STD = Standard** Pass =  $|\text{error}| + |\text{uncertainty}| \leq |\text{MPE}|$   
 UUC = Unit Under Calibration Fail =  $|\text{error}| + |\text{uncertainty}| > |\text{MPE}|$   
 MPE = Maximum Permissible Error  
 Calibrated condition : Pressure Medium Air : Density = 1.19 kg/m³ @ 20°C, 1 bar  
 Mounting Position Vertical  
 Reference Level at center of its dial  
 Conversion Factor Multiply by 1.0 E+02 - Pa unit

**Description of UUC :**  
 Range 950 - 1080 mbar Absolute  
 Calibration Range 990 - 1030 mbar Absolute  
 Scale Interval 1 mbar

Condition As-Received : Used Item  
 The measurement results and statements of conformity with specification only relate to the item calibrated.  
**Measurement Standards Used & Traceability :**  
 The International System of Units (SI) through  
 iRPC Certificate No. CL1-P230097 for Reference Pressure Monitor Serial No. 1598, Due 09-Nov-24

End of Certificate

**CERTIFICATE OF ANALYSIS**

**EPA PROTOCOL GAS**

**Cylinder No. : EB0145030**



## CERTIFICATE OF ANALYSIS

### Grade of Product: EPA Protocol

Part Number: E03NI99E15AC0U4  
Cylinder Number: EB0145030  
Laboratory: 124 - Plumsteadville - PA  
PGVP Number: A12021  
Gas Code: CH4,PPN,BALN  
Reference Number: 160-40224242-1  
Cylinder Volume: 144.4 CF  
Cylinder Pressure: 2015 PSIG  
Valve Outlet: 350  
Expiration Date: Oct 15, 2021

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 800/R-12/001, 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.

DO NOT USE THIS CYLINDER BELOW 100 PSI, i.e. 0.7 megapascals.

ANALYTICAL RESULTS				
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
METHANE	180.0 PPM	177.0 PPM	G1	+/- 1.0% NIST Traceable
PROPANE	185.0 PPM	187.0 PPM	G1	+/- 1.0% NIST Traceable
NITROGEN	Balance			
CALIBRATION STANDARDS				
Type	Lot ID	Cylinder No	Concentration	Expiration Date
NTRM	08011503	K002564	246.7 PPM METHANE/AIR	May 15, 2025
NTRM	200602-06	6162860Y	243.3 PPM PROPANE/AIR	Mar 17, 2027
ANALYTICAL EQUIPMENT				
Instrument/Make/Model	Analytical Principle			
Nicolet IS50 FTIR AUP2110295 CH4	FTIR			
Nicolet IS50 FTIR AUP2110295 C3H8	FTIR			
Last Multipoint Calibration				
				Oct 13, 2021
				Oct 14, 2021

#### Triad Data Available Upon Request

#### NOTES:

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



*Michael A. Hudes*

Approved for Release

**CERTIFICATE OF ANALYSIS**

**EPA PROTOCOL GAS**

**Cylinder No. : EB0062815**

# CERTIFICATE OF ANALYSIS

## Grade of Product: EPA Protocol

Part Number: E04NI9E15ACX9C 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	2488 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		
Nicolet 6700 APW1100391 CO			FTIR		
Nicolet 6700 APW1100391 NO			FTIR		
Nicolet 6700 APW1100391 NO2			FTIR		
Nicolet 6700 APW1100391 SO2			FTIR		
			Last Multipoint Calibration		
			Feb 08, 2018		
			Feb 15, 2018		
			Feb 16, 2018		
			Mar 01, 2018		

### Triad Data Available Upon Request

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

This calibration std. has been certified in accordance with the May 2012 EPA Traceability Protocol, Document EPA-600/R-12/531. All testing processes and measurements conform to the requirements of ISO/IEC 17025 and to Airgas ISO 9001:2000 and relate only to items identified on this certificate. All 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 Morris*  
Approved for Release

401135335-1

**DRY GAS METER XC-572-OV**

**Serial No. : A2204323**

## 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

Cal. Date : 22-May-24  
 Due Date : 22-May-25  
 Cal. Report No : WDS-SV6704018  
 Ambient Temp (°C) : 25  
 Pressure (mm Hg) : 758  
 Relative Humidity (%) : 80

## Factors/Conversion

Std Temp (°K) : 298  
 Std. Pressure (mm Hg) : 760  
 $K_1$  (K/mm Hg) : 0.3857

## Reference Equipment

WTM Model: W-NKoDa-5B WTM Cal. Due Date : Dec. 2024  
 WTM Serial: 600245 Gamma : 1.0000

## UUT Meter (DGM)

Run Time (minutes)	DGM Orifice (mm H <sub>2</sub> O)	Volume		Outlet Temp		Volume		Outlet Temp	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final
$\theta$	$P_{m(g)}$	$V_{m(i)}$	$V_{m(f)}$	$t_{m(i)}$	$t_{m(f)}$	$V_{w(i)}$	$V_{w(f)}$	$t_{w(i)}$	$t_{w(f)}$
15.00	13.0	194.6567	194.8274	26	27	61.39400	61.56423	28	27
10.00	25.0	195.0941	195.2514	28	28	61.82541	61.98088	29	28
8.00	50.0	195.2786	195.4572	28	28	62.00769	62.18342	28	27
7.00	80.0	195.4877	195.6846	28	29	62.21353	62.40748	28	27
5.00	120.0	195.7085	195.8796	29	29	62.43108	62.60020	26	27

## Standardized Data

Test Meter		Reference Meter		Correction Factor		Flow Rate		$\Delta H @$ (mm H <sub>2</sub> O)	
Std. Volume	Std. Flow Rate	Std. Volume	Std. Flow Rate	"Gamma"	Variation	Std & Corr	0.0212 SCMM	Variation	
$V_{m(std)}$ (m <sup>3</sup> )	$Q_{m(std)}$ m <sup>3</sup> /min	$V_{w(std)}$ (m <sup>3</sup> )	$Q_{w(std)}$ m <sup>3</sup> /min	(Y)	(ΔY)	$Q_{m(stdcorr)}$	$\Delta H_{sc}$	$\Delta \Delta H_{sc}$	
0.167	0.011	0.166	0.011	0.994	0.008	0.011	47.022	-1.348	
0.153	0.015	0.151	0.015	0.986	0.000	0.015	48.311	-0.059	
0.174	0.022	0.171	0.021	0.981	-0.005	0.021	48.458	0.089	
0.192	0.027	0.189	0.027	0.981	-0.004	0.027	48.869	0.499	
0.167	0.033	0.165	0.033	0.986	0.000	0.033	49.189		

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 of individual values from the average is ±0.02

Note: For  $\Delta H_{sc}$ , orifice pressure differential that equates to 0.75cfm (0.0212m<sup>3</sup>/min) at standard temperature and pressure, acceptable tolerance of individual values from the average is ±0.2inches (5.1mm)

Approved By: \_\_\_\_\_

( Patpasu Chaisana )  
 Service Manager

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 WISDOM SCIENCE SALE AND SERVICE GROUP COMPANY LIMITED

Date: 22-May-

## Certificate of Calibration - Supplemental

METHOD 5 PRE-TEST CONSOLE CALIBRATION

## Nomenclature

$P_b$  - Barometric Pressure  
 DGM - Dry Gas Meter  
 $K_1$  - Constant based on standard temp and press  
 $\theta$  - Run time, in minutes  
 $P_m$  -  $\Delta H$  (Meter Pressure, gauge)  
 $V_m$  - Volume collected by test meter, corrected for STP  
 $Q_{m(std)}$  - Calculated flow rate of test meter  
 $K'$  - Critical orifice coefficient  
 $P_w$  - Measured pressure of reference meter  
 $t_w$  - Temperature measured in reference meter  
 $t_m$  - Temperature measured in test meter  
 $Y$  - Ratio of volume collected from test meter and orifice  
 $sc$  - Scaling Factor  
 $Counts_{std}$  - Number of pulse counts, standardized  
 $Counts_{raw}$  - Number of raw pulse counts of a calibration run

## Equations

$$V_{w(std)} = Y * K_1 \frac{V_w * (P_{bar} + \frac{P_{m(w)}}{13.6})}{T_w}$$

$$V_{m(std)} = Counts_{std} * Y_{sc(avg)}$$

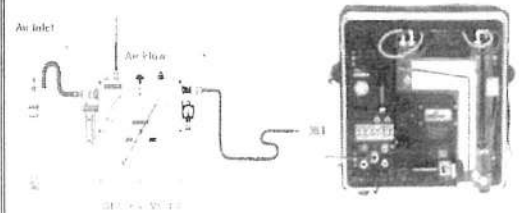
$$Counts_{std} = K_1' * Counts_{raw} * (P_{bar} + \frac{P_{m(w)}}{13.6})$$

$$Q_{m(std)} = \frac{V_{m(std)}}{\theta}$$

$$K_1' = \frac{T_w}{P_{std}}$$

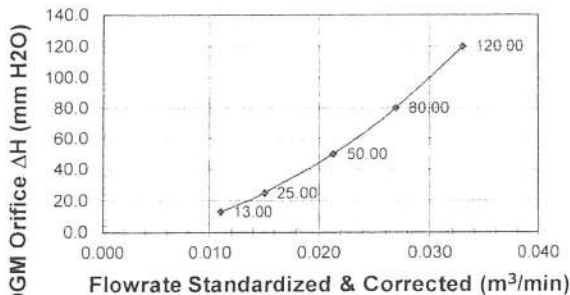
$$Y_{sc} = \frac{P_{m(w)} + 0.0011696 * (P_{m(w)} + \frac{P_{m(w)}}{13.6})}{P_{std}}$$

## Calibration Train



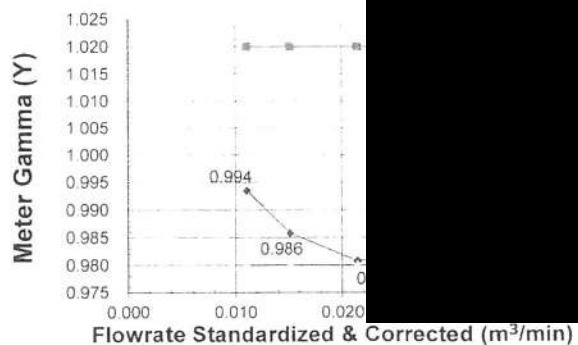
## Calibration Graphs

Meter Pressure vs Flowrate



Console Serial: A2204323 Console Model: XC-572-

Meter Gamma vs Flowrate



Console Serial: A2204323 Console Model: XC-572-OV



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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	JC05630

