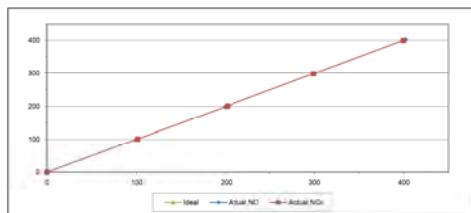



ภาคผนวก ง

ใบรับรองการสอบเทียบเครื่องมือ



Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	99.70	-0.30	-0.30	101.00	1.00	1.00
2	200.00	198.60	-1.40	-0.70	201.30	1.30	0.65
3	300.00	299.00	-1.00	-0.33	299.20	-0.80	-0.27
4	400.00	402.10	2.10	0.53	399.50	-0.50	-0.13
	AVERAGE (%)			0.14			0.97



Calibrated By

(Mr. Jirawat Sakorn)
Field Environmental Scientist (3)

Approved By

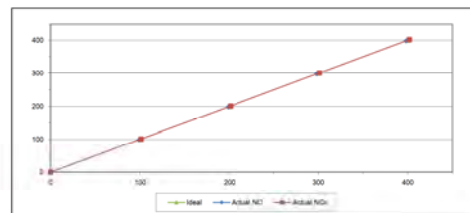



(Mr. Ganayuth Jitrenont)
Assistant General Manager

ALS Laboratory Group
FORM NO.: F-06-096 REVISION NO.: - ISSUE DATE: 02/04/12



Point	CALIBRATION RESULTS						
	Known	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10		0.10	0.10	0.10
1	100.00	99.00	-1.00	-1.00	101.00	0.00	1.00
2	200.00	196.50	-3.50	-0.75	201.30	1.30	0.65
3	300.00	296.40	-3.60	-0.53	301.50	1.50	0.50
4	400.00	396.20	-3.80	-0.45	402.00	2.00	0.50
	AVERAGE (%)			0.83			0.66



Calibrated By

(Mr. Jirawut Sakorn)
Field Environmental Scientist (3)

Approved By

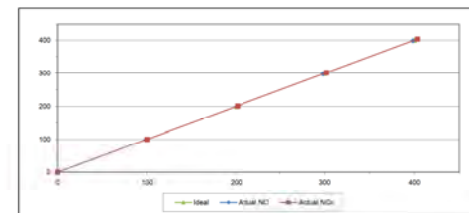



(Mr. Jitrenont Jitrenont
Assistant General Manager

FORM NO.: F-06-096 REVISION NO.: - ISSUE DATE: 02/04/13



Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	98.70	-1.30	-1.30	100.10	0.10	0.10
2	200.00	201.00	1.00	0.50	201.40	1.40	0.70
3	300.00	298.30	-1.70	-0.57	302.10	2.10	0.70
4	400.00	396.40	-1.60	-0.40	403.50	3.50	0.88
	AVERAGE (%)			0.39			0.60



Calibrated By

(Mr. Jirawut Gakorn)
Field Environmental Scientist ()

Approved By



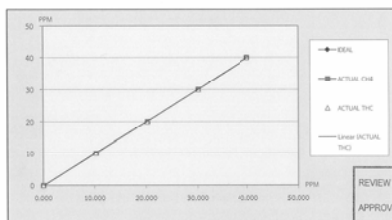
(Mr.Ganeyuth Jitrenont)
Assistant General Manager

FORM NO. : F-06-096 REVISION NO. : ISSUE DATE : 02/04/1



TEST RESULTS

POINT NO	TEST RESULTS						
	IDEAL	ACTUAL CH	ERROR CH	NUMBER CH	ACTUAL TH	ERROR TH	NUMBER TH
ZERO	0.00	0.00	0.00	-	0.00	0.00	-
1	10.00	10.260	0.260	2.40	10.210	0.210	2.10
2	20.00	20.230	0.230	1.15	20.200	0.200	1.00
3	30.00	30.120	0.120	0.40	30.170	0.170	0.57
4	40.00	40.000	0.000	0.00	40.000	0.000	0.00
AVERAGE (%)				0.99			0.92



CALIBRATED BY: 25196 4429/2561 DATE: 4/1/65
CHECKED BY: 8147 5149/61 **NAC** 4/1/65
BRANDES ASSOCIATES CO., INC.

สำหรับลูกค้าที่สนใจรับบริการ: สามารถติดต่อสอบถาม, โทร 02-660-0112 หรือ 15, 16, 14441 : Engineer@brandes.com
หรือ 0374 156705 36 40000000 7371 หรือติดต่อ สาขาบริการลูกค้า โทร 0600 13 13 หรือ 02 660 1899



TEST VALUES			
NO.	THC Analyzer (Apha - 370)	UNIT	
1	Signal (CH4)	mV	29.550
2	Signal (THC)	mV	30.200
3	Detectur	Temp °C , Standard Value : Ambient temp (30°Cto15°C) Pressure kPa , Standard Value : Ambient(1013.30-1010.4)kPa	47.300 81.900
4	Ambient	kPa current atmospheric pressure	101.150
5	Purifie	°C , Standard Value : 300°C to 430 °C kPa , Normal value : 8 kPa to 25 kPa	420.200 10.200
6	NMHC	°C , Standard Value : 230 °C to 260 °C V , Standard Value : 28 V± 0.5 V	243.000 29.900
7	DC 24 V	V , Standard Value : 28 V± 0.5 V	29.900
8	DC 5 V	V , Standard Value : 5 V ± 0.5 V	5.000
9	Bypass (Optional)	L/min, Normal value : 0.9 L/min ± 0.5 L/min	-
10	Over Flow (Optional)	L/min, Standard Value : 0.8 L/min or More	-
11	CH4 Sampling Reading	ppm	2.990
12	NMHC Sampling Reading	ppm	0.720
13	THC Sampling Reading	ppm	3.420
14	Zero Gas CH4/THC	ppm	0.970/0.81
15	Span Gas	ppm	37.89/37.81
16	Gas H2	ppm	20

Remark : (Ambient temperature = 5°C to 40°C)

อาการที่ตรวจพบ
- Service Mainte
รายละเอียดการคำ

ผลการศึกษา

CALIBRATED BY: 2540 J. J. J. J. DATE: 10/1/85
CHECKED BY: 2540 J. J. J. J. DATE: 10/1/85

ต้องการข้อมูลทางวิศวกรรมเพิ่มเติม : เจ้าหน้าที่ฝ่ายบริการการขาย โทร 02-868-0812 # 15-16 , E-Mail : Engineer@jarustee.com
 เลขที่ 63/14-15,67/35-36 ซอยเกษตรมน 7,7/1 ถนนเกษตรมน แขวงวัดท่าพระ เขตบางกอกใหญ่ กรุงเทพฯ 10600 โทร 02-868-0812-13 โทรสาร 02-868-1889



CERTIFICATE OF CALIBRATION

Certificate No. WS-03072021
Page 1 of 2 pages

Measurement Item	Cup anemometer with data logger
Manufacturer	Data logger: Novakyte, Cup anemometer: Novakyte.
Model/Type	Data logger: 200-WD-202L, Cup anemometer: WS-02P.
Serial Number	Data logger: A4985, Cup anemometer: -
El No.	Data logger: BM1 F00267.

Customer : 1. All laboratory group (Thailand co., Ltd.)
2. 104 Phattharalai 40, Phattharalai Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10260
Thailand.

Test Conditions	<ul style="list-style-type: none"> • Wind tunnel across bed section area • Annemometer friction area • Diameter of mounting pipe • Roughness ratio of test object 	900 100 - 0.111	cm ² cm ² mm []
Test Conditions	<ul style="list-style-type: none"> • Air temperature • Air pressure • Relative air humidity 	24.1 1006.3 60.8	°C hPa %RH


Calibration Procedure Calibration was carried out based on:
ISO 4140-12-1:2001, 2005Power Performance Measurements of Electricity Producing Wind
Turbines
IEA-WIND Task 27: Wind Turbine Calibration Procedures - Version 3, 2009;

Traceability This calibration documents its traceability to national standard, which realize the unit of measurements according to its international system of units (SI) through National Institute of Metrology (Thailand) (NIM).

Measurement Date
Issued Date

☒ **Yes, contact (normal)**



Approved Signature: 
M. Patricia Woodruff
Technical Support

THIS CERTIFICATE MAY NOT BE REPRODUCED EXCEPT WITH THE WRITTEN PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED BY WRITING FROM THE LABORATORIES

Continuation of Certificate of Calibration Number

Certificate No: WD-03072021
Page 2 of 2 pages

Result of calibration: ☐ without adjustment ☒ with adjustment

Calibration in the range of 1 ~ 15 m/s at a calibration interval of 1 m/s.
The results of calibration and associated measurement uncertainties are reported in the table below.

Y-axis Reading m/s	X-axis Reading m/s	Error m/s	Uncertainty (%)
0.00	0.00	0.00	0.4
0.10	0.10	0.00	0.4
0.20	0.20	0.00	0.4
0.30	0.30	0.00	0.4
0.40	0.40	0.00	0.4
0.50	0.50	0.00	0.4
0.60	0.60	0.00	0.4
0.70	0.70	0.00	0.4
0.80	0.80	0.00	0.4
0.90	0.90	0.00	0.4
1.00	1.00	0.00	0.4
1.10	1.10	0.00	0.4
1.20	1.20	0.00	0.4
1.30	1.30	0.00	0.4
1.40	1.40	0.00	0.4
1.50	1.50	0.00	0.4
1.60	1.60	0.00	0.4
1.70	1.70	0.00	0.4
1.80	1.80	0.00	0.4
1.90	1.90	0.00	0.4
2.00	2.00	0.00	0.4
2.10	2.10	0.00	0.4
2.20	2.20	0.00	0.4
2.30	2.30	0.00	0.4
2.40	2.40	0.00	0.4
2.50	2.50	0.00	0.4
2.60	2.60	0.00	0.4
2.70	2.70	0.00	0.4
2.80	2.80	0.00	0.4
2.90	2.90	0.00	0.4
3.00	3.00	0.00	0.4

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

Appendix 1: Instrumentation

NO	Sensor	Manufacturer	Model/Type	Calibration Date	Certificate Report Number	Range
1	Flow sensor	TEDEL	TEDEL-100	10/10/2020	MD-0010-20	0 ~ 30 m/s
2	Pressure sensor	TEDEL	TEDEL-100	10/10/2020	MD-0010-20	0 ~ 30 m/s
3	Air velocity sensor	TEDEL	TEDEL-100	10/10/2020	MD-0010-20	0 ~ 30 m/s
4	Temperature	TEDEL	TEDEL-100	10/10/2020	MD-0010-20	0 ~ 30 °C
5	Humidity	TEDEL	TEDEL-100	10/10/2020	MD-0010-20	0 ~ 100 %RH
6	Acceleration sensor	TEDEL	TEDEL-100	10/10/2020	MD-0010-20	0 ~ 100 m/s²
7	Flow sensor	TEDEL	TEDEL-100	10/10/2020	MD-0010-20	0 ~ 30 m/s



CERTIFICATE OF CALIBRATION

Certificate No: WD-03072021
Page 1 of 2 pages

Measurement Item: Wind direction sensor with data logger.

Manufacturer: Data logger: Novatek,
Wind direction sensor: Novatek.

Model/Type: Data logger: 2000-WB-000L,
Wind direction sensor: WB-000F.

Serial Number: Data logger: A4000,
Wind direction sensor: ~.