Calibration Conditions

Cal Date	22-May-24
Due Date	22-May-25
Cal Report No	WDS-SV6704018
Ambient Temp (°C)	25
Pressure (mm Hg)	759
Humidity (%)	60

Reference Equipment

Temp Meter Model	Fuke 714B
Serial No	60590035
Cal Date	07-Apr-24
Temp Meter Model	Fuke 179
Serial No	58620112
Cal Date	06-Feb-24

Temperature Sensor Calibration

Reference Point	Ref Thermometer Temperature °C	Thermocouple Display Temperature °C	Temperature Difference °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	150.0	-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	593.0	0.0
9	815.0	815.0	1.0
10	1038.0	1038.0	0.0
Maximum			1.0

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

PASS

DGM Out Temperature Sensor Calibration

Temperature point	Ref Thermometer Temperature °C	Thermocouple Display Temperature °C	Temperature Difference °C
#			
Ice	0.0	1.0	-1.0
Ambient	27.5	27.0	0.5
Heat	108.6	109.0	-0.4
Difference Rang			
Temp. Difference	$\pm 2^{\circ}\text{F}$ or $\pm 1.1^{\circ}\text{C}$		PASS

Note

The temperatures of the thermocouple and reference thermometers shall agree to within  $\pm 2^{\circ}\text{F}$  (EPA Method 5, section 10.5)

Approved By :

*Paulin*

( Palbasu Chaisana )

Service Manager

**WISDOM SCIENCE**

WISDOM SCIENCE SALE AND SERVICE GROUP CO., LTD.

**DRY GAS METER XC-572-V**

**Serial No. : 1110070**





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## Certificate Of Calibration

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

### Meter Console Information

Console Model : XC-572-V  
Console serial : 1110070  
DGM Model #: SK25EX  
DGM Serial #: 00006432

### Calibration Condition

Cal. Date: 28-Jun-24  
Due Date: 28-Jun-25  
Cal. Report No.: WDS-SV6706007  
Ambient Temp (°C): 25  
Pressure (mm Hg): 758  
Relative Humidity (%): 60

### Factors/Conversion

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

### Reference Equipment

WTM Model: W-NKoDa-5B WTM Cal. Due Date: Dec. 2024  
WTM Serial: 600245 Gamma: 1.0000

### UUT Meter (DGM)

Run Time (minutes)	DGM Orifice (mm H <sub>2</sub> O)	Volume		Outlet Temp		Volume		Outlet Temp	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final
a	P <sub>msl</sub>	V <sub>mi</sub>	V <sub>mf</sub>	t <sub>mi</sub>	t <sub>mf</sub>	V <sub>mi</sub>	V <sub>mf</sub>	t <sub>mi</sub>	t <sub>mf</sub>
15.00	13.0	239.7603	239.9212	27	27	63.63889	63.79843	27	27
10.00	25.0	239.9406	240.0979	27	27	63.81777	63.97353	27	27
8.00	50.0	240.1147	240.2952	27	28	63.99028	64.16968	26	26
7.00	80.0	240.3308	240.5352	28	28	64.20536	64.40956	26	26
5.00	120.0	240.5641	240.7422	29	29	64.43852	64.61730	26	26

### Reference Meter (WTM)

### Standardized Data

Test Meter		Reference Meter		Correction Factor		Flow Rate		ΔH@ (mm H <sub>2</sub> O)
Std. Volume	Std. Flow Rate	Std. Volume	Std. Flow Rate	"Gamma"	Variation	Std & Corr	0.0212 SCMM	Variation
V <sub>m(std)</sub> (m <sup>3</sup> )	Q <sub>m(std)</sub> m <sup>3</sup> /min	V <sub>r(std)</sub> (m <sup>3</sup> )	Q <sub>r(std)</sub> m <sup>3</sup> /min	(Y)	(ΔY)	Q <sub>m(std/corr)</sub>	ΔH <sub>g</sub>	ΔΔH <sub>g</sub>
0.157	0.010	0.155	0.010	0.991	-0.003	0.010	53.303	6.250
0.154	0.015	0.152	0.015	0.989	-0.005	0.015	47.880	0.807
0.176	0.022	0.175	0.022	0.993	-0.001	0.022	46.233	-0.820
0.200	0.029	0.199	0.028	0.997	0.003	0.028	43.895	-3.158
0.174	0.035	0.175	0.035	1.001	0.007	0.035	43.973	-3.04

### Calibration Results

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 of individual values from the average is ±0.02.

Note: For ΔH<sub>g</sub>, orifice pressure differential that equates to 0.75cfm (0.0212m<sup>3</sup>/min) at standard temperature and pressure. Acceptable tolerance of individual values from the average is ±0.2inches (5.1mm) H<sub>2</sub>O.

Approved By:

*Patpasu Chaisana*  
(Patpasu Chaisana)  
Service Manager

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WISDOM SCIENCE SALE AND SERVICE GROUP COMPANY LIMITED

Date: 28-Jun-24

## Certificate of Calibration - Supplemental

METHOD 5 PRE-TEST CONSOLE CALIBRATION

### Nomenclature

P<sub>b</sub> - Barometric Pressure  
DGM - Dry Gas Meter  
K<sub>1</sub> - Constant based on standard temp and press  
θ - Run time, in minutes  
P<sub>m</sub> - ΔH (Meter Pressure, gauge)  
V<sub>m</sub> - Volume collected by test meter, corrected for STP  
Q<sub>m(std)</sub> - Calculated flow rate of test meter  
K' - Critical orifice coefficient  
P<sub>w</sub> - Measured pressure of reference meter  
t<sub>w</sub> - Temperature measured in reference meter  
t<sub>m</sub> - Temperature measured in test meter  
Y - Ratio of volume collected from test meter and orifice  
sc - Scaling Factor  
Counts<sub>std</sub> - Number of pulse counts, standardized  
Counts<sub>raw</sub> - Number of raw pulse counts of a calibration run

### Equations

$$V_{m(std)} = Y * K_1 \frac{V_{sc} * (P_{bar} + \frac{P_{m(std)}}{13.6})}{T_{sc}}$$

$$V_{m(std)} = Counts_{std} * Y_{sc(avg)}$$

$$Counts_{std} = K_1 \frac{Q_{total} * (P_{bar} + \frac{P_{m(std)}}{13.6})}{T_{m}}$$

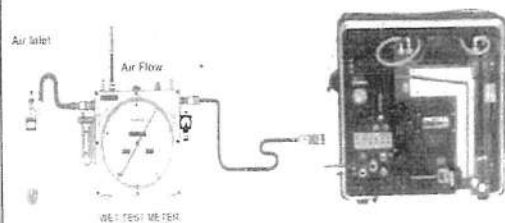
$$Q_{m(std)} = \frac{V_{m(std)}}{t}$$

$$K_1 = \frac{T_{std}}{P_{std}}$$

$$Y = \frac{V_{m(std)}}{V_{sc(std)}}$$

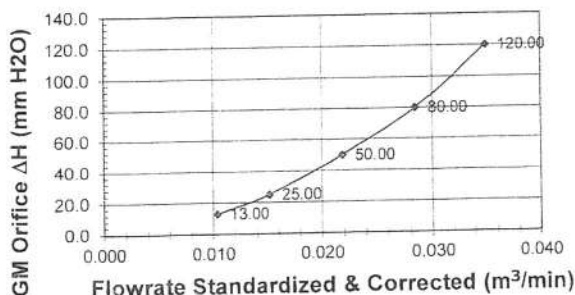
$$Metric \Delta H = \frac{P_{m(std)} - 0.00116 * (P_{m(std)} + \frac{P_{m(std)}}{13.6})}{T_{sc}} * \left( \frac{T_{sc} + \theta}{T_{sc} + P_{sc}} \right)$$

### Calibration Train



### Calibration Graphs

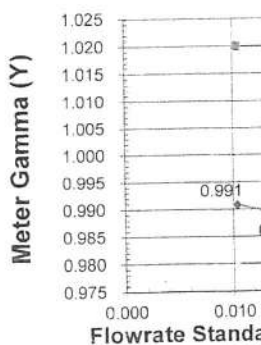
#### Meter Pressure vs Flowrate



Console Serial: 1110070

Console Model: XC-572-V

#### Meter Gamma vs Flowrate



Console Serial: 1110070



**TEMPERATURE DISPLAY CALIBRATION**

**Meter Console Information**

Console Model: XC-572-V  
Console serial: 1110070  
Temp Indicator Model: ID-85  
Temp Indicator Serial:

**Calibration Conditions**

Cal Date: 28-Jun-24  
Due Date: 28-Jun-25  
Cal Report No: WDS-SV6706007  
Ambient Temp (°C): 25  
Pressure (mm Hg): 758  
Humidity (%): 60

**Reference Equipment**

Temp Meter Model: Fluke 714B  
Serial No: 60590035  
Cal Date: 07-Apr-24  
Temp Meter Model: Fluke 179  
Serial No: 56620112  
Cal Date: 06-Feb-24

**Temperature Sensor Calibration**

Reference Point	Ref Thermometer Temperature °C	Thermocouple Display Temperature °C	Temperature Difference °C
#	°C	°C	°C
1	-18.0	-17.0	1.0
2	38.0	39.0	-1.0
3	93.0	94.0	-1.0
4	149.0	150.0	-1.0
5	260.0	261.0	-1.0
6	371.0	372.0	-1.0
7	482.0	483.0	-1.0
8	593.0	593.0	0.0
9	816.0	815.0	1.0
10	1038.0	1038.0	0.0
Maximum *			1.0

**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

PASS

**DGM Out Temperature Sensor Calibration**

Temperature point	Ref Thermometer Temperature °C	Thermocouple Display Temperature °C	Temperature Difference °C
#	°C	°C	°C
Ice	1.0	2.0	-1.0
Ambient	24.2	25.0	-0.8
Heat	110.5	111.0	-0.5
<b>Difference Range</b>			
Temp. Difference	$\pm 2^{\circ}\text{F}$ or $\pm 1.1^{\circ}\text{C}$		

**Note**

The temperatures of the thermocouple and reference thermometers shall agree to within  $\pm 2^{\circ}\text{F}$  (EPA Method 5, section 10.5)

PASS

Approved By :

*Patrasa*  
( Patpasu Chaisana )  
Service Manager

**WISDOM SCIENCE**

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

**Serial No. : 1007055**

## Certificate Of Calibration

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

## Meter Console Information

Console Model: MC-572-V  
 Console serial: 1007055  
 DGM Model #: SK25EX  
 DGM Serial #: 0009799

## Calibration Condition

Cal. Date: 04-Aug-24  
 Due Date: 04-Aug-25  
 Cal. Report No.: WDS-SV6707001  
 Ambient Temp (°C): 25  
 Pressure (mm Hg): 758  
 Relative Humidity (%): 60

## Factors/Conversion

Std. Temp (°K): 298  
 Std. Pressure (mm Hg): 750  
 $K_1$  (K/mm Hg): 0.3857

## Reference Equipment

WTM Model: W-NKoDa-5B WTM Cal. Due Date: Dec. 2024  
 WTM Serial: 600245 Gamma: 1.0000

## UUT Meter (DGM)

Run Time (minutes)	DGM Orifice (mm H <sub>2</sub> O)	Volume		Outlet Temp		Volume		Outlet Temp	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final
15.00	13.0	107.7550	107.9221	29	30	68.41024	68.57350	28	27
10.00	25.0	107.9308	108.0876	30	30	68.58202	68.73488	27	27
8.00	50.0	108.1027	108.2822	30	30	68.74958	68.92516	27	27
7.00	80.0	108.3029	108.5061	30	30	68.94550	69.14488	27	27
5.00	120.0	108.5139	108.6908	30	30	69.15251	69.32550	27	27

## Reference Meter (WTM)


## Standardized Data

Test Meter		Reference Meter		Correction Factor		Flow Rate		ΔH@ (mm H <sub>2</sub> O)	
Std. Volume	Std. Flow Rate	Std. Volume	Std. Flow Rate	"Gamma"	Variation	Std & Corr	0.0212 SCMM	Variation	
$V_{m(std)}$ (m <sup>3</sup> )	$Q_{m(std)}$ m <sup>3</sup> /min	$V_{r(std)}$ (m <sup>3</sup> )	$Q_{r(std)}$ m <sup>3</sup> /min	(Y)	(ΔY)	$Q_{m(std)corr}$	$\Delta H_{std}$	$\Delta \Delta H_{std}$	
0.162	0.011	0.159	0.011	0.982	0.000	0.011	50.751	2.535	
0.152	0.015	0.149	0.015	0.982	0.001	0.015	49.300	1.084	
0.174	0.022	0.171	0.021	0.983	0.002	0.021	48.061	-0.155	
0.197	0.028	0.194	0.028	0.983	0.002	0.028	45.922		
0.173	0.035	0.169	0.034	0.976	-0.005	0.034	47.046		
				0.981	= Y Avg		48.216		

Note: 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 ±0.02

Note: For ΔH<sub>std</sub>, orifice pressure differential that equates to 0.75cfm (0.0212m<sup>3</sup>/min) at standard temperature and pressure, acceptable tolerance of individual values from the average is ±0.2inches (5.1mm)

Approved By:



(Patpasu Chaisana)  
 Service Manager

Date: 04-Aug

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 WISDOM SCIENCE SALE AND SERVICE GROUP COMPANY LIMITED

## Certificate of Calibration - Supplemental

METHOD 5 PRE-TEST CONSOLE CALIBRATION

## Nomenclature

## Equations

## Calibration Train

$P_b$  - Barometric Pressure  
 $P_{dgm}$  - Dry Gas Meter  
 $K_1$  - Constant based on standard temp and press  
 $t$  - Run time, in minutes  
 $P_m$  - ΔH (Meter Pressure, gauge)  
 $V_m$  - Volume collected by test meter, corrected for STP  
 $Q_{m(std)}$  - Calculated flow rate of test meter  
 $K'$  - Critical orifice coefficient  
 $P_w$  - Measured pressure of reference meter  
 $t_w$  - Temperature measured in reference meter  
 $t_m$  - Temperature measured in test meter  
 $Y$  - Ratio of volume collected from test meter and orifice  
 $sc$  - Scaling Factor  
 $Counts_{std}$  - Number of pulse counts, standardized  
 $C_{total}$  - Number of raw pulse counts of a calibration run

$$V_{m(std)} = Y * K_1 \frac{V_w * (P_{bw} + \frac{P_w}{1.133})}{T_w}$$

$$V_{m(std)} = Counts_{std} * Y_{sc(arq)}$$

$$Counts_{std} = K_1 \frac{C_{total} * (P_{bw} - \frac{P_w}{1.133})}{T_m}$$

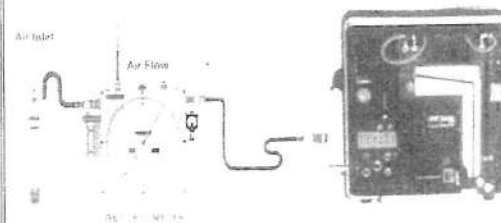
$$Q_{w(std)} = \frac{V_{w(std)}}{t}$$

$$Y_{sc} = \frac{V_{m(std)}}{Counts_{std} * sc}$$

$$K_1 = \frac{T_{std}}{P_{std}}$$

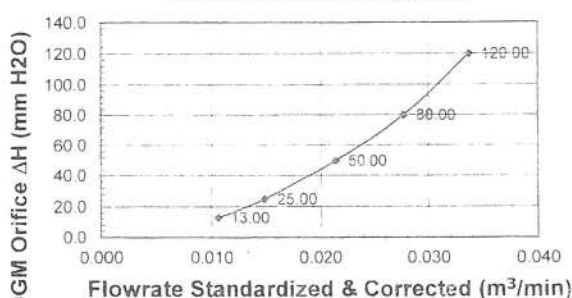
$$Y^* = \frac{V_{m(std)}}{V_{r(std)}}$$

$$Y_{std} = \frac{P_{std} * (1 - \frac{P_{std}}{P_b}) * (1 - \frac{P_{std}}{P_b})}{P_{std} * (1 - \frac{P_{std}}{P_b}) * (1 - \frac{P_{std}}{P_b})} * \left( \frac{1 - \frac{P_{std}}{P_b}}{1 - \frac{P_{std}}{P_b}} \right)$$



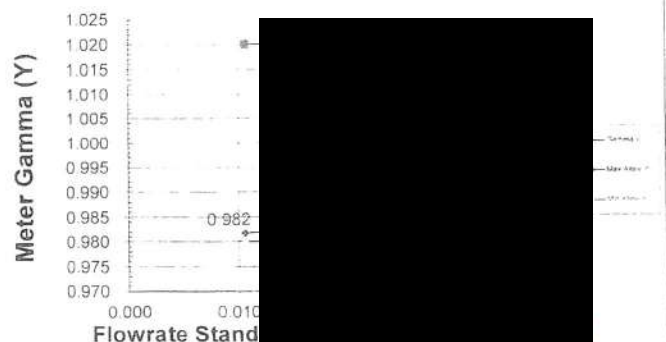
## Calibration Graphs

## Meter Pressure vs Flowrate



Console Serial: 1007055 Console Model: MC-

## Meter Gamma vs Flowrate





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TEMPERATURE DISPLAY CALIBRATION

Meter Console Information

Console Model	MC-572-V
Console serial	1007055
Temp Indicator Model	765-KF
Temp Indicator Serial	JC17852

Calibration Conditions

Cal Date	04-Aug-24
Due Date	04-Aug-25
Cal. Report No	WDS-SV6707001
Ambient Temp (°C)	25
Pressure (mm Hg)	758
Humidity (%)	60

Reference Equipment

Temp Meter Model	Fluke 714B
Serial No	60590035
Cal. Date	07-Apr-24
Temp Meter Model	Fluke 179
Serial No	58620112
Cal. Date	06-Feb-24

Temperature Sensor Calibration

Reference Point	Ref Thermometer Temperature °C	Thermocouple Display Temperature °C	Temperature Difference °C
#			
1	-18.0	-18.0	0.0
2	38.0	38.0	0.0
3	93.0	94.0	-1.0
4	149.0	149.0	0.0
5	260.0	261.0	-1.0
6	371.0	372.0	-1.0
7	482.0	482.0	0.0
8	593.0	593.0	0.0
9	816.0	816.0	0.0
10	1038.0	1038.0	0.0
Maximum			1.0

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

PASS

DGM Out Temperature Sensor Calibration

Temperature point	Ref Thermometer Temperature °C	Thermocouple Display Temperature °C	Temperature Difference °C
#			
Ice	0.0	0.0	0.0
Ambient	26.9	27.0	-0.1
Heat	114.5	115.0	-0.5

Difference Range

Temp. Difference  $\pm 2^{\circ}\text{F}$  or  $\pm 1^{\circ}\text{C}$

PASS

Note

The temperatures of the thermocouple and reference thermometers shall agree to within  $\pm 2^{\circ}\text{F}$  (EPA Method 5, section 10.5)

Approved By :

*Paipasu Chaisana*

( Paipasu Chaisana )

Service Manager



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**Flue gas Analyzer**

**Testo 350XL**

**Serial No. 01794619/002**



# Calibration Certificate

ENTECH  
Difference For Greater Value

Certificate No.: G 670415  
Date of issue : 25-Jun-24

Instrument description : Flue Gas Analyzer  
Instrument model : Testo 350XL  
Control unit serial no. : 01794619/002  
Instrument serial no. : 01807527/002  
ID no. or control no. :  
Manufacturer : Testo SE & Co. KGaA  
Probe description :  
Probe model :  
Probe serial no. :  
Customer name : Eastern Thai Consulting 1992 Company Limited  
Customer address : 683 Moo 11, Sukhaphibarn 8 Road, Nongkham, Si Racha, Chon Buri 20280

Total pages of certificate : 2 Pages  
Receiving no. : L-242269  
Receiving date. : 19-Jun-24  
Parameter of calibration : Gas Calibration(Oxygen 2.50,10.04,21.02 %vol, Carbon Monoxide 80.18,302,1001 ppm, Nitrogen Dioxide 30.34,81.32, 201.9 ppm, Nitric Oxide 30.01, 151.5, 322.5 ppm, Sulphur Dioxide 50.36, 100.8, 600.8 ppm)

Condition of UUC. : Used  
Ambient condition : All of the Measurement were carried out the stabilized laboratory  
Temperature : 23 ±5 °C  
Humidity : 55 ± 15 %RH

Calibration place : 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 Instruction no. WI-CL-28-C

The calibration certificate expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by coverage factor  $k=2$ , which for a normal distribution corresponds to a coverage probability of approximately 95%.