ID No: Data logger: RYD, P3000F,
Wind direction sensor: ~.

Address: ~ At ~ Laboratory group (Thailand) Co., Ltd.
104 Phatthanasak 40, Phatthanasak Rd, Phatthanasak Sub District, Bangkok 10250 Thailand.

Environmental Conditions:
The measurement was carried out in an ambient temperature of 23±0.5°C and relative humidity of 40±10%.

Measurement Method:
The wind direction sensor calibration according to comparison method with reference angle measurement electronic theodolite and the laser is used for axis control. The measurement was taken at 45° intervals in clockwise and counter-clockwise directions.

Note: The UAC was warmed up for 1 hour prior to the calibration being performed.

Traceability:

The measurement results are traceable to the international system of units (SI) through Certificate No: CC563-07-0045, Certificate No: KHL63-0044.

Measurement Item: ~ At ~, 0307
Issued Date: ~ At ~, 0301



Performed by:
☒ Mr. Sornwit Thachad
☐ Miss Chaiwit Wuthakarn

Approved Signature: ~
Mr. Pichak Boonchaisri,
Technical Support
and Calibration Manager

This certificate is valid for use only for the purpose stated on the certificate. It is not valid for use for any other purpose. It is not valid for use for any other purpose. It is not valid for use for any other purpose.

Continuation of Certificate of Calibration Number

Certificate No: WD-03072021
Page 2 of 2 pages

Result of calibration: ☐ without adjustment ☒ with adjustment

Calibration in the range of 0 ~ 360° at a calibration interval of 45°.
The results of calibration and associated measurement uncertainties are reported in the table below.

NO	Turning Direction	Nominal Angle (°)	Standard Reading (°)	UAC* Reading (°)	Error (°)	Uncertainty ±(°)
1	Clockwise	0/360	360	359	-1	3.0
2		45	45	45	-5	3.0
3		90	90	87	-3	3.0
4		135	135	132	-3	3.0
5		180	180	178	-2	3.0
6	Counter Clockwise	225	225	227	2	3.0
7		270	270	273	3	3.0
8		315	315	318	3	3.0
9		0/360	360	359	-1	3.0
10		45	45	42	-3	3.0
11	Clockwise	90	90	87	-3	3.0
12		135	135	132	-3	3.0
13		180	180	178	-2	3.0
14		225	225	227	2	3.0
15		270	270	273	3	3.0
16	Counter Clockwise	315	315	318	3	3.0
17		0/360	360	359	-1	3.0
18		45	45	42	-3	3.0
19		90	90	87	-3	3.0
20		135	135	132	-3	3.0

UAC* Ltd Under Calibration: The reported expanded uncertainty is based on standard uncertainty multiplied by a coverage factor $k=2$ providing a level of confidence of approximately 95%.



SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

45/1-45/11 Sinitiporn Rd, Bangchuan, Bangkok 10700 THAILAND
Tel: 0-2435-8100 Fax: 0-2433-1676 e-mail: cal@sitiporn.com http://www.sitiporn.com

Cert. No.: ACC21009
Pages: 1 of 3

Calibration Certificate

Equipment: SOUND CALIBRATOR
Manufacturer: RISON
Model: NC-74
Serial No.: 34178123
ID No.: RYO J50215

Condition As Found: GOOD

Customer: A.S. LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANASAK 40, PHATTHANASAK ROAD,
KIWAENG, PHATTHANASAK, SUB DISTRICT, BANGKOK, 10250 THAILAND

Location: ~
Ambient Temperature: (23.0 ± 0.3) °C
Pressure: (101.3 ± 0.1) kPa
Relative Humidity: (50.0 ± 2.0) %

Received Date: 05 AUGUST 2021
Calibration Date: 09 AUGUST 2021
Date of Issue: 11 AUGUST 2021

Calibrated by: ~
Nithakorn Pinitiporn

Approved by: ~
(Thanakorn Petchsri)

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

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No.: ACC21009
Job No.: VC64AC0058
Pages: 2 of 3

Calibration Procedure: CP-AC-03

Calibration Method:

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

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

Condition of this result of calibration:

1. Reference Standard Instruments:

Instrument	Model	Serial No.	Cert. No.	Exp. Date
Waveform Generator	33511B	MY53202742	EF-0011-21	10-Feb-22
Digital Multimeter	33461A	MY53201014	EEL-BP. 05/0264	10-Feb-22
Digital Multimeter	8846A	1997025	EEL-BP. 06/0264	05-Feb-22
Digital Multimeter	33461A	MY53201116	EEL-BP. 04/0264	10-Feb-22
Programmable Attenuator	MAT-1070	62100114	1500-07774E	08-Mar-22
Condenser Microphone	4180	2977900	AA-1008-21	05-Feb-22
Measuring Amplifier	NA-42KA	34560495	AA-3003-21	16-Feb-22
Audio Analyzer	AVR-3360A	V744B6069	EF-0019-21	10-Feb-22

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:

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

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No.: ACC21009
Job No.: VC64AC0058
Pages: 3 of 3

Result of calibration:

1. Sound pressure level

Specified sound pressure level (dB)	Measured value (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit (dB)
94	94.06	0.06	0.14	0.40

2. Frequency

Specified Frequency (Hz)	Measured value (Hz)	Deviated value (%)	Uncertainty (%)	Tolerance limit (%)
1000	1001.5	0.1	0.1	1.0

3. Total distortion

Measured value (%)	Uncertainty (%)	Tolerance limit (%)
1.67	0.10	3.0

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

End of Calibration Certificate

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

451/45/1 Sathorn Rd, Bangkok 10120 THAILAND
Tel: 02-435-8800 Fax: 02-435-1879 e-mail: sathorn@kplphom.com http://www.kplphom.com



Cert. No. : ACL22025
Job No. : VC65AC0040
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42; Microphone UC 52 / Pre-amplifier N11 24
Serial No.: 00734221 / 14526 / 34371
ID No.: RYG F50027

Condition As Found : GOOD

Customer : A/S LABORATORY GROUP (THAILAND) CO., LTD.
106 PHATTHANAKAN 46, PHATTHANAKAN ROAD,
KHUANG KHUANG PHATTHANAKAN, KHUANG KHUANG
BANGKOK, 10250 THAILAND.

Location :
Ambient Temperature : $\pm 23.0 \pm 3$ °C
Pressure : $\pm 101.3 \pm 3$ kPa
Relative Humidity : $\pm 50.0 \pm 20$ %

Received Date : 05 JANUARY 2022
Calibration Date : 10-12 JANUARY 2022
Date of Issue : 13 JANUARY 2022

REVIEW BY: [Signature]
APPROVED BY: [Signature]
NEXT CAL DATE: 10/1/23

Calibrated by : Natchorn Pongpattan

Approved by : [Signature]
(Thasakul Petchurai)

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

QP-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22025
Job No. : VC65AC0040
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.
For tests results of each item 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	EP-0012-21	10-Feb-22
Waveform Generator	33511B	MY53202742	EP-0011-21	10-Feb-22
Digital Multimeter	22461A	MY53202104	EEL-00-06-0264	10-Feb-22
Digital Multimeter	33461A	MY53202076	EEL-00-03-0264	08-Feb-22
Digital Multimeter	34461A	MY60024273	1-15180725251-1	15-Sep-22
Programmable Attenuator	MAT-1070	62100114	1500-07774E	08-Mar-22
Condenser Microphone	4180	2977900	AA-1008-21	05-Feb-22
Measuring Amplifier	NA-42KA1	34560495	AA-3003-21	16-Feb-22

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).

QP-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22025
Job No. : VC65AC0040
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings	✓	-	0.3	0.6
125 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings	✓	-	0.3	0.6
For 10 Hz to 4 kHz	✓	-	0.3	0.7
For > 4 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

QP-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22025
Job No. : VC65AC0040
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.96)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
16.2

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

Frequency Weighting	Measured value (dB)
A-weight	11.6
C-weight	18.0
Flat	23.9

3. Acoustical signal tests of frequency weightings

Meter free field acoustic response at a level of 94 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.5	0.5	0.6	±1.5
1000	0.0	0.0	0.1	±1.0
8000	-2.3	-1.3	-2.3	±5.0

QP-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22025
Job No. : VC65AC0040
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 Hz

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	0.0	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

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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	-0.1	±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	25.0	0.0	±1.1

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Continuation of Calibration Certificate

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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 _b (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	106.0	106.0	0.0	±2.5/±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	106.0	106.0	0.0	±2.5/±5.0
	200	800	127.4	127.4	0.0	±1.0
	0.25	1	99.0	99.8	-0.1	±1.5/±3.0
SEL	2	8	108.0	108.0	0.0	±2.0/±2.5
	200	800	128.0	128.1	0.1	±1.0

10. Peak C sound level

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	-
One	136.4	136.3	-0.1	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	135.0	135.0	0.0	-
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

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~ R.L.A.

Continuation of Calibration Certificate

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11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
88.2	89.6	0.1	±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

QF-TS12-04-04-020664

~ R.L.A.



451-451/1 Sithiporn Rd., Banghumsu, Bangkok Bangkok 10700 THAILAND
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Cert. No. : ACL21098
Page : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : SR-35 Microphone 15" x 5" / Pre-amplifier SR-34
Serial No. : 00472126 / 10M D / SR10
ID No. : RYU-150101

Condition As Found : GOOD

Customer : A/S LABORATORY GROUP (THAILAND) CO., LTD.
104 PHAT THANAKAN 40 PHAT THANAKAN ROAD,
KHWAENG PHATTHANAKAN, KHET SIKHA, LIANG,
BANGKOK, 10250 THAILAND

Location :
Ambient Temperature : 23.0 ± 3.1 °C
Pressure : 101.3 ± 3.1 kPa
Relative Humidity : 50.0 ± 20.3 %

REVIEW BY : [Signature]
APPROVED BY : [Signature]
NEXT CAL. DATE : 15/10/20

Received Date : 01 SEPTEMBER 2021
Calibration Date : 13-15 SEPTEMBER 2021
Date of Issue : 16 SEPTEMBER 2021

Calibrated by : [Signature] Natchanon Pongpauan

Approved by : [Signature]
(Thanakul Petchurai)

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QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL21098
Job No. : VC64AC086
Page : 2 of 8

Calibration Procedure : CP-VC-01

Calibration Method :

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

For tests results of each item 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	13210A	MY48017076	EF-0012-21	10-Feb-22
Waveform Generator	33511B	MY52302742	EF-0011-21	10-Feb-22
Digital Multimeter	33461A	MY53220104	EEL-BP-050204	10-Feb-22
Digital Multimeter	33461A	MY53220076	EEL-BP-030204	08-Feb-22
Digital Multimeter	8446A	1997023	EEL-BP-000204	05-Feb-22
Programmable Attenuator	MA1-1070	82100114	1500-077746	06-Mar-22
Condenser Microphone	4189	297590	AA-1006-21	05-Feb-22
Measuring Amplifier	NA-42K-A	34560495	AA-1003-21	16-Feb-22

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

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

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

QF-TS12-04-04-020664

~ R.L.A.

Continuation of Calibration Certificate

Cert. No. : ACL21098
Job No. : VC64AC086
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Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	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	0.75
12. High level stability	✓	-	0.1	0.1

QF-TS12-04-04-020664

~ R.L.A.

Continuation of Calibration Certificate

Cert. No. : ACL21098
Job No. : VC64AC086
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Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
93.9 (93.96)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
26.1

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	11.4
Flat	11.9

3. Acoustical signal tests of frequency weightings

Micro free-field acoustic response at a level of 94 dB

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
125	-1.8	-1.8	-1.8	±1.5
1000	0.0	0.0	0.0	±1.0
8000	0.4	0.5	0.5	±5.0

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~ R.L.A.

Continuation of Calibration Certificate

Cert. No. : ACL21098
Job No. : VC64AC0066
Pages : 5 of 6

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency (Hz)	Deviation from various Rooming + emitting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	-0.2	-0.1	+2.0
125	0.0	0.0	0.0	+1.5
250	0.0	0.0	-0.1	+1.5
500	0.0	0.0	-0.1	+1.5
1000	0.0	0.0	0.0	+1.0
2000	0.0	0.0	0.0	+2.0
4000	0.0	0.0	0.0	+3.0
8000	0.0	0.1	0.1	+5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long-term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	+0.3

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Continuation of Calibration Certificate

Cert. No. : ACL21098
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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
128.0	128.0	0.0	+1.1
127.0	127.0	0.0	+1.1
126.0	126.0	0.0	+1.1
125.0	125.0	0.0	+1.1
124.0	124.0	0.0	+1.1
123.0	123.0	0.0	+1.1
122.0	122.0	0.0	+1.1
121.0	121.0	0.0	+1.1
120.0	120.0	0.0	+1.1
119.0	119.0	0.0	+1.1
118.0	118.0	0.0	+1.1
117.0	117.0	0.0	+1.1
116.0	116.0	0.0	+1.1
115.0	115.0	0.0	+1.1
114.0	114.0	0.0	+1.1
113.0	113.0	0.0	+1.1
112.0	112.0	0.0	+1.1
111.0	111.0	0.0	+1.1
110.0	110.0	0.0	+1.1
109.0	109.0	0.0	+1.1
108.0	108.0	0.0	+1.1
107.0	107.0	0.0	+1.1
106.0	106.0	0.0	+1.1
105.0	105.0	0.0	+1.1
104.0	104.0	0.0	+1.1
103.0	103.0	0.0	+1.1
102.0	102.0	0.0	+1.1
101.0	101.0	0.0	+1.1
100.0	100.0	0.0	+1.1
99.0	99.0	0.0	+1.1
98.0	98.0	0.0	+1.1
97.0	97.0	0.0	+1.1
96.0	96.0	0.0	+1.1
95.0	95.0	0.0	+1.1
94.0	94.0	0.0	+1.1
93.0	93.0	0.0	+1.1
92.0	92.0	0.0	+1.1
91.0	91.0	0.0	+1.1
90.0	90.0	0.0	+1.1
89.0	89.0	0.0	+1.1
88.0	88.0	0.0	+1.1
87.0	87.0	0.0	+1.1
86.0	86.0	0.0	+1.1
85.0	85.0	0.0	+1.1
84.0	84.0	0.0	+1.1
83.0	83.0	0.0	+1.1
82.0	82.0	0.0	+1.1
81.0	81.0	0.0	+1.1
80.0	80.0	0.0	+1.1
79.0	79.0	0.0	+1.1
78.0	78.0	0.0	+1.1
77.0	77.0	0.0	+1.1
76.0	76.0	0.0	+1.1
75.0	75.0	0.0	+1.1
74.0	74.0	0.0	+1.1
73.0	73.0	0.0	+1.1
72.0	72.0	0.0	+1.1
71.0	71.0	0.0	+1.1
70.0	70.0	0.0	+1.1
69.0	69.0	0.0	+1.1
68.0	68.0	0.0	+1.1
67.0	67.0	0.0	+1.1
66.0	66.0	0.0	+1.1
65.0	65.0	0.0	+1.1
64.0	64.0	0.0	+1.1
63.0	63.0	0.0	+1.1
62.0	62.0	0.0	+1.1
61.0	61.0	0.0	+1.1
60.0	60.0	0.0	+1.1
59.0	59.0	0.0	+1.1
58.0	58.0	0.0	+1.1
57.0	57.0	0.0	+1.1
56.0	56.0	0.0	+1.1
55.0	55.0	0.0	+1.1
54.0	54.0	0.0	+1.1
53.0	53.0	0.0	+1.1
52.0	52.0	0.0	+1.1
51.0	51.0	0.0	+1.1
50.0	50.0	0.0	+1.1
49.0	49.0	0.0	+1.1
48.0	48.0	0.0	+1.1
47.0	47.0	0.0	+1.1
46.0	46.0	0.0	+1.1
45.0	45.0	0.0	+1.1
44.0	44.0	0.0	+1.1
43.0	43.0	0.0	+1.1
42.0	42.0	0.0	+1.1
41.0	41.0	0.0	+1.1
40.0	40.0	0.0	+1.1
39.0	39.0	0.0	+1.1
38.0	38.0	0.0	+1.1
37.0	37.0	0.0	+1.1
36.0	36.0	0.0	+1.1
35.0	35.0	0.0	+1.1
34.0	34.0	0.0	+1.1
33.0	33.0	0.0	+1.1
32.0	32.0	0.0	+1.1
31.0	31.0	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	25.0	0.0	+1.1

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Continuation of Calibration Certificate

Cert. No. : ACL21098
Job No. : VC64AC0066
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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. Time burst response

Time Weighting	Time burst duration, T _b (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	+5.5/-5.0
	2	8	117.0	117.0	0.0	+5.0/-5.0
	200	800	134.0	134.0	0.0	+4.0/-4.0
Slow	2	8	108.0	108.0	0.0	+5.5/-5.0
	200	800	127.6	127.6	0.0	+4.0/-4.0
	200	800	127.6	127.6	0.0	+4.0/-4.0
SEL	0.25	1	99.0	98.9	-0.1	+5.5/-5.0
	2	8	108.0	108.0	0.0	+5.0/-5.0
	200	800	128.0	128.0	0.0	+3.0/-3.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	135.8	-0.6	+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	-
Positive half cycle	135.4	135.1	-0.3	+2.0/-
Negative half cycle	135.4	135.1	-0.3	+2.0/-

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Continuation of Calibration Certificate

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Job No. : VC64AC0066
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11. Overload indication

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

12. High level stability

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

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

QF-TS12-04-04-020664

451/451/1 Srinakharin Rd., Bangkok, Bangkok 10700 THAILAND.
Tel: 0-2435-8800 Fax: 0-2431-1679 e-mail: calcenter@sithiporn.com http://www.sithiporn.com



Cert. No. : ACL22059
Page : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : SL-42 Microphone UC-02 / Pre-amplifier NH-24
Serial No. : 9074420 / 143272 / 34370
ID No. : RYO F36026

Condition As Found : GOOD

Customer : A.I.S. LABORATORY GROUP (THAILAND) CO., LTD.
404 PHATHANAKAN 40, PHATHANAKAN ROAD,
KHUAEANG PHATHANAKAN, KHEE SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location :
Ambient Temperature : 1 23.0 ± 0.1 °C
Pressure : 1 101.3 ± 0.1 kPa
Relative Humidity : 1 50.0 ± 2.0 %

Received Date : 14 JANUARY 2022
Calibration Date : 21-24 JANUARY 2022
Date of Issue : 25 JANUARY 2022

Calibrated by : Natchanon Pongpattana

Approved by : T. Petchai
Thanasak Petchai

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Continuation of Calibration Certificate

Cert. No. : ACL22059
Job No. : VC64AC0066
Pages : 2 of 8

Calibration Procedure : JIS A1103

Calibration Method :

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

For test results of each item were made by observation of all instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Exp. Date
Waveform Generator	33210A	MY4007076	EE-0012-21	10-Feb-22
Waveform Generator	33511B	MY3207242	EE-0011-21	10-Feb-22
Digital Multimeter	33461A	MY51220104	EEI-BP-18-0984	19-Feb-22
Digital Multimeter	33461A	MY51220076	EEI-BP-18-0984	19-Feb-22
Digital Multimeter	34401A	MY60624273	1-1910722231	19-Feb-22
Programmable Acoustics	MAT-170	6210114	1200-07746	06-Mar-22
Condenser Microphone	4180	2977960	AA-1008-21	05-Feb-22
Measuring Amplifier	NA-42KA	34560495	AA-3003-21	16-Feb-22

2. This result of calibration was based on accurate and stable standard 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).

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22059
Job No. : VCSAC0043
Page : 3 of 8

Summary of Measurement Result:

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty (dB)
1. Absolute sensitivity	✓	—	0.2	N/A
2. Self-generated noise	✓	—	0.3	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

QP-TS12-04-04-020664

T. B. L.

Continuation of Calibration Certificate

Cert. No. : ACL22059
Job No. : VCSAC0043
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Result of calibration:

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limits (dB)
93.9 (93.96)	93.9	-0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.6

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

Frequency Weighting	Measured value (dB)
A-weight	11.6
C-weight	17.8
Flat	23.7

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 94 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			Acceptance Limits
	Flat	C-weight	A-weight	
125	0.3	0.3	0.3	±1.5
1000	0.0	0.0	0.0	±1.0
8000	-1.6	-1.5	-1.5	±5.0

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Continuation of Calibration Certificate

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4. Electrical signal tests of frequency weightings

Weighting network response with relative to (dB)

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			Acceptance Limits
	Flat	C-weight	A-weight	
63	0.0	0.0	0.0	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.4
500	0.0	0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long-term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.3

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T. B. L.

Continuation of Calibration Certificate

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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
29.0	29.0	0.0	±1.1
24.0	24.0	0.0	±1.1
19.0	19.0	0.0	±1.1
14.0	14.0	0.0	±1.1
9.0	9.0	0.0	±1.1
4.0	4.0	0.0	±1.1

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T. B. L.

Continuation of Calibration Certificate

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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 _b (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	-1.2, -2.0
	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	-1.2, -2.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	99.9	+0.9	-1.5, -3.0
GTL	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 (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	—
One	136.4	136.1	-0.3	±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	—
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

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T. B. L.