This certificate is applied only to item under test Environmental condition.

This Calibration Certificate may not be reproduced other than in full except with the permission of the issuing laboratory.

Calibration certificates without signature and seal not valid and The results relate only to the items tested/calibrated.

This calibration certificate documents are traceability to national standards, which realize measurement according to the International System of Units (SI).

Date of calibration : 24-Jun-24

*Kwanchai K.*  
Mr. Kwanchai Khamdoung  
Calibration Technician

*9090*  
Mrs. Nongjue  
Technical



# Calibration Certificate

Certificate No.: G 670415

Standard References (Table 1)

Standard	Certificate No.	Vendor	Due date
Oxygen ( O2 ) 2.50 % Vol	2412/23	Linde	27-Aug-27
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 ) 80.18 ppm	CG-0002-24	Nimt	11-Jan-29
Carbon monoxide ( CO ) 302 ppm	1915/23	Linde	16-Jun-25
Carbon monoxide ( CO ) 1001 ppm	CG-0085-24	Nimt	22-May-29
Nitrogen Dioxide ( NO2 ) 30.34 ppm	2703/22	Linde	22-Aug-24
Nitrogen Dioxide ( NO2 ) 81.32 ppm	3546/23	Linde	14-Jan-26
Nitrogen Dioxide ( NO2 ) 201.9 ppm	1975/23	Linde	17-Jul-25
Nitric Oxide ( NO ) 30.01 ppm	CG-0014-23	Nimt	19-Feb-25
Nitric Oxide ( NO ) 151.5 ppm	0161/23	Linde	22-Jan-25
Nitric Oxide ( NO ) 322.5 ppm	1974/23	Linde	17-Jul-25
Sulphur Dioxide ( SO2 ) 50.36 ppm	2004/23	Linde	17-Jul-25
Sulphur Dioxide ( SO2 ) 100.8 ppm	3507/22	Linde	09-Nov-24
Sulphur Dioxide ( SO2 ) 600.8 ppm	2003/23	Linde	17-Jul-25

## Measured room conditions

Temperature : 24.1 °C Humidity : 62.8 %RH Pressure : 1009.9 mbar

## Calibration conditions

Gas Temperature : 24 °C Flow rate : 1,000 ml/min Gas pressure : 1014.7 mbar

Calibration Results (Without adjustment) (Table 2)

Parameter of Standard	Mean of		Error	Uncertainty (±)
	Standard Values	UUC		
O2 (%Vol)	2.50	2.48	-0.02	0.15
O2 (%Vol)	10.04	9.93	-0.11	0.20
O2 (%Vol)	21.02	21.11	0.09	0.30
CO (ppm)	80.18	81	0.82	3.0
CO (ppm)	302	302	0	6.0
CO (ppm)	1001	1002	1	12
NO2 (ppm)	30.34	31.5	1.16	8.0
NO2 (ppm)	81.32	82.3	0.98	8.0
NO2 (ppm)	201.9	201.2	-0.7	12
NO (ppm)	30.01	32	1.99	8.0
NO (ppm)	151.5	155	3.5	8.0
NO (ppm)	322.5	327	4.5	12
SO2 (ppm)	50.36	49	-1.36	6.0
SO2 (ppm)	100.8	100	-0.8	6.0
SO2 (ppm)	600.8	602	1.2	13

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

## End of Report

**Hot Air Oven**

**Model : UFE 500**

**Serial No. : G511.0182**









## REPORT OF CALIBRATION

Page 3 of 3

Certificate No. : 23-148804

Sample Code : 23-56200-006

## Results of Calibration

## Notes

## 1. Sensor installation locations

1.1 All sensors at any corners or walls should be positioned

5 cm (a x b x c) from the wall.

1.2 The reference sensor is preferably located of the geometric center of the chamber.

## 2. Interior dimensions approx of chamber :

W = 56 cm ; D = 40 cm ; H = 48 cm

3. Air valve or fresh air level : Off

4. Fan level : Open

5. The quoted uncertainty includes: Stability of chamber and loading effect in chamber at 20% of uniformity \*

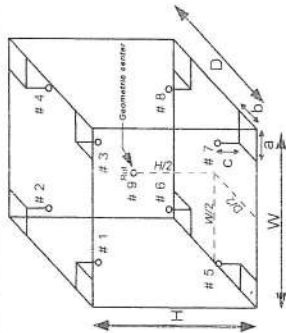
6. Uniformity : the maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time.

7. Stability : one-half of the greatest maximum difference of measured temperatures at any one sensor.

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

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

10. Calibration results without adjustment.

Figure: Example of sensor  
installation Positions

The result expanded uncertainty of measurement  $U$  is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k$ , which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS MCO03.

- End of Report -


**ICP-OES/Avio550**

**Serial No. : M81S2210101**

ICP-OES/Avio550 Preventive Maintenance (PM)

Company Name:	Eastern Thai Consulting 1992 Co., Ltd.		
Address (Instrument Location):	683 Moo 11 Sukhapibarn 8 Rd.,Siracha, Chon Buri 20230		
Serial Number:	M81S2210101	PM Number:	1 OF 2 W
Customer Name (if applicable):	K.Nunnaphat	Telephone Number:	038 481 197
Service Engineer Name:	K.Piyawit	Service Order Number:	WO-02754304
Date PM Performed: (DD-MMM-YYY)	25-Apr-2024	Next PM Due Date: (DD-MMM-YYY)	25-Oct-2024
Standard Labor Hours to Complete PM :		4 hours	

Part Number	Release	Publication Date
TH09370188 Rev 2	B	July 2020

PerkinElmer<sup>®</sup>

Scope

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

General Instructions:

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

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Component List

Component / Specific Model	Serial #	Configuration Notes
Avio550Max	M81S2210101	Syngistix S.1.0.0293

Parts Lists

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

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

## Procedure Checklist

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

### 1. General:

- ☒ Ask customer about unit's performance since last visit.
- ☒ Check incoming AC line voltage under load for proper levels and grounding.
- ☒ Is the instrument operational? If not, please comment.

### 2. Mechanical:

- ☒ Inspect and clean all fans and filters.
- ☒ Inspect and replace torch components and necessary.  
Torch Components Replaced: ☐ Yes ☒ No
- ☒ Inspect all tubing for signs of cracking or leaking and replace as necessary.  
Tubing Replaced: ☒ Yes ☐ No
- ☒ Inspect the peristaltic pump for proper operation.
- ☒ Check and adjust if necessary, the external nitrogen, argon shear gas and water supply pressures.
- ☒ Check and adjust if necessary, the internal nitrogen, main argon, torch argon and shear gas pressures.

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

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

### 3. Electrical

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

#### RF Generator:

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

#### Spectrometer:

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

### 4. Optical:

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

### 5. PM Performance Tests:

- ☒ Perform View Align.

#### Test Spectral Resolution:

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

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

#### Test Precision:

- ☒ Test for reproducibility of a set of measurement.

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

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

**Test Axial BEC Cd:**

Method "BEC-XL" For Samples "IB (2%HNO3)" and "IS (N930-0221/100)", record intensities.

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

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

**Test Radial BEC Mn:**

Method "BEC-RL" For Samples "IB (2%HNO3)" and "IS (N069-1579)", record intensities.

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

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

**6. Review:**

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

**Additional Comments**

Additional Comments Regarding the PM

**Review**

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

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

**Review of Preventive Maintenance:**

Authorized PerkinElmer Representative:

Authorized Customer Representative:

Piyaa

ICP-OES/Avio550 Preventive Maintenance (PM)

ICP-OES/Avio550 Preventive Maintenance (PM)

**UV/VIS SPECTROPHOTOMETER**

**Model : UV-1800**

**Serial No. : A11635101643 CD**





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



## Certificate of Calibration

Number of Page(s) 1 of 3

Certificate No. BSCC-UV-146/24  
Equipment UVM/vis Spectrophotometer  
Model UV-1800  
Manufacturer Shimadzu  
Serial No. A11635101643 CD  
ID No. LABE 03/2  
Date of receipt 22 April 2024  
Date of calibration 22 April 2024  
Date of issue 29 April 2024  
Customer name Eastern Thai Consulting 1992 Co., Ltd.  
Address 683 Moo 11, Sukkaphibarn 8 Rd., Nongkham, Sriracha, Chonburi 20230

Temperature (22.9-24.1) °C (On site)  
Humidity (41.7-46.9) %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. 116614 and 116613  
Photometric Accuracy is traceable to certificate No. 116210 and 116224  
Sray Light is traceable to certificate No. 116616  
The above certificate are traceable to SI unit through Starna Scientific Ltd  
(UKAS accredited calibration laboratory NO. 0659)

Calibrated by Mr. Poomjai Korsawatvorakul

Approved by

Mr. Sonthi Temboon  
Service Manager

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



Bara Scientific Co., Ltd.  
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www.barascientific.com



## Certificate of Calibration

Number of Page(s) 2 of 3

Certificate No. BSCC-UV-146/24

Calibration Results:

### 1. Wavelength Accuracy

Certified Wavelength (nm)	UUC (nm)	Error (nm)	Uncertainty (nm)
287.71	287.75	0.04	0.18
445.82			0.18
536.52			0.18
741.02			0.18
879.41			0.18