Continuation of Calibration Certificate

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11. Overload indication

Measured value (dB)		Desired Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.6	89.7	0.1	±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, provides level of confidence of approximately 95 %

End of Calibration Certificate

QP-TS12-04-04-020664

T. B. L.



Calibration Certificate

Equipment: SOUND LEVEL METER
Manufacturer: RION
Model: NL-42 Microphone UC-52 / Preampifier NH-24
Serial No.: 0881305 / 17159 / 73332
ID No.: RYG_J50381

Condition As Found: GOOD

Customer: ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN 40 PHATTHANAKAN ROAD,
KHUANG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location:
Ambient Temperature: $\pm 23.0 \pm 3.1$ °C
Pressure: $\pm 101.3 \pm 3.1$ kPa
Relative Humidity: $\pm 50.0 \pm 20.1$ %

Received Date: 06 JULY 2021
Calibration Date: 07-08 JULY 2021
Date of Issue: 13 JULY 2021

Calibrated by: Natsakorn Pitsuppan

Approved by: *T. Petchum*
(Thanakul Petchum)

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Continuation of Calibration Certificate

Cert. No.: ACL21008
Job No.: VC64AC0052
Page: 2 of 8

Calibration Procedure: N/A

Calibration Method:

This equipment was calibrated by hand 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 Acoustic 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	33240C	ADP46017078	TF-0012-21	19-Feb-22
Waveform Generator	33511E	MY53200742	TF-0013-21	10-Feb-22
Digital Multimeter	33401A	MY53220104	EEL-200-050264	10-Feb-22
Digital Multimeter	33401A	MY53220076	EEL-200-050264	10-Feb-22
Digital Multimeter	33401A	MY53220116	EEL-200-050264	10-Feb-22
Programmable Antenna	MAT-1019	82100114	1500-077746	06-Mar-22
Condenser Microphone	A180	2977000	AA-1008-21	05-Feb-22
Measuring Amplifier	NA-42KA1	34560495	AA-2003-21	16-Feb-22

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 units maintained at:

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

QP-TS12-04-04-02064

Continuation of Calibration Certificate

Cert. No.: ACL21008
Job No.: VC64AC0052
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Summary of Measurement Result:

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings	✓	-	-	-
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings	✓	-	-	-
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	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. Time burst response	✓	-	0.2	0.3
10. Peak C-weighted level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High-level stability	✓	-	0.1	0.1

QP-TS12-04-04-02064

Continuation of Calibration Certificate

Cert. No.: ACL21008
Job No.: VC64AC0052
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Result of calibration:

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.90)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
13.8

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

Frequency Weighting	Measured value (dB)
A-weight	5.9
C-weight	6.5
Flat	22.1

3. Acoustical signal tests of frequency weightings

Mean free-field acoustic response at a level of 93 dB

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
125	0.4	0.4	0.4	±1.5
1000	-0.1	-0.1	-0.1	±1.0
6000	0.2	0.8	0.0	±2.0

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Continuation of Calibration Certificate

Cert. No.: ACL21008
Job No.: VC64AC0052
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4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	-0.1	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long-term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.3

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Continuation of Calibration Certificate

Cert. No.: ACL21008
Job No.: VC64AC0052
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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	±1.3
136.0	136.0	0.0	±1.3
135.0	135.0	0.0	±1.4
134.0	134.0	0.0	±1.4
133.0	133.0	0.0	±1.4
132.0	132.0	0.0	±1.3
131.0	131.0	0.0	±1.3
129.0	129.0	0.0	±1.3
124.0	124.0	0.0	±1.3
119.0	119.0	0.0	±1.3
114.0	114.0	0.0	±1.3
109.0	109.0	0.0	±1.3
104.0	104.0	0.0	±1.3
99.0	99.0	0.0	±1.3
94.0	94.0	0.0	±1.3
89.0	89.0	0.0	±1.3
84.0	84.0	0.0	±1.3
79.0	79.0	0.0	±1.3
74.0	74.0	0.0	±1.3
69.0	69.0	0.0	±1.3
64.0	64.0	0.0	±1.3
59.0	59.0	0.0	±1.3
54.0	53.9	-0.1	±1.3
49.0	49.0	0.0	±1.3
44.0	44.0	0.0	±1.3
39.0	38.9	-0.1	±1.3
34.0	33.9	-0.1	±1.3
29.0	28.9	-0.1	±1.3
24.0	23.9	-0.1	±1.3
19.0	18.8	-0.2	±1.3
14.0	13.8	-0.2	±1.3

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Continuation of Calibration Certificate

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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 _b (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, Leq(dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	136.0	-0.4	±1.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
C continuous	133.0	133.0	0.0	-
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

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Continuation of Calibration Certificate

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Job No. : VC6AAC0052
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11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.8	89.2	-0.3	±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

QP-TS12-04-04-020664

451/451/1 Sithiporn Rd., Bangphum, Bangkok Bangkok 10700 THAILAND
Tel: 0-2419-8806 Fax: 0-2421-1629 e-mail: cal@siha.com http://www.sithiporn.comCert. No. : ACL21069
Page : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42; Microphone UC-52 / Pre-amplifier J01-24
Serial No. : 00873109 / 171842 / 73485
ID No. : RVG-P03044

Condition As Found : GOOD

Customer : AES LABORATORY GROUP (THAILAND) CO., LTD.
101 PHAT THANMAN 40, PHAT THANMAN ROAD,
KHAENG PHOTTHANAKAN, KHET SUAN LUANG,
BANGKOK 10250 (THAILAND)

Location :
Ambient Temperature : 1 23.0 ± 3) °C
Pressure : 1 101.3 ± 3) kPa
Relative Humidity : 1 50.0 ± 20) %
Received Date : 06 JULY 2021
Calibration Date : 07-08 JULY 2021
Date of Issue : 13 JULY 2021

REVIEW BY : *Pichon P.*
APPROVED BY : *T. Petch.*
NEXT CAL DATE : 7/1/22

Calibrated by : Nollakorn Pongmanee

Approved by : *T. Petch.*
(Thanakul Petchurak)

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Continuation of Calibration Certificate

Cert. No. : ACL21069
Job No. : VC6AAC0052
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Calibration Procedure : CP-A0-01

Calibration Method :

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

For tests results of each item were made by observation of each instrument 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	MY48013056	EP-0012-21	10-Feb-22
Waveform Generator	33511E	MY5320742	EP-0011-21	10-Feb-22
Digital Multimeter	35461A	MY5320104	EEL-0P_058064	10-Feb-22
Digital Multimeter	33461A	MY5320076	FEL-0P_031064	08-Feb-22
Digital Multimeter	33461A	MY5320118	EEL-0P_040264	10-Feb-22
Programmable Attenuator	MAT-100	42100113	1509-07774E	08-Mar-22
Condenser Microphone	4180	2977900	AA-1008-21	05-Feb-22
Measuring Amplifier	NA-42KA	34560495	AA-3003-21	16-Feb-22

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

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

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

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Continuation of Calibration Certificate

Cert. No. : ACL21069
Job No. : VC6AAC0052
Page : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings	✓	-	0.3	0.6
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	✓	-	0.3	0.6
For 10 Hz to 4 kHz	✓	-	0.3	0.7
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
5. Frequency and time weightings at 1 kHz	✓	-	0.2	1.0
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	0.25
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.3

QP-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL21069
Job No. : VC6AAC0052
Page : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
92.9 (92.9)	92.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
15.4

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

Frequencies Weighting	Measured value (dB)
A-weight	12.9
C-weight	12.7
Flat	25.1

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 94 dB

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
125	0.5	0.4	0.4	±1.5
1000	-0.1	-0.1	-0.1	±1.0
8000	-1.9	-1.9	-2.0	±2.0

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Continuation of Calibration Certificate

Cert. No. : ACL121069
Job No. : VCBAAC0052
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
40	0.3	-0.3	-0.3	±0.5
125	0.3	0.3	0.3	±1.5
250	0.2	0.2	0.1	±1.5
500	0.1	0.1	0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	-0.1	-0.1	-0.1	±3.0
8000	-0.1	-0.1	-0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long-term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.3

QP-TS12-04-04-020664

T. Petchur

Continuation of Calibration Certificate

Cert. No. : ACL121069
Job No. : VCBAAC0052
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±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
29.0	29.0	0.0	±1.1
24.0	24.0	0.0	±1.1
19.0	19.0	0.0	±1.1
14.0	14.0	0.0	±1.1
9.0	9.0	0.0	±1.1

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T. Petchur

Continuation of Calibration Certificate

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Job No. : VCBAAC0052
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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	±1.3

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	127.0	127.0	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	128.1	0.1	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Leqpeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±1.0
One	136.4	135.4	-1.0	±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	±1.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

QP-TS12-04-04-020664

T. Petchur

Continuation of Calibration Certificate

Cert. No. : ACL121069
Job No. : VCBAAC0052
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11. Overload Indication

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

QP-TS12-04-04-020664

T. Petchur

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Tel:0-2435-8800 Fax:0-2431-1679 e-mail:cal-center@itiporn.com http://www.itiporn.com



Cert. No. : ACL121069
Job No. : VCBAAC0052
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Pre-amplifier NH-24
Serial No. : 01073423 / 160411 / 71684
ID No. : RYG JS0380

Condition As Found : GOOD

Customer : A.S. LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATHANAKAN RD. PHATHANAKAN ROAD,
KHUWADNO PHATHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND

Location :
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 2.3) kPa
Relative Humidity : (50.0 ± 20.1) %

Received Date : 06 JULY 2021
Calibration Date : 07-08 JULY 2021
Date of Issue : 13 JULY 2021

Calibrated by : Natchanon Pitsuraporn

Approved by : T. Petchur
(Thanakul Petchur)

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

QP-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL121069
Job No. : VCBAAC0052
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2019) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with A-weighting chamber and Reference
Standard Instruments.

For test results of each item were made by observation of test 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	IF-0012-21	10-Feb-22
Waveform Generator	33311B	MY52302742	IF-0011-21	10-Feb-22
Digital Multimeter	3246A	MY53220704	EEL-BP-059264	10-Feb-22
Digital Multimeter	3340A	MY53220076	EEL-BP-034268	06-Feb-22
Digital Multimeter	3340A	MY53220110	EEL-BP-040264	10-Feb-22
Programmable Attenuator	MAT-1001	62150114	1500-077748	08-Mar-22
Condenser Microphone	-4180	2977900	AA-1008-21	03-Feb-22
Measuring Amplifier	NA-42KA	34504485	AA-3003-21	16-Feb-22

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 as :

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

QP-TS12-04-04-020664

T. Petchur

Continuation of Calibration Certificate

Cert. No. : AUL21007
Job No. : VC64AC0052
Pages : 3 of 8

Summary of Measurement Result:

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.2	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. Time 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

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : AUL21007
Job No. : VC64AC0052
Pages : 4 of 8

Result of calibration:

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.96)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
34.9

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

Frequency Weighting	Measured value (dB)
A-weight	33.6
C-weight	29.2
Flat	25.8

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 64 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.2	0.2	0.3	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	1.2	1.3	1.3	± 5.0

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : AUL21007
Job No. : VC64AC0052
Pages : 5 of 8

3. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	0.0	± 2.0
125	0.0	0.0	0.0	± 1.3
250	0.0	0.0	0.0	± 1.5
500	0.0	0.1	0.0	± 1.5
1000	0.0	0.0	0.0	± 1.0
2000	0.0	0.1	0.0	± 2.0
4000	0.0	0.1	0.0	± 3.0
8000	0.1	0.1	0.1	± 5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long-term stability

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

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : AUL21007
Job No. : VC64AC0052
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.3
133.0	133.0	0.0	± 1.3
132.0	132.0	0.0	± 1.3
131.0	131.0	0.0	± 1.3
129.0	129.0	0.0	± 1.3
124.0	124.0	0.0	± 1.3
119.0	119.1	0.1	± 1.3
114.0	114.0	0.0	± 1.3
109.0	109.0	0.0	± 1.3
104.0	104.1	0.1	± 1.3
99.0	99.0	0.0	± 1.3
94.0	94.0	0.0	± 1.3
89.0	89.0	0.0	± 1.3
84.0	84.0	0.0	± 1.3
79.0	79.0	0.0	± 1.3
74.0	74.0	0.0	± 1.3
69.0	69.0	0.0	± 1.3
64.0	64.0	0.0	± 1.3
59.0	59.0	0.0	± 1.3
54.0	54.0	0.0	± 1.3
49.0	49.0	0.0	± 1.3
44.0	44.0	0.0	± 1.3
39.0	39.0	0.0	± 1.3
34.0	34.0	0.0	± 1.3
30.0	29.9	-0.1	± 1.3
26.0	26.0	0.0	± 1.3
28.0	27.9	-0.1	± 1.3
27.0	26.9	-0.1	± 1.3
26.0	25.9	-0.1	± 1.3
25.0	24.9	-0.1	± 1.3