### 2. Photometric Accuracy (UV)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (±A)
235	0.0000	0.0000	0.0000	0.0075
	0.7415	0.7387	-0.0028	0.0075
257	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
313	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
350	0.0000	0.0000	0.0000	0.0075
	0.6406	0.6395	-0.0011	0.0075

\*CNR = Customer not request

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



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www.barascientific.com



# Certificate of Calibration

Certificate No. BSCC-UV-146/24 Number of Page(s) 3 of 3

Calibration Results:

## 3. Photometric Accuracy (Visible)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (±A)
420.0	0.0000	0.0000	0.0000	0.0042
	0.5715	0.5729	0.0014	0.0042
	0.7087	0.7087	0.0000	0.0042
	1.0987	1.1005	0.0018	0.0042
440.0	0.0000	0.0000	0.0000	0.0042
	0.5561	0.5578	0.0017	0.0042
	0.6968	0.6969	0.0001	0.0042
	1.0757	1.0774	0.0017	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
	0.5193	0.5213	0.0020	0.0042
	0.6937	0.6940	0.0003	0.0042
	1.0411	1.0428	0.0017	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
	0.5605	0.5624	0.0019	0.0042
	0.7579	0.7583	0.0004	0.0042
	1.1131	1.1138	0.0007	0.0042

\*CNR = Customer not request

## 4. Stray Light

Standard cut-off wavelength (nm)	Wavelength (nm)	Unit Under Calibration(UUC) Transmission (%T)
201.33±0.1nm	200.80	0.9750

The Stray light transmission reference is less than 1.0%T and Stray light absorbance reference is less than 0.0042A

\*Stray Light not NSC-ONSC Accredited.

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

\*\*\*End of Certificate\*\*\*

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



**SOUND LEVEL CALIBRATOR**

**MODEL : NC-75**

**SERIAL No. : 34302326**

Cert. No. : ACC24014  
Pages : 1 of 3

## Calibration Certificate

Equipment : SOUND CALIBRATOR  
Manufacturer : RION  
Model : NC-75  
Serial No.: 34302326  
ID No.:

Condition As Found : GOOD

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

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

Received Date : 29 APRIL 2024  
Calibration Date : 16 MAY 2024  
Date of Issue : 20 MAY 2024

Calibrated by : Nathakorn Pisutpaisan

Approved by :  
( Thanakul Petchurai )

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may other than in full, except with the prior written approval of the head of Calibration Laboratory.

Cert. No. : ACC24014  
Job No. : VC67AC0083  
Pages : 2 of 3

Calibration Procedure : CP-AC-03

### Calibration Method :

This equipment was calibrated by follow on IEC-60942-2003 Standard.

The sound pressure level, frequency and total distortion of the sound calibrator was measured using the reference microphone.

### Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33511B	MY52302742	EF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	EEL-BP 21/0267	13-FEB-25
Digital Multimeter	33461A	MY53220076	EEL-BP 20/0267	15-FEB-25
Digital Multimeter	33461A	MY60024273	EEL-BP 22/0267	15-FEB-25
Programmable Attenuator	MAT-1070	62100114	EF-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KAI	34560495	AA-3001-24	05-FEB-25
Audio Analyzer	AVR-3360A	V744B6069	EF-0009-24	09-FEB-25

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

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

Result of calibration :

1. Sound pressure level

Specified sound pressure level (dB)	Measured value (dB)	Deviated value (dB)	Uncertainty (dB)	Acceptance limit (dB)
94	94.01	0.01	0.28	0.40

2. Frequency

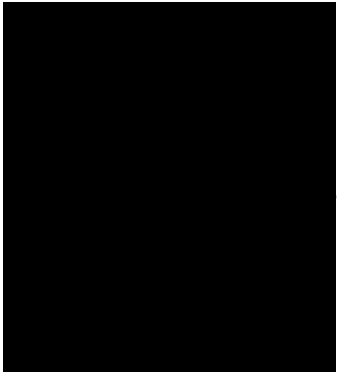
Specified Frequency (Hz)	Measured value (Hz)	Deviated value (%)	Uncertainty (%)	Acceptance limit (%)
1000	1000.0	0.0	0.1	1.0

3. Total distortion

Measured value (%)	Uncertainty (%)	Acceptance limit (%)
0.31	0.10	3.0

The reported uncertainty is based on a standard uncertainty multiplied by coverage or any value following calculation, providing a level of confidence of approximate

End of Calibration Certificate



*G. Petcha*

**SOUND LEVEL METER**

**MODEL : NL-42A**

**SERIAL No. : 00322752**

Cert. No. : ACL24139  
Pages : 1 of 8

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42A / Microphone UC-52 / Preamplifier NH-24  
Serial No. : 00322752 / 196475 / 15484  
ID No. : -

Condition As Found : GOOD

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

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

Received Date : 29 APRIL 2024  
Calibration Date : 13-17 MAY 2024  
Date of Issue : 20 MAY 2024

Calibrated by : Nathakorn Pisutpaisan

Approved by :  
( Thanakul Petchurai )

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may other than in full, except with the prior written approval of the head of Calibration Laboratory

Cert. No. : ACL24139  
Job No. : VC67AC0083  
Pages : 2 of 8

Calibration Procedure : CP-AC-01

### Calibration Method :

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

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

### Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-4	05-FEB-25
Waveform Generator	33511B	MY52302742	EF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	EEL_BP 21/0267	13-FEB-25
Digital Multimeter	33461A	MY53220076	EEL_BP 20/0267	15-FEB-25
Digital Multimeter	34461A	MY60024273	EEL_BP 22/0267	15-FEB-25
Programmable Attenuator	MAT-1070	62100114	EF-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KAI	34560495	AA-3001-24	05-FEB-25

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

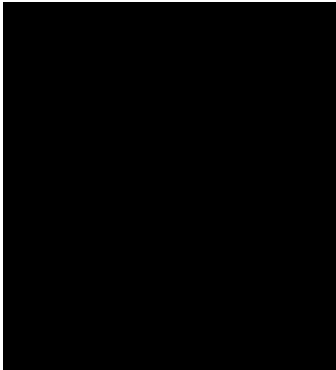
3. This certificate is traceable to the international system of unit maintained at :

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

T. Petchurai

Summary of Measurement Result :

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



Y. Petcha.

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal ( dB )	Measured Value ( dB )	Deviation ( dB )	Acceptance Limit ( dB )
93.9 (93.98)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value ( dB )
14.4

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

Frequency Weighting	Measured value ( dB )
A - weight	10.8
C - weight	17.0
Flat	22.7

3. Acoustical signal tests of frequency weightings

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

Frequency ( Hz )	Deviation from various frequency weighting response curve (dB)		
	Flat	C-weight	A-weight
125	0.1	0.1	0.1
1000	0.0	0.0	0.1
8000	0.8	0.9	0.1





#### 4. Electrical signal tests of frequency weightings

Weighing network response with relative to 1 kHz.

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

#### 5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

#### 6. Long - term stability

Frequency Weighting	SLM Display at initial ( dB )	SLM Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	94.0	94.1	0.1	± 0.3

#### 7. Level linearity on the reference level range

Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.1	0.1	± 1.1
134.0	134.1	0.1	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.1	0.1	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.1	0.1	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	38.9	-0.1	± 1.1
34.0	33.9	-0.1	± 1.1
30.0	29.9	-0.1	± 1.1
29.0	28.9	-0.1	± 1.1
28.0	27.9	-0.1	± 1.1
27.0	26.9	-0.1	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.8	-0.2	± 1.1

## 8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±1.1

## 9. Tone burst response

Time Weighting	Tone burst duration, T <sub>b</sub> (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	116.9	-0.1	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	107.9	-0.1	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.8	-0.2	1.5 ; -5.0
	2	8	108.0	107.9	-0.1	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

## 10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L <sub>peak</sub> (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
One	136.4	135.6	-0.8	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
Positive half cycle	135.4	135.1	-0.3	±3.0
Negative half cycle	135.4	135.1	-0.3	±3.0

## 11. Overload indication

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

## 12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	137.0	137.0	0.0	±0.3

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

End of Calibration Certificate



**SOUND LEVEL METER**

**MODEL : NL-42A**

**SERIAL No. : 00222593**

Cert. No. : ACL24133  
Pages : 1 of 8

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42A / Microphone UC-52 / Preamplifier NH-24  
Serial No. : 00222593 / 195905 / 15425  
ID No. : -

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

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

Received Date : 29 APRIL 2024  
Calibration Date : 13-17 MAY 2024  
Date of Issue : 20 MAY 2024

Calibrated by :

Nathakorn Pisutrasri

Approved by :

T. Pet  
( Thanakul Pet

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard other than in full, except with the prior written approval of the head of Calibration Laboratory.

Cert. No. : ACL24133  
Job No. : VC67AC0083  
Pages : 2 of 8

Calibration Procedure : CP-AC-01

### Calibration Method :

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

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

### Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-4	05-FEB-25
Waveform Generator	33511B	MY52302742	EF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	EEL-BP 21/0267	13-FEB-25
Digital Multimeter	33461A	MY53220076	EEL-BP 20/0267	15-FEB-25
Digital Multimeter	34461A	MY60024273	EEL-BP 22/0267	15-FEB-25
Programmable Attenuator	MAT-1070	62100114	EF-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KAI	34560495	AA-3001-24	05-FEB-25

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

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

**Summary of Measurement Result :**

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

**Result of calibration :**

**1. Absolute sensitivity**

Reference Acoustic Signal (dB )	Measured Value (dB )	Deviation (dB )	Acceptance Limit (dB )
93.9 (93.98)	93.9	0.0	±0.3

**2. Self-generated noise**

2.1 Normal test

Measured Value (dB )
14.2

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

Frequency Weighting	Measured value (dB )
A - weight	12.0
C - weight	18.5
Flat	24.0

**3. Acoustical signal tests of frequency weightings**

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

Frequency (Hz )	Deviation from various frequency weighting response curve (dB)		
	Flat	C-weight	A-weight
125	0.0	0.1	0.1
1000	-0.1	-0.1	-0.1
8000	0.5	0.6	0.6

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

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

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Fast	94.0	94.0	0.0	± 0.2
Slow	94.0	94.0	0.0	± 0.2
Leq	94.0	94.0	0.0	± 0.2

6. Long - term stability

Frequency Weighting	SLM Display at initial ( dB )	SLM Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	94.0	94.0	0.0	± 0.2

7. Level linearity on the reference level range

Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	29.9	-0.1	± 1.1
29.0	28.9	-0.1	± 1.1
28.0	27.9	-0.1	± 1.1
27.0	26.9	-0.1	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.9	-0.1	± 1.1

T. Ketch.



8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±1.1

9. Tone burst response

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

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lepeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	
One	136.4	135.8	-0.6	

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

11. Overload indication

Measured value (dB)	Deviated Value (dB)		Acceptance Limits (dB)
	Positive one-half cycle	Negative one-half cycle	
89.6		89.7	±1.5
		0.1	

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	137.0	137.0	0.0	±0.3

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

End of Calibration Certificate

**SOUND LEVEL METER**

**MODEL : NL-42**

**SERIAL No. : 01147298**

CALIBRATION CERTIFICATE

Submitted by : Eastern Thai Consulting 1992 Co., Ltd.  
Address : 683 Moo 11, Sukhapham 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 :		Ambient Environment
Description	: Sound Level Meter	Temperature : (23 ± 3) °C
Manufacturer	: Rion	Relative Humidity : (50 ± 15) %
Model	: NL-42	Ambient Pressure : (101.325±1.5) kPa
Serial No.	: 01147298	
Microphone	: UC-52 No.179113	
Preamplifier	: NH-24 No.87521	

Standards used :

1. Band Pass Filter Wavetek 752A S/N 90010494.
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 : 5 Feb. 2024  
Date of Calibration : 1 Mar. 2024

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 : 1 Mar. 2024



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0252

MTC No. EEL. BP. 9/0267

### 1. Absolute Sensitivity

Reference Acoustic Signal (dB)	Measured value (dB)		Deviation value(dB)	Acceptance limit class 2(±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	Before adjust	After adjust				
113.92	114.2	113.9	0.0	1.0	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)
25.8	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	20.1	0.10	N/A
C-Weight	40.2	0.10	N/A
Flat	41.3	0.10	N/A

Date of Calibration : 1 Mar. 2024

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0252

MTC No. EEL. BP. 9/0267

### 3. Acoustical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response curve(dB)			Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	A-weight	C-weight	Flat			
125	0.0	0.2	0.2	1.5	0.45	0.6
1 000	0.0	0.0	0.0	1.0	0.45	0.6
8 000	1.8	1.8	1.7	5.0	0.45	0.7

### 4. Electrical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response curve(dB)			Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	A-weight	C-weight	Flat			
63	0.0	0.1	0.0	2.0	0.20	0.6
125	0.0	0.1	0.0	1.5	0.20	0.6
250	0.0	0.0	0.0	1.5	0.20	0.6
500	0.0	0.0	0.0	1.5	0.20	0.6
1 000	0.0	0.0	0.0	1.0	0.20	0.6
2 000	-0.2	-0.1	-0.2	2.0	0.20	0.6
4 000	-0.3	-0.3	-0.3	3.0	0.20	0.6
8 000	0.0	0.0	-0.1	5.0	0.20	0.7

Date of Calibration : 1 Mar. 2024

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**Office/Laboratory**  
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Amphoe Muang, Changwat Samutprakan 10280, Thailand  
Tel. (66) 0 2323 1672-80 ext. 115, 116  
Fax. (66) 0 2323 9165  
E-mail : nistr@tistr.or.th



5. Long-term stability

Time	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Begin	94.0	0.0	0.3	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 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
A-weight	94.0	0.0	0.2	0.20	0.2
C-weight	94.0	0.0	0.2	0.20	0.2
Flat	94.0	0.0	0.2	0.20	0.2

6.2 Time weightings at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Fast	94.0	0.0	0.1	0.20	[REDACTED]
Slow	94.0	0.0	0.1	0.20	
Leq	94.0	0.0	0.1	0.20	

Date of Calibration : 1 Mar. 2024

7. Level linearity on the reference level range

Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
137	137.1	0.1	1.1	0.30	0.3
136	136.1	0.1	1.1	0.30	0.3
135	135.1	0.1	1.1	0.30	0.3
134	134.1	0.1	1.1	0.30	0.3
129	129.1	0.1	1.1	0.30	0.3
124	124.0	0.0	1.1	0.30	0.3
119	119.0	0.0	1.1	0.30	0.3
114	114.0	0.0	1.1	0.30	0.3
109	109.0	0.0	1.1	0.30	0.3
104	104.0	0.0	1.1	0.30	0.3
99	99.0	0.0	1.1	0.30	0.3
94	94.0	0.0	1.1	0.30	0.3
89	89.0	0.0	1.1	0.30	0.3
84	84.0	0.0	1.1	0.30	0.3
79	79.0	0.0	1.1	0.30	0.3
74	74.0	0.0	1.1	0.30	0.3
69	69.0	0.0	1.1	0.30	0.3
64	63.9	-0.1	1.1	0.30	0.3

Date of Calibration : 1 Mar. 2024

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

Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
59	58.9	-0.1	1.1	0.30	0.3
54	53.9	-0.1	1.1	0.30	0.3
49	48.9	-0.1	1.1	0.30	0.3
44	43.9	-0.1	1.1	0.30	0.3
39	38.9	-0.1	1.1	0.30	0.3
34	33.9	-0.1	1.1	0.30	0.3
29	28.9	-0.1	1.1	0.30	0.3
28	27.9	-0.1	1.1	0.30	0.3
27	26.9	-0.1	1.1	0.30	0.3
26	25.9	-0.1	1.1	0.30	0.3
25	24.9	-0.1	1.1	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 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty
30-130	94.0	94.0	0.0	1.1	0.3	0.3

Date of Calibration : 1 Mar. 2024

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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 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
30-130	35	35.0	0.0	1.1	0.30	0.3

9. Tone burst response

Time Weighting	Toneburst Duration, Tb(ms)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Fast	200	126.0	0.0	±1.0	0.20	0.3
	2	108.9	-0.1	+1.0; -2.5	0.20	0.3
	0.25	99.9	-0.1	+1.5; -5.0	0.20	0.3
Slow	200	119.5	-0.1	±1.0	0.20	0.3
	2	99.9	-0.1	+1.0; -5.0	0.20	0.3
	200	120.0	0.0	±1.0	0.20	0.3
SEL	2	100.0	0.0	+1.0; -2.5	0.20	0.3
	0.25	90.9	-0.1	+1.5; -5.0	0.20	0.3

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MTC No. EEL. BP. 9/0267

10. Peak C sound level

Number of cycles in test signal	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 ( $\pm$ dB)	Uncertainty ( $\pm$ dB)	Maximum-permitted uncertainty of measurement ( $\pm$ dB)
Complete cycle	125.4	125.3	-0.1	3.0	0.20	0.35
Positive half cycle	124.4	124.1	-0.3	2.0	0.20	0.35
Negative half cycle	124.4	124.1	-0.3	2.0	0.20	0.35

11. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limit class 2 ( $\pm$ dB)	Uncertainty ( $\pm$ dB)	Maximum-permitted uncertainty of measurement ( $\pm$ dB)
Positive one-half cycle	Negative one-half cycle	value (dB)	limit class 2 ( $\pm$ dB)	( $\pm$ dB)	of measurement ( $\pm$ dB)
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 2 ( $\pm$ dB)	Uncertainty ( $\pm$ dB)	Maximum-permitted uncertainty of measurement ( $\pm$ dB)
Begin	129.0	0.0	0.3	0.10	0.1
End	129.0				

Calibrated by: 

Approved by:

(Mr. Wittawat Supanich)

Electrical and Electronic  
Industrial Metrology

Date of Calibration : 1 Mar. 2024

Date of Issue : 4 Mar. 2024

Ref : 2

End of Certificate

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**SOUND LEVEL METER**

**MODEL : NL-42A**

**SERIAL No. : 00222592**



Cert. No. : ACL24132  
Pages : 1 of 8

## Calibration Certificate

**Equipment :** SOUND LEVEL METER  
**Manufacturer :** RUON  
**Model :** NL-42A / Microphone UC-52 / Preamplifier NH-24  
**Serial No.:** 00222592 / 195904 / 15424  
**ID No.:**

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

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

**Received Date :** 29 APRIL 2024  
**Calibration Date :** 13-17 MAY 2024  
**Date of Issue :** 20 MAY 2024

**Calibrated by :** Nathakorn Pisutpaisan

**Approved by :**  
( Thanakul Petchur )

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, other than in full, except with the prior written approval of the head of Calibration Laboratory



Cert. No. : ACL24132  
Job No. : VC67AC0983  
Pages : 2 of 8

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

### Calibration Method :

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

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

### Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-4	05-FEB-25
Waveform Generator	33511B	MY52302742	EF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	EEL_BP 21/0267	13-FEB-25
Digital Multimeter	33461A	MY53220076	EEL_BP 20/0267	15-FEB-25
Digital Multimeter	34461A	MY60024273	EEL_BP 22/0267	15-FEB-25
Programmable Attenuator	MAT-1070	62100114	EF-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KA1	34560495	AA-3001-24	05-FEB-25

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

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



Summary of Measurement Result :

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

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal ( dB )	Measured Value ( dB )	Deviation ( dB )	Acceptance Limit ( dB )
93.9 (93.98)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value ( dB )
14.4

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

Frequency Weighting	Measured value ( dB )
A - weight	12.5
C - weight	19.0
Flat	24.5

3. Acoustical signal tests of frequency weightings

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

Frequency ( Hz )	Deviation from various frequency		
	Flat	C-weight	A-weight
125	0.0	0.0	0.0
1000	-0.1	-0.1	-0.1
8000	1.4	1.5	1.5

T. Petch

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

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

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Fast	94.0	94.0	0.0	+ 0.2
Slow	94.0	94.0	0.0	+ 0.2
Leq	94.0	94.0	0.0	+ 0.2

6. Long - term stability

Frequency Weighting	SLM Display at initial ( dB )	SLM Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	94.0	94.0	0.0	+ 0.2

7. Level linearity on the reference level range

Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	132.9	-0.1	± 1.1
132.0	131.9	-0.1	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.0	0.0	± 1.1
29.0	29.0	0.0	± 1.1
28.0	28.0	0.0	± 1.1
27.0	27.0	0.0	± 1.1
26.0	26.0	0.0	± 1.1
25.0	24.9	-0.1	± 1.1

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±1.1

9. Tone burst response

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

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L <sub>peak</sub> (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±1.0
One	136.4	136.1	-0.3	

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)
Continuous	133.0	133.0	0.0
Positive half cycle	135.4	135.1	-0.3
Negative half cycle	135.4	135.1	-0.3

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle	0.1	±1.5
89.5	89.6		

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	137.0	137.0	0.0	±0.3

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

End of Calibration Certificate

T. Kelnh



**SOUND LEVEL METER**

**MODEL : NL-42A**

**SERIAL No. : 00322744**



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0252

MTC No. EEL. BP. 11/0267

Request No. 21-67/0252

MTC No. EEL. BP. 11/0267

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 : (23 ± 3) °C  
Manufacturer : Rion : (50 ± 15) %  
Model : NL-42A : Ambient Pressure : (101.325±1.5) kPa

Serial No. : 00322744  
Microphone : UC-52 No.196467  
Preamplifier : NH-24 No.15476

Standards used :

1. Band Pass Filter Wavetek 752A S/N 90010494.
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 : 5 Feb. 2024

Date of Calibration : 5 Mar. 2024

The results relate only to the items tested/calibrated or value assigned to the standards used. The results are not valid for other items or values unless written permission is obtained from TISTR.