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Continuation of Calibration Certificate

Cert. No. : AUL21007
Job No. : VC64AC0052
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	± 1.3

9. Time burst response

Time Weighting	Time burst duration, T _b (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	108.0	0.0	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	0.25	1	108.0	108.0	0.0	1.5 ~ -5.0
	2	8	108.0	108.0	0.0	± 1.0
	200	800	127.6	127.8	0.2	± 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	128.1	0.1	± 1.0

10. Peak C sound level

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	-
One	136.4	135.6	-0.8	± 1.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
Positive half cycle	133.4	135.1	+1.7	± 2.0
Negative half cycle	135.4	135.1	-0.3	± 2.0

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : AUL21007
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11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limit (dB)
Positive one-half cycle	Negative one-half cycle		
90.6	90.7	0.1	± 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

QF-TS12-04-04-020664



**ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT**

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Phraek Sa, Muang Samut Prakan, Samut Prakan 10280
Tel: +66 2709 4860-8 Fax: +66 2324 0917-8



Certificate No.: 02265V21
Operation No.: CP2021050036

Certificate of Calibration

Equipment: Sound Level Meter
Manufacturer: RION
Model/Type: NL-42 (Meter), UC-S2 (Microphone), N8-24 (Preamplifier)
Serial No.: 00572561 (Meter), 170398 (Microphone), 72899 (Preamplifier)
ID No.: RVG_F50300
Customer: ALS Laboratory Group(Thailand) Co.,Ltd.
Address: 104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan
Khet Suan Luang, Bangkok 10250 Thailand
Received Date: 28 May 2021
Calibrated Date: 4 - 9 June 2021
Issued Date: 11 June 2021
Calibrated by: Ms. Juntaporn Kunhalom

REVIEW BY *Maniam P.*

APPROVED BY *[Signature]*


NEXT CAL DATE *4/6/28*




Approved by:
(Mr. Sittichai Srirachakulchai)
Group Manager, Calibration Section

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor k = 2.00, providing a level of confidence of approximately 95%. This certificate may not be reproduced other than in full except with the prior written approval of the Electrical and Electronics Institute, Foundation for Industrial Development.

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**ELECTRICAL AND ELECTRONICS INSTITUTE
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Certificate No.: 02265V21

Calibration Report


Equipment: Sound Level Meter
Manufacturer: RION
Model/Type: NL-42 (Meter), UC-S2 (Microphone), N8-24 (Preamplifier)
Serial No.: 00572561 (Meter), 170398 (Microphone), 72899 (Preamplifier)
ID No.: RVG_F50300
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Pressure: (101.3 ± 1.5) kPa
Method of Calibration > IEC 61672-3:2013.
Condition of this result of calibration
1. Reference standards instrument >
2. This result of calibration was found accurate as shown on date and place of calibration only.
3. This certification is traceable to the international system of unit maintained at >
Reference standards instrument for Acoustic function
- National Institute of Metrology (Thailand)
Reference standards instrument for Electrical function
- National Institute of Metrology (Thailand)
- Electrical and Electronics Institute, ONSC Accredited Calibration No.0119

Result of Calibration:
Function : 1. Indication at the calibration check frequency


Reference	Measured value	Deviation	Acceptance limits
Acoustic Signal (dB)	94.0	0.0	±1.0

Note: Absolute sensitivity was established by the use of the Sound Calibrator RION Type NC-74 S/N : 34613278.

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**ELECTRICAL AND ELECTRONICS INSTITUTE
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Certificate No.: 02265V21

Calibration Report

Function : 2. Self-generated Noise
2.1 Microphone installed

Measured value
(dB)
18.7

2.2 Microphone replaced by the electrical input signal device

Frequency	Measured value
Weighting	(dB)
A-weighting	12.0
C-weighting	18.4
Z-weighting	23.7

Function : 3. Acoustical signal tests of frequency weightings (Without Windscreen)
Meter free-field acoustic response at a level of 94 dB

Frequency	C-Weighting	A-Weighting	Z-Weighting	Acceptance limits
(Hz)	(dB)	(dB)	(dB)	(dB)
125	0.5	0.3	0.5	±1.5
1000	0.0	0.3	0.0	±1.0
8000	-0.8	-0.3	-0.9	±5.0


Function : 4. Electrical signal tests of frequency weightings
Weighting network response with relative to 1 kHz

Frequency	C-Weighting	A-Weighting	Z-Weighting	Acceptance limits
(Hz)	(dB)	(dB)	(dB)	(dB)
63	-0.1	0.3	-0.1	±2.0
125	0.0	-0.2	0.0	±1.5
250	0.0	-0.1	0.0	±1.5
500	0.0	-0.1	0.0	±1.5
1000	0.0	0.3	0.0	±1.0
2000	0.0	0.3	0.0	±2.0
4000	0.0	0.3	0.0	±1.0
8000	0.1	0.3	0.0	±5.0


Function : 5. Frequency and time weighting at 1 kHz
5.1 Frequency weighting at 1 kHz

Frequency	Measured value	Deviated value	Acceptance limits
Weighting	(dB)	(dB)	(dB)
C-weighting	94.0	0.0	±0.2
A-weighting	94.0	0.0	±0.2
Z-weighting	94.0	0.0	±0.2

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**ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT**



Certificate No.: 02265V21

Calibration Report

5.2 Time weighting at 1 kHz

Time Weighting	Measured value	Deviated value	Acceptance limits
Value (dB)	(dB)	(dB)	(dB)
Fast	94.0	0.0	±0.1
Slow	94.0	0.0	±0.1
LAE	94.0	0.0	±0.1

Function : 6. Long-Term Stability
Long-term stability over 30 minutes, with steady 1 kHz signal at reference level.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
30	94.0	94.0	0.0	±0.3


Function : 7. Level Linearity on the reference level range
7.1 Level Linearity on the reference level range, Upper

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±1.1
99.0	99.0	0.0	±1.1
104.0	104.0	0.0	±1.1
109.0	109.0	0.0	±1.1
114.0	114.0	0.0	±1.1
119.0	119.0	0.0	±1.1
124.0	124.0	0.0	±1.1
129.0	129.0	0.0	±1.1
130.0	130.0	0.0	±1.1
131.0	131.0	0.0	±1.1
132.0	132.0	0.0	±1.1
133.0	133.0	0.0	±1.1
134.0	134.0	0.0	±1.1
135.0	135.0	0.0	±1.1
136.0	136.0	0.0	±1.1
137.0	137.0	0.0	±1.1


7.2 Level Linearity on the reference level range, Lower

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
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

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**ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT**



Certificate No.: 02265V21

Calibration Report

7.2 Level Linearity on the reference level range, Lower (Cont.)

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
24.0	24.0	0.0	±1.1
49.0	49.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
34.0	33.9	-0.1	±1.1
29.0	28.8	-0.2	±1.1
24.0	24.0	0.0	±1.1

Function : 8. Tone burst response

Time Weighting	Tone burst duration, T _b (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	2	105.0	0.0	+1.0 ; -2.5
	0.25	99.9	-0.1	+1.5 ; -5.0
	200	115.6	0.0	±1.0
Slow	2	100.0	0.0	+1.0 ; -5.0
	0.25	120.0	0.0	±1.0
	2	100.0	0.0	+1.0 ; -2.5
LAE	0.25	90.9	-0.1	+1.5 ; -5.0


Function : 9. Peak C sound level

Number of cycles in test signal	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Complete cycle	125.4	125.2	-0.2	±3.0
Positive half cycle	124.4	124.1	-0.3	±2.0
Negative half cycle	124.4	124.1	-0.3	±2.0


Function : 10. Overload Indication

Positive one-half cycle	Negative one-half cycle	Deviated value (dB)	Acceptance limits (dB)
139.4	139.4	0.0	±1.3

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**ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT**



Certificate No.: 02265V21

Calibration Report

Function : 11. High-Level Stability
High-level stability over 5 minutes, with steady 1 kHz signal, 1 dB below upper boundary.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
5	129.0	129.0	0.0	±0.3

Uncertainty of measurement

Function	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1) Indication at the calibration check frequency	0.30	Not applicable
2) Self-generated Noise	0.10	Not applicable
3) Acoustical signal tests of frequency weightings - Free-field sound pressure response level	0.30	0.60 (10Hz to 6kHz) 0.70 (>6kHz to 10kHz)
4) Electrical signal tests of frequency weightings	0.20	0.20
5) Frequency and time weighting at 1 kHz	0.20	0.20
6) Long-Term Stability	0.10	0.10
7) Level Linearity on the reference level range	0.30	0.30
8) Tone burst response	0.20	0.30
9) Peak C sound level	0.20	0.35
10) Overload indication	0.20	0.25
11) High-Level Stability	0.10	0.10

Remarks:
1. The acceptance limit is for the deviated value.
2. Acceptance limits was IEC61672-3:2013 Class 2.

-- End of Report --

Page 6 of 6

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

851-81711 Srinakharin Rd., Bangna, Bangkok 10700 THAILAND
Tel:0-2435-8800 Fax:0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.com



Cert. No. : ACC22001
Page : 1 of 3

Calibration Certificate

Equipment : SOUND CALIBRATOR
Manufacturer : RION
Model : NC-54
Serial No. : 35002736
ID No. : 1-1-1-1-1

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHAT THANAKAN RD. PHAT THANAKAN ROAD,
KHUANG PHA THANAKAN, KHUAT SUAN LIANG,
BANGKOK, 10256 THAILAND.

Location :
Ambient Temperature : $\pm 23.0 \pm 1.1$ °C
Pressure : $\pm 101.3 \pm 3.3$ kPa
Relative Humidity : $\pm 50.0 \pm 2.0$ %

Received Date : 08 JANUARY 2022
Calibration Date : 10 JANUARY 2022
Date of Issue : 13 JANUARY 2022

Calibrated by : Nathakorn Pimpasarn

Approved by : T. Petchumai
(Thanakul Petchumai)

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QF-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACC22001
Job No. : VC65AC0040
Page : 2 of 3

Calibration Procedure : CP-AC-03

Calibration Method :

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

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33511B	MY32302742	1-1-1-1-1	10-Feb-22
Digital Multimeter	33461A	MY3230104	EEL-BP. 05-0264	10-Feb-22
Digital Multimeter	33461A	MY3230076	EEL-BP. 05-0264	08-Feb-22
Digital Multimeter	33461A	MY60024273	1-1-1-1-1	15-Sep-22
Programmable Attenuator	MAT-1070	62100114	1504-077746	08-Mar-22
Condenser Microphone	4180	2977980	AA-1008-21	05-Feb-22
Measuring Amplifier	NA-42KAJ	34560495	AA-3005-21	16-Feb-22
Audio Analyzer	AVR-3560A	V74406069	EP-0010-21	10-Feb-22

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).

QF-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACC22001
Job No. : VC65AC0040
Page : 3 of 3

Result of calibration :

1. Sound pressure level

Specified sound pressure level (dB)	Measured value (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit (dB)
94	93.99	-0.01	0.14	0.40

2. Frequency

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

3. Total distortion

Measured value (%)	Uncertainty (%)	Tolerance limit (%)
0.28	0.40	3.0

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

End of Calibration Certificate

QF-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

451-45171 Srinakharin Rd., Bangna, Bangkok 10700 THAILAND
Tel:0-2435-8800 Fax:0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.com



Cert. No. : ACC22001
Page : 1 of 3

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Pre-amplifier NH-24
Serial No. : 0122716 / 143832 / 22763
ID No. : RYO_TSR020

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHAT THANAKAN RD. PHAT THANAKAN ROAD,
KHUANG PHAT THANAKAN, KHUAT SUAN LIANG,
BANGKOK, 10256 THAILAND.

Location :
Ambient Temperature : $\pm 23.0 \pm 1.1$ °C
Pressure : $\pm 101.3 \pm 3.3$ kPa
Relative Humidity : $\pm 50.0 \pm 2.0$ %

Received Date : 08 JANUARY 2022
Calibration Date : 10-12 JANUARY 2022
Date of Issue : 13 JANUARY 2022

Calibrated by : Nathakorn Pimpasarn

Approved by : T. Petchumai
(Thanakul Petchumai)

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SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACC22001
Job No. : VC65AC0040
Page : 2 of 3

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (20:3) Standard for sound level meter (SLM).
The SLM had tests in Acoustical and Electrical signal tests of frequency weighting with Acoustic chamber and Reference Standard Instruments.

For tests results of each item 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	1-1-1-1-1	10-Feb-22
Waveform Generator	33511B	MY5302742	ET-0011-21	10-Feb-22
Digital Multimeter	33461A	MY3230194	EEL-BP. 05-0264	10-Feb-22
Digital Multimeter	33461A	MY3230076	EEL-BP. 05-0264	08-Feb-22
Digital Multimeter	33461A	MY60024273	1-1-1-1-1	15-Sep-22
Programmable Attenuator	MAT-1070	62100114	1504-077746	08-Mar-22
Condenser Microphone	4180	2977980	AA-1008-21	05-Feb-22
Measuring Amplifier	NA-42KAJ	34560495	AA-3005-21	16-Feb-22

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

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

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

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SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACC22001
Job No. : VC65AC0040
Page : 3 of 3

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	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

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22001
Job No. : VC65AC0040
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.96)	92.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.6

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

Frequency Weighting	Measured value (dB)
A-weight	12.6
C-weight	19.2
Flat	24.6

3. Acoustical signal tests of frequency weightings

Mean free-field acoustic response at a level of 94 dB

Frequency (Hz)	Deviation from chosen frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.7	0.1	0.1	±1.0
1000	0.0	0.0	0.0	±1.0
8000	-2.1	-1.0	-2.0	±5.0

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T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL22001
Job No. : VC65AC0040
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
43	0.0	0.0	-0.1	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	-0.1	0.0	±5.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long-term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.3

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T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL22001
Job No. : VC65AC0040
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
127.0	127.0	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
110.0	109.0	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	38.8	-0.1	±1.1
34.0	34.0	0.0	±1.1
29.0	29.9	0.1	±1.1
24.0	26.9	-0.1	±1.1
19.0	27.9	-0.1	±1.1
14.0	26.9	-0.1	±1.1
9.0	25.9	-0.1	±1.1
4.0	24.8	-0.2	±1.1

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T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL22001
Job No. : VC65AC0040
Pages : 7 of 8

8. Level linearity including the level range control

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

9. Time burst response

Time Weighting	Time burst duration, Ds (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	106.0	107.0	0.1	±2.1; ±5.0
	2	8	117.0	117.0	0.0	±0.1; ±2.3
	200	800	134.0	134.1	0.1	±1.0
Slow	0.25	1	106.0	106.0	0.0	±2.1; ±5.0
	2	8	127.6	127.6	0.0	±1.0
	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	106.0	106.0	0.0	±1.0; ±2.5
	200	800	126.0	126.1	0.1	±1.0

10. Peak C sound level

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	-
One	136.4	136.3	-0.1	±1.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.1	0.1	-
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

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T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL22001
Job No. : VC65AC0040
Pages : 8 of 8

11. Overload indication

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

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	137.0	137.0	0.0	±0.2

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

QF-TS12-04-04-020664

T. Petch

TS1-45/17 SITHIPORN RD., Bangthong, Bangkok 10710 THAILAND
Tel:0-2435-8800 Fax:0-2431-1670 e-mail:service@sithiporn.com http://www.sithiporn.com



Cert. No. : ACL22001
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 Microphone UC-52 / Pre-amplifier NH-24
Serial No. : 00298517 / 179124 / 87527
ID No. : RYO-F50434

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHAKARAN 40, PHATTHAKARAN ROAD,
KHUANG PHATTHAKARAN, KHUANG SUAN LUANG,
BANGKOK, 10250 THAILAND

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

Received Date : 14 JANUARY 2022
Calibration Date : 21-24 JANUARY 2022
Date of Issue : 25 JANUARY 2022

Calibrated by : Nuthakorn Petchum

Approved by : T. Petch
(Thanakul Petchum)

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Continuation of Calibration Certificate

Cert. No. : ACL22087
Job No. : VC65AC0843
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by tested 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 Anchoic chamber and Reference Standard Instruments.

For tests results of each item 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.	Exp. Due
Waveform Generator	33210A	MY48012076	ET-0012-21	10-Feb-22
Waveform Generator	33511B	MY53202742	ET-0011-21	10-Feb-22
Digital Multimeter	34461A	MY5320104	EEL-BP-05/0264	10-Feb-22
Digital Multimeter	32461A	MY53207476	CEL-BP-02/0363	09-Feb-22
Digital Multimeter	34461A	MY60034273	1-15180723251-7	15-Sep-22
Programmable Attenuator	MAT-100	62100114	1500-07774E	08-Mar-22
Condenser Microphone	4180	2977000	AA-1068-21	05-Feb-22
Measuring Amplifier	NA-42Ka	3456405	AA-3003-21	16-Feb-22

2. This result of calibration was found accurate as shown in line 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).

QP-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22087
Job No. : VC65AC0843
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓		0.2	N/A
2. Self-generated noise	✓		0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓		0.3	0.6
1000 Hz	✓		0.3	0.6
8000 Hz	✓		0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓		0.3	0.6
For > 4 kHz to 10 kHz	✓		0.3	0.7
For > 10 kHz to 20 kHz	-		-	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. Time burst response	✓		0.2	0.3
10. Peak C sound level	✓		0.2	0.3
11. Overload indication	✓		0.2	0.25
12. High level stability	✓		0.3	0.1

QP-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22087
Job No. : VC65AC0843
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.96)	93.9	0.0	±0.3

2. Self-generated noise

2.1. Normal test

Measured Value (dB)
15.4

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

Frequency Weighting	Measured value (dB)
A-weight	11.6
C-weight	17.7
Flat	23.4

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 94 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance limits
125	0.1	0.1	0.1	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	0.6	0.7	0.7	± 5.0

QP-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22087
Job No. : VC65AC0843
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	-0.1	0.0	±2.0
125	0.0	0.1	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±2.0
4000	0.0	0.1	0.0	±2.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long-term stability

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

QP-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22087
Job No. : VC65AC0843
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±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	104.1	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	39.0	0.0	±1.1
34.0	34.0	0.0	±1.1
29.0	29.0	0.0	±1.1
24.0	24.0	0.0	±1.1
19.0	19.0	0.0	±1.1
14.0	14.0	0.0	±1.1
9.0	9.0	0.0	±1.1
4.0	4.0	0.0	±1.1

QP-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22087
Job No. : VC65AC0843
Pages : 7 of 8

8. Level linearity including the level range control

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

9. Time burst response

Time Weighting	Time burst duration, T _b (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Average Limit (dB)
Fast	0.25	1	109.0	109.0	0.0	±3.5
	2	8	117.0	117.0	0.0	±2.5
	200	300	134.0	134.1	0.1	±1.0
Slow	0.25	8	109.0	109.0	0.0	±5.5
	200	300	127.6	127.6	0.0	±1.0
	2	8	109.0	109.0	0.0	±2.5
SEL	200	300	128.0	128.1	0.1	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	173.0	173.0	0.0	±0.5
One	176.4	176.3	-0.1	±1.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	135.0	135.0	0.0	±2.0
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

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Cert. No. : ACL22058
Job No. : VC65AC0043
Pages : 9 of 9

11. Overall indication

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

12. High level stability

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

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

QP-TS12-04-04-020664

T. Petchum

431-431/1 Srinthorn Rd., Banghumi, Bangkok 10700 THAILAND
Tel: 0-2433-8800 Fax: 0-2433-8679 e-mail: cal-center@sithiporn.com http://www.sithiporn.com



Cert. No. : ACL22058
Job No. : VC65AC0043
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 Microphone UC-52 / Pre-amplifier NH-24
Serial No. : 00296518 / 179118 / 87525
ID No. : RYG-1790431

Condition As Found : GOOD

Customer : A.S. LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTHANAKAN-6, PHATTHANAKAN ROAD,
KHUANG PHATTHANAKAN, KHET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location :
Ambient Temperature : 23.6 ± 0.1 °C
Pressure : (101.3 ± 0.1) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 14 JANUARY 2022
Calibration Date : 21-24 JANUARY 2022
Date of Issue : 25 JANUARY 2022

Calibrated by : Natchanon Pongpanu

Approved by : T. Petchum

(Thankul Petchum)

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QP-TS12-04-04-020664

Cert. No. : ACL22058
Job No. : VC65AC0043
Pages : 2 of 8

Calibration Procedure : CP-001-01

Calibration Method :

This equipment was calibrated by based on IEC-61672-2 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Antechamber and Reference Standard Instruments.
For test results of each item 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	332196	MY40017076	EE-4002-21	10-Feb-22
Waveform Generator	335118	MY52202742	EE-4011-21	10-Feb-22
Digital Multimeter	334614	MY53220104	EFL-HP-05-0204	10-Feb-22
Digital Multimeter	334614	MY53220276	EFL-HP-03-0204	08-Feb-22
Digital Multimeter	344614	MY49054279	1-1510725231-1	15-Sep-22
Programmable Attenuator	MAV-1670	62100114	1300-07774E	08-Mar-22
Condenser Microphone	4180	2977809	AA-1006-21	05-Feb-22
Measuring Amplifier	NA-42KA	MA560405	AA-5005-21	16-Feb-22

2. This result of calibration was based on accuracy on shown on label and place of calibration, for this calibration 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).