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## 1. Absolute Sensitivity

Reference Acoustic Signal (dB)	Measured value (dB)		Deviation value(dB)	Acceptance limit class 2(±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	Before adjust	After adjust				
113.92	113.8	113.9	0.0	1.0	0.30	N/A

**Note:** The external calibration adjustment was firstly performed. The internal calibration adjustment was then completed at the display of 114.2 dB.

## 2. Self-generated noise

## 2.1 Normal test

Measured value (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
16.9	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	12.4	0.10	N/A
C-Weight	17.9	0.10	N/A
Flat	23.1	0.10	N/A

Date of Calibration : 5 Mar. 2024

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## 3. Acoustical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response curve(dB)			Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	A-weight	C-weight	Flat			
125	0.1	0.3	0.4	1.5	0.45	0.6
1 000	0.0	0.0	-0.1	1.0	0.45	0.6
8 000	-0.2	-0.2	-0.2	5.0	0.45	0.7

## 4. Electrical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response curve(dB)			Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	A-weight	C-weight	Flat			
63	0.0	0.1	0.0	2.0	0.20	0.6
125	0.0	0.1	0.0	1.5	0.20	0.6
250	0.1	0.1	0.0	1.5	0.20	0.6
500	0.1	0.1	0.0	1.5	0.20	0.6
1 000	0.0	0.0	0.0	1.0	0.20	0.6
2 000	-0.1	-0.1	-0.2	2.0	0.20	0.6
4 000	-0.3	-0.2	-0.3	3.0	0.20	0.6
8 000	0.1	0.0	-0.1	5.0	0.20	0.6

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## 5. Long-term stability

Time	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Begin	94.0	0.0	0.3	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 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
A-weight	94.0	0.0	0.2	0.20	0.2
C-weight	94.0	0.0	0.2	0.20	0.2
Flat	94.0	0.0	0.2	0.20	0.2

## 6.2 Time weightings at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Fast	94.0	0.0	0.1	0.20	
Slow	94.0	0.0	0.1	0.20	
Leq	94.0	0.0	0.1	0.20	

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## 7. Level linearity on the reference level range

Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
137	137.1	0.1	1.1	0.30	0.3
136	136.1	0.1	1.1	0.30	0.3
135	135.1	0.1	1.1	0.30	0.3
134	134.1	0.1	1.1	0.30	0.3
129	129.1	0.1	1.1	0.30	0.3
124	124.0	0.0	1.1	0.30	0.3
119	119.1	0.1	1.1	0.30	0.3
114	114.0	0.0	1.1	0.30	0.3
109	109.0	0.0	1.1	0.30	0.3
104	104.1	0.1	1.1	0.30	0.3
99	99.0	0.0	1.1	0.30	0.3
94	94.0	0.0	1.1	0.30	0.3
89	89.0	0.0	1.1	0.30	0.3
84	84.0	0.0	1.1	0.30	0.3
79	79.1	0.1	1.1	0.30	0.3
74	74.1	0.1	1.1	0.30	0.3
69	69.0	0.0	1.1	0.30	0.3
64	64.0	0.0	1.1	0.30	0.3

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

Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 ( $\pm$ dB)	Uncertainty ( $\pm$ dB)	Maximum-permitted uncertainty of measurement ( $\pm$ dB)
59	59.0	0.0	1.1	0.30	0.3
54	54.0	0.0	1.1	0.30	0.3
49	49.0	0.0	1.1	0.30	0.3
44	44.0	0.0	1.1	0.30	0.3
39	39.0	0.0	1.1	0.30	0.3
34	34.0	0.0	1.1	0.30	0.3
29	29.0	0.0	1.1	0.30	0.3
28	28.0	0.0	1.1	0.30	0.3
27	27.0	0.0	1.1	0.30	0.3
26	26.0	0.0	1.1	0.30	0.3
25	25.0	0.0	1.1	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 2 ( $\pm$ dB)	Uncertainty ( $\pm$ dB)
30-130	94.0	94.0	0.0	1.1	0.30

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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 2 ( $\pm$ dB)	Uncertainty ( $\pm$ dB)	Maximum-permitted uncertainty of measurement ( $\pm$ dB)
30-130	35	35.0	0.0	1.1	0.30	0.3

### 9. Tone burst response

Time Weighting	Toneburst Duration, Tb(ms)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (dB)	Uncertainty ( $\pm$ dB)	Maximum-permitted uncertainty of measurement ( $\pm$ dB)
Fast	200	126.0	0.0	$\pm 1.0$	0.20	0.3
	2	108.9	-0.1	+1.0; -2.5	0.20	0.3
	0.25	99.9	-0.1	+1.5; -5.0	0.20	0.3
Slow	200	119.5	-0.1	$\pm 1.0$	0.20	0.3
	2	99.9	-0.1	+1.0; -5.0	0.20	0.3
SEL	200	120.0	0.0	$\pm 1.0$	0.20	0.3
	2	100.0	0.0	+1.0; -2.5	0.20	0.3
	0.25	90.9	-0.1	+1.5; -5.0	0.20	0.3

Date of Calibration : 5 Mar. 2024

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Request No. 21-67/0252

MTC No. EEL. BP. 11/0267

10. Peak C sound level

Number of cycles in test signal	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Complete cycle	125.4	125.2	-0.2	3.0	0.20	0.35
Positive half cycle	124.4	124.1	-0.3	2.0	0.20	0.35
Negative half cycle	124.4	124.1	-0.3	2.0	0.20	0.35

11. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limit class 2 (±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 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Begin	129.0	0.0	0.3	0.10	0.1
End	129.0				

Calibrated by :

Approved by :

Approved by :  
(Mr. Trawate Khuaypa)

(Mr. Wittawat Supanich)

Date of Calibration : 5 Mar. 2024

Date of Issue : 6 Mar. 2024

Electrical and Industrial Met

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**ANALYTICAL BALANCE (DU)**

**Model : XS205DU**

**Serial No. : 1126323724**





Certificate No. : 23-148799

Sample Code : 23-56200-001

Page 1 of 4

## CERTIFICATE OF CALIBRATION

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

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

Equipment : ELECTRONIC BALANCE

Manufacturer : METTLER TOLEDO

Model : XS205DU

Serial No. : 1126323724

ID No. : LABE 05/1

Date of Receipt : 22 December 2023

Date of Calibration : 22 December 2023

Calibrated by : Mr. Somwang Sangdee (M)  
Scientist Approved by

Issue date : 25 December 2023

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

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

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



Certificate No. : 23-148799

Sample Code : 23-56200-001

Page 2 of 4

## 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 weightings 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 checked="" type="checkbox"/> Before adjustment	<input checked="" type="checkbox"/> After adjustment
<input type="checkbox"/> No adjustment	Nominal value	40 80 40 80	
<input checked="" type="checkbox"/> Adjustment	Standard weight	40.000054 80.000048 40.000054 80.000048	
	Average reading of indicator	40.000026 80.000037 40.000017 80.000017	
	Standard deviation	0.000015	
Unit : g	Range : 200	<input checked="" type="checkbox"/> Before adjustment	<input checked="" type="checkbox"/> After adjustment
<input type="checkbox"/> No adjustment	Nominal value	100	
<input checked="" type="checkbox"/> Adjustment	Standard weight	100.000042	
	Average reading of indicator	100.00003	
	Standard deviation	0.00005	



Certificate No. : 23-148799

Sample Code : 23-56200-001

Page 3 of 4

NSC-TIS-1517025  
CALIBRATION 0152

## 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 Range : 200

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

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

Unit : g

Nominal Value	Standard Value	Average Reading of Indicator	Correction Value	Expanded Uncertainty	Coverage Factor (k)
Unload	0.0000000	0.00000	0.00000	0.000012	2.05
0.01	0.0100025	0.01000	0.00000	0.000012	2.05
0.1	0.1000019	0.10001	-0.00001	0.000013	2.03
1	1.0000125	1.00001	0.00000	0.000015	2.02
5	5.0000208	5.00004	-0.00002	0.000015	2.05
10	10.0000004	10.00008	-0.00008	0.000015	2.05
20	20.0000030	20.00011	-0.00008	0.000015	2.05
50	50.0000014	50.00014	-0.00013	0.000015	2.05
100	100.0000042	100.00001	-0.00001	0.000015	2.05
150	150.0000056	150.00001	0.00000	0.000015	2.05
200	200.0000041	200.00002	-0.00002	0.000015	2.05

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

UKAS M3003.