QP-TS12-04-04-020664

T. Petchum

Cert. No. : ACL22058
Job No. : VC65AC0043
Pages : 3 of 8

Summary of Measurement Results :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For 2-4 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-weighting level	✓	-	0.2	0.35
11. Overall indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

QP-TS12-04-04-020664

T. Petchum

Cert. No. : ACL22058
Job No. : VC65AC0043
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limits (dB)
93.9 (93.96)	93.9	0.0	±0.2

2. Self-generated noise

2.1 Noise test

Measured Value (dB)
14.6

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

Frequency Weighting	Measured value (dB)
A-weight	11.6
C-weight	17.6
Flat	23.2

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 94 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.1	6.1	0.1	±1.5
1000	0.0	6.0	0.0	±1.0
8000	0.8	6.9	0.9	±5.0

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T. Petchum

Cert. No. : ACL22058
Job No. : VC65AC0043
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to (dB)

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	-0.1	0.0	±2.0
125	0.0	0.0	-0.1	±1.2
250	-0.1	0.0	-0.1	±1.4
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.0	0.0	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long-term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.3

QP-TS12-04-04-020664

T. Petchum

Continuation of Calibration Certificate

Cert. No. : ACL22008
Job No. : VC04AC0043
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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	136.1	-0.1	± 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
128.0	128.0	0.0	± 1.1
115.0	115.0	0.0	± 1.1
114.0	114.1	-0.1	± 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	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	27.1	-0.1	± 1.1
26.0	26.1	-0.1	± 1.1
25.0	25.1	-0.1	± 1.1

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Continuation of Calibration Certificate

Cert. No. : ACL22008
Job No. : VC04AC0043
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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 _b (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	106.0	107.0	-0.1	± 1.5 / ± 0.1
	2	8	117.0	116.0	-0.1	± 1.0 / ± 0.2
	200	800	134.0	134.0	0.0	± 0.0
Slow	2	8	106.0	106.0	0.0	± 0.5 / ± 0.0
	200	800	127.6	127.6	0.0	± 0.0
	0.25	1	99.0	99.0	-0.1	± 1.5 / ± 0.0
SEL	2	8	108.0	108.0	0.0	± 0.0 / ± 0.0
	200	800	128.0	128.0	0.0	± 0.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	138.4	133.4	-5.0	± 1.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
Positive half cycle	135.4	135.1	-0.3	± 2.0
Negative half cycle	135.4	135.1	-0.3	± 2.0

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Continuation of Calibration Certificate

Cert. No. : ACL22008
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11. Overload indication

Measured value (dB)		Revised Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.7	89.7	0.0	± 1.5

12. High level stability

Frequency Weighting	SUM Display at initial (dB)	SUM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weighting	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 level of confidence of approximately 95 %

End of Calibration Certificate

QP-TS12-04-04-020664

451-451/1 Sithiporn Rd.,Bangnaeang, Bangkok 10700 THAILAND
Tel:02-2435-8800 Fax:02-2433-1679 e-mail:cali-center@kijijorn.com http://www.sithiporn.comCert. No. : ACL21079
Page : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42/ Microphone UC-52 / Pre-amplifier N01-24
Serial No. : 00597168 / 18042 / 88182
ID No. : RVG, F04336

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATTANAKAN ROAD, PHATTANAKAN ROAD,
KHWAENG PHATTANAKAN, KHUET SUAN LUANG,
BANGKOK, 10350 THAILAND.

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

Received Date : 08 AUGUST 2021
Calibration Date : 08-10 AUGUST, 2021
Date of Issue : 11 AUGUST 2021

Calibrated by : Nitakorn Pichairat

Approved by : T. Pichairat
(Thanasak Pichairat)

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QP-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL21079
Job No. : VC04AC0058
Page : 3 of 8

Calibration Procedure : CF-001-01

Calibration Method :

This equipment was calibrated by based on IEC 61672-2 (2013) Standard for sound level meter (SLM).

The SLM had been to Acoustical and Electrical signal tests of frequency weighting with anechoic chamber and Reference Standard Instruments.

For test results of each item were made by observation of each Instruments display unit 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	IF-001251	16-Feb-22
Waveform Generator	33511B	MY52102742	IF-001121	10-Feb-22
Digital Multimeter	34461A	MY53220104	E33-105-050264	10-Feb-22
Digital Multimeter	8046A	1997025	E33-105-060264	10-Feb-22
Digital Multimeter	34461A	MY53220118	E33-105-045264	10-Feb-22
Programmable Attenuator	MAT-1070	62100114	LS00-077746	08-Mar-22
Condenser Microphone	4180	2977000	AA-100021	05-Feb-22
Measuring Amplifier	NA-42KA1	34360485	AA-000321	16-Feb-22

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

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

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

Continuation of Calibration Certificate

Cert. No. : ACL21079
Job No. : VC04AC0058
Page : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	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

QP-TS12-04-04-020664

Cert. No. : ACL21079
Job No. : VCMAC0958
Page : 4 of 8

Result of calibration:

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.96)	91.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
14.8

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

Frequency Weighting	Measured value (dB)
A-weight	11.6
C-weight	17.8
Flat	23.5

3. Acoustical signal tests of frequency weightings

Motor free-field acoustic response at a level of 94 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.2	0.2	-0.2	± 1.5
1000	-0.1	-0.1	-0.1	± 1.0
8000	0.6	0.7	0.7	±5.0

QF-TS12-04-04-020664

P.T.A.

Cert. No. : ACL21079
Job No. : VCMAC0958
Page : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	-0.7	-0.7	-0.1	±2.0
125	-0.1	-0.1	-0.1	±1.5
250	-0.1	-0.1	-0.1	±1.5
500	-0.1	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.0	0.0	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long-term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	93.9	94.0	0.1	±0.3

QF-TS12-04-04-020664

P.T.A.

Cert. No. : ACL21079
Job No. : VCMAC0958
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7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±0.1
136.0	136.1	-0.1	±0.1
135.0	135.1	-0.1	±0.1
134.0	134.1	-0.1	±0.1
133.0	133.0	0.0	±0.1
132.0	132.0	0.0	±0.1
131.0	131.0	0.0	±0.1
129.0	129.0	0.0	±0.1
124.0	124.0	0.0	±0.1
119.0	119.1	-0.1	±0.1
114.0	114.1	-0.1	±0.1
109.0	109.0	0.0	±0.1
104.0	104.1	-0.1	±0.1
99.0	99.1	-0.1	±0.1
94.0	94.0	0.0	±0.1
89.0	89.0	0.0	±0.1
84.0	84.0	0.0	±0.1
79.0	79.0	0.0	±0.1
74.0	74.0	0.0	±0.1
69.0	69.0	0.0	±0.1
64.0	64.0	0.0	±0.1
59.0	59.0	0.0	±0.1
54.0	54.0	0.0	±0.1
49.0	49.0	0.0	±0.1
44.0	44.0	0.0	±0.1
39.0	39.0	0.0	±0.1
34.0	34.0	0.0	±0.1
29.0	29.0	0.0	±0.1
24.0	24.0	0.0	±0.1
19.0	19.0	0.0	±0.1
14.0	14.0	0.0	±0.1
9.0	9.0	0.0	±0.1
4.0	4.0	0.0	±0.1

QF-TS12-04-04-020664

P.T.A.

Cert. No. : ACL21079
Job No. : VCMAC0958
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8. Level linearity increasing the level range contour

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

9. Time burst response

Time Weighting	Time 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; -3.0
	2	8	117.0	116.9	-0.1	1.0; 2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	0.25	1	108.0	108.0	0.0	1.5; -3.0
	2	8	108.0	108.0	0.0	±1.0
	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 _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	136.2	-0.2	±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	-
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

QF-TS12-04-04-020664

P.T.A.

Cert. No. : ACL21079
Job No. : VCMAC0958
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11. Overload indication

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

12. High level stability

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

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

QF-TS12-04-04-020664

P.T.A.

42/145/111 Sittimarn Rd., Bangna Suburb, Bangkok 10710 THAILAND
Tel: 0-2432-8800 Fax: 0-2432-1679 e-mail: sithiporn@thaisithiporn.com http://www.sithiporn.comCert. No. : ACL21079
Page : 8 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 Microphone UC-52 / Pre-amplifier NF-24
Serial No. : 00597167 / 15779 / 34375
ID No. : RYG_F50437

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATHANAKAN 40, PHATHANAKAN ROAD,
KHUANG PHATHANAKAN, KHUANG SUAN LUANG,
BANGKOK, 10250 THAILAND.Location :
Ambient Temperature : 1 23.0 ± 3.1 °C
Pressure : 1 101.3 ± 3.1 kPa
Relative Humidity : 1 50.0 ± 20.0 %Received Date : 05 AUGUST 2021
Calibration Due : 06 ~ 10 AUGUST 2021
Date of Issue : 11 AUGUST 2021

Calibrated by : Nattakorn Prasitpraporn

Approved by :

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

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL21078
Job No. : VCAAC0058
Page : 3 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

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

For test results of each item 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	3321B	MY24011076	IF-0012-21	10-Feb-22
Waveform Generator	2351B	MY2203292	IF-0013-21	10-Feb-22
Digital Multimeter	12461A	MY2203199	EEL-H05-104204	10-Feb-22
Digital Multimeter	8846A	1907025	EEL-H05-060264	09-Feb-22
Digital Multimeter	33461A	MY33220118	EEL-H05-043064	10-Feb-22
Programmable Attenuator	MAT-1070	62100114	1309-07774E	06-Mar-22
Condenser Microphone	4180	2977900	AA-1006-21	05-Feb-22
Measuring Amplifier	NA-42XA1	3450495	AA-3003-21	16-Feb-22

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 as :

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

QP-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL21078
Job No. : VCAAC0058
Page : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.1	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.1	0.6
1000 Hz	✓	-	0.1	0.6
8000 Hz	✓	-	0.1	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.1	0.6
For >4 kHz to 10 kHz	✓	-	0.1	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

QP-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL21078
Job No. : VCAAC0058
Page : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.96)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
16.5

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	8.6
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 weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.5	0.6	0.6	±1.5
1000	-0.1	-0.1	0.0	±1.0
8000	-1.6	-1.6	-1.6	±5.0

QP-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL21078
Job No. : VCAAC0058
Page : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with reference to 1 kHz

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	-0.1	0.0	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long-term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.3

QP-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL21078
Job No. : VCAAC0058
Page : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±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	104.1	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	39.0	0.0	±1.1
34.0	34.0	0.0	±1.1
29.0	29.0	0.0	±1.1
24.0	24.0	0.0	±1.1
19.0	19.0	0.0	±1.1
14.0	14.0	0.0	±1.1
9.0	9.0	0.0	±1.1
4.0	4.0	0.0	±1.1

QP-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL21078
Job No. : VCAAC0058
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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 _b (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	108.0	0.0	1.5; ±5.0
	2	8	117.0	117.0	0.0	1.0; ±2.5
	200	800	124.0	124.1	0.1	±1.0
Slow	2	8	108.0	108.0	0.0	1.5; ±5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	99.9	+0.1	1.5; ±5.0
SEL	2	8	108.0	108.0	0.0	1.0; ±2.5
	200	800	128.0	128.1	0.1	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, V _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	136.0	-0.4	±1.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.1	0.1	-
Positive half cycle	138.4	138.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

QP-TS12-04-04-020664

Continuation of Calibration Certificate

Cvtl No : ACL10178
Job No : VC64AC0058
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11. Overload indication

Measured value (dB)	Deviant Value (dB)	Acceptance Limit (dB)
Positive (one-half cycle)	Negative (one-half cycle)	
89.6	89.6	±1.5

12. High level stability

Frequency Weighting	SUM Display at initial (dB)	SUM Display at final (dB)	Deviant Value (dB)	Acceptance Limit (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

QE-1512-04-04-02064

CERTIFICATE OF CALIBRATION

ISSUED BY: Cirrus Research plc
DATE OF ISSUE: 01/11/21
CERTIFICATE NUMBER: 165112Cirrus Research plc
Acoustic House
Bridlington Road
Hummanby
North Yorkshire
YO14 6PH
United Kingdom

Page 1 of 1

Test engineer:
Nigel Smith
Electronically signed.

doseBadge Reader

Instrument
Manufacturer: Cirrus Research plc
Model Number: RC110A
Serial Number: 92612
Notes:

Calibration Procedure

The tests were carried out in accordance with the requirements of IEC 60942:2003 where applicable.