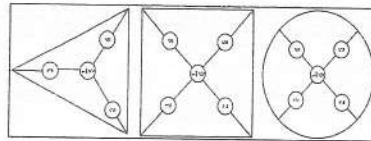
## REPORT OF CALIBRATION

## Result of Calibration :

## 4. Eccentric or off-centre loading

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

Weighting pan	Circle	Triangular	Rectangular	Test weight : 50 and 100 Unit : g
Range	80	200		
Position	Reading of indicator	Reading of indicator	Reading of indicator	
1	50.00015	100.0001	100.0001	
2	50.00022	100.0001	100.0001	
3	50.00008	100.0001	100.0001	
4	50.00002	100.0000	100.0000	
5	50.00016	100.0002	100.0002	
6	50.00014	100.0001	100.0001	
Maximum difference	0.00013	0.0001		



## 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 Company Limited (instrument number 1).

5. Reference standard instrument :

Instrument	Class	ID No.
1) STANDARD WEIGHT 1 mg to 1 kg	E2	LB-WE-79

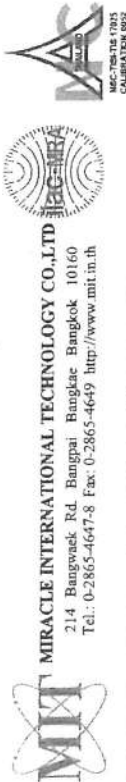
- End of Report

Ambient conditions	Min	Max
Temperature (°C)	22.8	23.0
Relative Humidity (%Rh)	43.5	51.1
Air pressure (hPa)	102.5	104.5

## **BAROMETER**

**Equipment : Analog Barometer**

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



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



## CALIBRATION CERTIFICATE

Certificate No. : L202405022-0013  
Date Issued : 08-May-24

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

**Equipment** : Analog Barometer

**Manufacturer** : Barigo  
**Model** : -  
**Serial No.** : -  
**ID No./Tag No.** : BM001/41  
**Date Received** : 03-May-24  
**Date Calibrated** : 06-May-24  
**Calibrated by** : Mr. Saruth Srichutikul

**Calibration Method or Calibration Procedure Used**

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

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

### Result of Calibration

The reported uncertainty of measurement was based on standard uncertainty 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 permission of the Miracle International Technology Company Limited.



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

Certificate No : L202405022-0013  
Environment : Ambient Temperature : (25 ± 2)°C  
Relative Humidity : (50 ± 15)%RH

STD Reading	UUC Reading (mbar)	UUC Reading (mbar)	UUC Error	Uncertainty	MPE	Pass / Fail
mbar	Before Adjusted	After Adjusted	mbar	± mbar	± mbar	with Guard Band
990.00	990	-	0.00	0.59	10.3	Pass
1000.00	1000	-	0.00	0.59	10.3	Pass
1010.00	1010	-	0.00	0.59	10.3	Pass
1020.00	1020	-	0.00	0.59	10.3	Pass
1030.00	1030	-	0.00	0.59	10.3	Pass

STD = Standard  
UUC = Unit Under Calibration  
MPE = Maximum Permissible Error  
Calibrated condition : Pressure Medium  
Mounting Position  
Reference Level  
Conversion Factor

Pass =  $|\text{error}| + |\text{uncertainty}| \leq |\text{MPE}|$   
Fail =  $|\text{error}| + |\text{uncertainty}| > |\text{MPE}|$

Air : Density = 1.19 kg/m<sup>3</sup> @ 20°C, 1 bar  
Vertical  
at center of its dial  
Multiply by 1.0 E+02 - Pa unit

Description of UUC :  
Range  
Calibration Range  
Scale Interval

950 - 1080 mbar Absolute  
990 - 1030 mbar Absolute  
1 mbar

Condition As-Received : Used Item  
The measurement results and statements of conformity with specification only relate to the item as received.  
Measurement Standards Used & Traceability :  
The International System of Units (SI) through  
IRPC Certificate No. CL1-4230097 for Reference Pressure Monitor Serial No. 1598.

End of Certificate

**Hot Air Oven**

**Model : UFE 500**

**Serial No. : G511.0182**

REPORT OF CALIBRATION

Certificate No. : 23-148804  
Sample Code : 23-56200-006

Results of Calibration

Resolution : 0.5 °C

1. Reporting of Temperature

Calibration point (°C)	UUC* setting (°C) reading (°C)	Measured temperature at each positions (°C)										Uncertainty ± (°C)	Coverage factor k
		# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	# 9 <sup>Rev</sup>	# 10		
104	103.5	104.11	103.94	103.85	103.84	103.97	103.93	103.64	103.51	104.23		0.47	2.00

2. Characterization results

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

Notes

UUC\* = Unit Under Calibration

*[Signature]*

CERTIFICATE OF CALIBRATION

Certificate No. : 23-148804  
Sample Code : 23-56200-006

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

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

**Equipment** : Temperature controlled enclosures (Hot air oven)

**Manufacturer** : Memmert      **Model** : UFE 500

**Serial No.** : G511.0182      **ID No.** : LABE17/4

**Date of Receipt** : 22 December 2023      **Date of Calibration** : 22 December 2023

Condition of Calibration

1. Environment
- 1.1 Ambient temperature : Maximum 30.9 °C : Minimum 29.6 °C
  - 1.2 Relative humidity : Maximum 54.5 % : Minimum 46.8 %
  - 1.3 Line voltage supplied : Maximum 227.6 VAC : Minimum 224.2 VAC

2. Calibration method

TLAS-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)	L8-DA-08 (RTD-248 to RTD-256)	23-084070	06 August 2024

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

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

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

6. Condition of calibration item : Normal

**Calibrated by** : Mr. Pisek Into      **Approved by** : *[Signature]*

**Issue date** : 25 December 2023      **Scientist**

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 laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standard reproduced other than in full except with the prior written approval of the Asia Medical and Agricultural Laboratory and Research Center Public



## REPORT OF CALIBRATION

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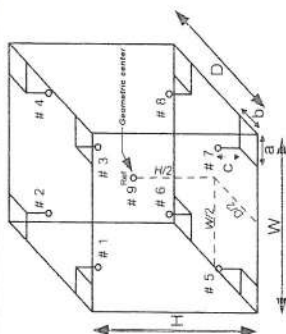
Certificate No. : 23-148804

Sample Code : 23-56200-006

## Results of Calibration

## Notes

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

Figure: Example of sensor  
installation Positions

The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor k, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS MD3003

- End of Report -



**ORIFICE TRANSFER STANDARD CERTIFICATION**

**WORKSHEET TE-5025A**

**ROOTSMETER S/N 0438320**



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

ORIFICE TRANSFER STANDARD CERTIFICATION WORKSHEET TE-5025A

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

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

DATA TABULATION

Vstd	(x axis) Qstd	(y axis)	Va	(x axis) Qa	(y axis)
0.9832	0.7337	1.4054	0.9957	0.7430	0.8911
0.9791	1.0296	1.9875	0.9915	1.0426	1.2603
0.9770	1.1481	2.2221	0.9894	1.1626	1.4090
0.9760	1.2006	2.3305	0.9884	1.2157	1.4778
0.9707	1.4510	2.8107	0.9830	1.4694	1.7823
Qstd slope (m) =	1.96262	Qa slope (m) =	1.22896		
intercept (b) =	-0.03249	intercept (b) =	-0.02060		
coefficient (r) =	0.99993	coefficient (r) =	0.99993		
y axis = SQRT(H2O(Pa/760) (298/Ta))			y axis = SQRT(H2O(Ta/Pa))		

CALCULATIONS

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

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

For subsequent flow rate calculation

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

**THERMO-HYGROMETER**

**Model : 608-H1**

**Serial No. : 45106737**



## CERTIFICATE OF CALIBRATION

Page 1 of 2  
Certificate No. : 24-062442  
Sample Code : 24-25546-002

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

Date of Receipt : 23 May 2024

Date of Calibration : 27-28 May 2024

Condition of Calibration

1. Environment

1.1 Ambient temperature : 23.0 °C ± 3.0 °C

1.2 Relative humidity : 55.0 % ± 15.0 %

2. Calibration method

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

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

3. Reference standard instrument

Instrument	Model	ID No.	Certificate No.	Due Date
3.1 Chilled Mirror	Optidew 401	LB-DP-03 & LB-DP-03 (DP)	TH-0064-23	07 August 2024
3.2 Digital Thermometer	Optidew 401	LB-DP-03 & LB-DP-03 (Temp.)	23-103423	03 September 2024
3.3 Digital Thermometer	34972A	LB DA-07 with RTD-89	23-101374	05 September 2024

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

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

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

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

6. Condition of calibration item : Normal

Calibrated by : Miss Pornsuda Lohabai

Approved by : (Mr. S. S.)

Issue date : 30 May 2024

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

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

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has been

laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards

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361 Soi Ladprao 122, Ladprao Road, Phlabphla, Wang Thonglang, Bangkok 10310

FM-CL-114

TEL 02-516-2122 FAX 02-516-6949

Rev 01

Effective Date 15/10/21



## REPORT OF CALIBRATION

Page 2 of 2  
Certificate No. : 24-062442  
Sample Code : 24-25546-002

## Results of Calibration

## Temperature measurement

Resolution : 0.1 °C

Range : 0 °C to 50 °C

Calibration point °C	Average of standard reading		Unit under calibration		Expanded uncertainty °C
	Controlled humidity %RH	Temperature °C	Average reading °C	Correction value °C	
20	50	20.00	20.1	- 0.10	± 0.39
25	50	25.00	25.0	0.00	± 0.39
30	50	30.00	29.9	+ 0.10	± 0.39

## Humidity measurement

Resolution : 0.1 %RH

Range : 10 %RH to 95 %RH

Calibration point %RH	Average of standard reading		Unit under calibration		Expanded uncertainty %RH
	Air temperature °C	Calculated humidity %RH	Average reading %RH	Correction value %RH	
45	25.02	45.10	48.4	- 3.30	± 1.3
60	25.01	60.07	63.4	- 3.33	± 1.5
75	25.01	75.15	78.5	- 3.35	± 1.7

## Notes

Calibration results without adjustment.

The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor k = 2, which corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with the Guide to the Expression of Uncertainty in Measurement (GUM).

- End of Report -

361 Soi Ladprao 122, Ladprao Road, Phlabphla, Wang Thonglang, Bangkok 10310

FM-CL-018

TEL 02-516-2122 FAX 02-516-6949

Rev 09

Effective Date 15/10/21