Date of Calibration: 31 November 2021

Functionality Results

Function	Result
Keypad	Pass
Battery Power	Pass
Display	Pass
Communication	Pass
2 way IR link	Pass
Clock	Pass

REVIEW BY: *Handwritten signature*
APPROVED BY: *Handwritten signature*
NEXT CAL DATE: 1/11/22

Calibration Results

	Level (dB)	Frequency (Hz)	Distortion (% THD + Noise)
Initial	113.90	1000.3	0.40
Adjusted	114.00	1000.3	0.40
Uncertainty	± 0.11	± 0.14	± 0.10
Tolerances	± 0.60	± 2.00	± 4.00

Environmental Conditions

Pressure: 97.50 kPa
Temperature: 20.1 °C
Humidity: 47.7 %

Notes

This certificate provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95%.

CERTIFICATE OF CALIBRATION

ISSUED BY: Cirrus Research plc
DATE OF ISSUE: 07/09/21
CERTIFICATE NUMBER: 162336Cirrus Research plc
Acoustic House
Bridlington Road
Hummanby
North Yorkshire
YO14 6PH
United Kingdom

Page 1 of 1

Test engineer:
Nigel Smith
Electronically signed.

doseBadge Reader

Instrument
Manufacturer: Cirrus Research plc
Model Number: RC110A
Serial Number: 89107
Notes:

Calibration Procedure

The tests were carried out in accordance with the requirements of IEC 60942:2003 where applicable.

Date of Calibration: 07 September 2021

Functionality Results

Function	Result
Keypad	Pass
Battery Power	Pass
Display	Pass
Communication	Pass
2 way IR link	Pass
Clock	Pass

Calibration Results

	Level (dB)	Frequency (Hz)	Distortion (% THD + Noise)
Initial	113.90	1000.2	0.20
Adjusted	114.00	1000.2	0.20
Uncertainty	± 0.11	± 0.14	± 0.10
Tolerances	± 0.60	± 2.00	± 4.00

Environmental Conditions

Pressure: 101.40 kPa
Temperature: 22.4 °C
Humidity: 60.2 %

Notes

This certificate provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95%.

CERTIFICATE OF CALIBRATION

ISSUED BY: Cirrus Research plc
DATE OF ISSUE: 14/03/22
CERTIFICATE NUMBER: 171913Cirrus Research plc
Acoustic House
Bridlington Road
Hummanby
North Yorkshire
YO14 6PH
United KingdomPage 1 of 1
Test engineer:
Nigel Smith
Electronically signed.

doseBadge Reader

Instrument
Manufacturer: Cirrus Research plc
Model Number: RC110A
Serial Number: 92612
Notes:

Calibration Procedure

The tests were carried out in accordance with the requirements of IEC 60942:2003 where applicable.

Date of Calibration: 14 March 2022

Functionality Results

Function	Result
Keypad	Pass
Battery Power	Pass
Display	Pass
Communication	Pass
2 way IR link	Pass
Clock	Pass

Calibration Results

	Level (dB)	Frequency (Hz)	Distortion (% THD + Noise)
Initial	113.90	1000.4	0.34
Adjusted	114.00	1000.4	0.36
Uncertainty	± 0.11	± 0.14	± 0.10
Tolerances	± 0.60	± 2.00	± 4.00

Environmental Conditions

Pressure: 101.30 kPa
Temperature: 21.3 °C
Humidity: 42.5 %

Notes

This certificate provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95%.



ROTA METER CALIBRATION RESULT JANUARY 2022

Rotameter ID	Calibration Date	Regression Result	Coefficient (K²)
BKK_FS0577	05 Jan 22	$Y = 0.9899x + 0.9112$	0.9999
BKK_FS0579	05 Jan 22	$Y = 1.007x - 0.0299$	1.0000
BKK_FS0583	05 Jan 22	$Y = 1.0513x + 1.869$	0.9967
BKK_FS0584	05 Jan 22	$Y = 1.0048x - 1.069$	1.0000
BKK_FS0585	05 Jan 22	$Y = 1.0076x - 1.1036$	0.9999
BKK_FS0586	05 Jan 22	$Y = 0.9933x + 3.2655$	1.0000
BKK_FS0587	05 Jan 22	$Y = 1.0401x - 17.457$	0.9996
BKK_FS0588	05 Jan 22	$Y = 1.0154x + 4.8357$	0.9999
BKK_FS0589	05 Jan 22	$Y = 0.9918x + 4.8069$	0.9999
BKK_FS0590	05 Jan 22	$Y = 0.9961x + 10.07$	0.9995
BKK_FS0591	05 Jan 22	$Y = 1.0117x - 92.415$	0.9995
BKK_FS0592	05 Jan 22	$Y = 1.0031x - 69.305$	0.9996
BKK_FS0593	05 Jan 22	$Y = 1.0131x - 88.198$	0.9996
BKK_FS0594	05 Jan 22	$Y = 1.0075x - 7.0829$	0.9999
BKK_FS0595	05 Jan 22	$Y = 1.0249x - 98.162$	0.9999
BKK_FS0596	05 Jan 22	$Y = 0.9843x - 28.806$	0.9991
BKK_FS0597	05 Jan 22	$Y = 1.0203x - 122.14$	0.9999
BKK_FS1004	04 Jan 22	$Y = 0.9651x + 19.648$	0.9989
BKK_FS1005	04 Jan 22	$Y = 1.0096x + 4.6643$	0.9997
BKK_FS1006	04 Jan 22	$Y = 1.2188x - 7.1214$	0.9994
BKK_FS1007	05 Jan 22	$Y = 1.0563x - 1.0912$	1.0000
BKK_FS1008	05 Jan 22	$Y = 0.9889x + 1.9061$	1.0000
BKK_FS1009	05 Jan 22	$Y = 1.0132x + 1.1633$	0.9990
BKK_FS1010	05 Jan 22	$Y = 1.0032x + 0.5758$	0.9999
BKK_FS1014	05 Jan 22	$Y = 1.0021x + 0.3148$	0.9998
BKK_FS1015	05 Jan 22	$Y = 0.9994x + 1.786$	1.0000
BKK_FS1016	05 Jan 22	$Y = 1.0105x - 80.256$	0.9998
BKK_FS1017	05 Jan 22	$Y = 0.9995x + 0.649$	1.0000
BKK_FS1018	05 Jan 22	$Y = 1.0011x + 1.1786$	1.0000
BKK_FS1019	05 Jan 22	$Y = 1.0023x - 88.424$	0.9996
BKK_FS1020	05 Jan 22	$Y = 0.9887x + 2.8844$	0.9999
BKK_FS1021	05 Jan 22	$Y = 0.9659x + 1.4905$	0.9978
BKK_FS1022	05 Jan 22	$Y = 1.022x - 17.957$	0.9997
BKK_FS1023	05 Jan 22	$Y = 1.0094x + 0.0717$	0.9999
BKK_FS1024	05 Jan 22	$Y = 1.0042x + 0.4086$	0.9997
BKK_FS1025	05 Jan 22	$Y = 1.0132x - 88.507$	0.9996
BKK_FS1026	05 Jan 22	$Y = 0.9902x + 0.9654$	1.0000
BKK_FS1027	05 Jan 22	$Y = 1.0086x + 2.279$	1.0000
BKK_FS1028	05 Jan 22	$Y = 1.0105x - 81.055$	0.9997



ROTA METER CALIBRATION RESULT JANUARY 2022

Rotameter ID	Calibration Date	Regression Result	Coefficient (K²)
BKK_FS1029	05 Jan 22	$Y = 0.9935x + 0.8234$	1.0000
BKK_FS1030	05 Jan 22	$Y = 1.0039x + 0.515$	0.9999
BKK_FS1031	05 Jan 22	$Y = 1.009x - 79.295$	0.9998
BKK_FS1039	04 Jan 22	$Y = 0.9916x + 6.1524$	0.9988
BKK_FS1040	04 Jan 22	$Y = 1.0133x - 10.177$	0.9985
BKK_FS1041	04 Jan 22	$Y = 1.0805x - 1.7381$	0.9998
BKK_FS1042	04 Jan 22	$Y = 1.0061x + 1.3405$	0.9994
BKK_FS1043	04 Jan 22	$Y = 1.0112x - 10.393$	0.9999
BKK_FS1044	04 Jan 22	$Y = 1.0495x - 1.0136$	0.9996
BKK_FS1161	09 Jan 22	$Y = 0.9812x + 159.71$	1.0000
BKK_FS1162	05 Jan 22	$Y = 0.9932x + 5.0014$	0.9997
BKK_FS1163	05 Jan 22	$Y = 1.0082x - 82.062$	0.9998
BKK_FS1164	05 Jan 22	$Y = 0.9914x + 0.8427$	0.9997
BKK_FS1165	05 Jan 22	$Y = 0.9893x + 8.5919$	0.9996
BKK_FS1166	05 Jan 22	$Y = 1.0031x - 77.891$	0.9996
RYG_FS0197	04 Jan 22	$Y = 1.0068x + 1.7152$	0.9998
RYG_FS0198	04 Jan 22	$Y = 0.9986x + 18.196$	0.9995
RYG_FS0199	04 Jan 22	$Y = 1.1202x - 3.5782$	0.9999

Review By: *Handwritten signature*
(Mr. Wichan Choonharat)
Enviro Field Services ManagerApproved By: *Handwritten signature*
(Mr. Sarayuth Jitranont)
Assistant General Manager

Represent to Certificate of Calibration JTCG/022104

Certificate No.: JTCG/022104

Page: 2 of 3

Measurement Results:

Without Adjustment:

Function Calibration: Non Adjustment

Eccentric Error: Weight to be 1/2, 1/2 or of Maximum capacity

Eccentricity test		50 (g)	
		Position (g)	
1	2	3	4
0.00000	-0.00004	-0.00001	0.00000
Maximum deviation		0.00004	

Repeatability Test: Weight to be 1/2 \leq L₁ \leq Maximum capacity

Determination of the standard deviation of weighing balance, Readability 0.00001 (g)

Nominal test value (g)	Standard Deviation
50	0.000007

Error of indication: from nominal value, Readability 0.00001 (g)

Nominal Value (g)	Conventional Mass (g)	Indication (g)	Correction of Balance (g)	Uncertainty (g)	k
0	0.000000	0.00000	0.00000	0.000020	2.68
0.01	0.010001	0.01000	0.00000	0.000022	2.17
0.05	0.050002	0.04999	0.00001	0.000022	2.17
0.1	0.099999	0.09999	0.00001	0.000022	2.17
0.5	0.500001	0.50001	-0.00001	0.000022	2.17
1	1.000004	0.99999	0.00001	0.000022	2.14
2	1.999999	1.99999	0.00001	0.000022	2.14
5	5.000015	4.99999	0.00002	0.000023	2.14
10	10.000004	10.00000	0.00000	0.000024	2.10
20	20.000029	20.00000	0.00003	0.000032	2.00
50	50.000043	49.99999	0.00005	0.000069	2.00

Note: Weight of adjust - (g)

Represent to Certificate of Calibration JTCG/022104

Certificate No.: JTCG/022104

Page: 3 of 3

Measurement Results:

Without Adjustment:

Function Calibration: Non Adjustment

Eccentric Error: Weight to be 1/2, 1/2 or of Maximum capacity

Eccentricity test		50 (g)	
		Position (g)	
1	2	3	4
0.0000	0.0000	0.0000	0.0000
Maximum deviation		0.0000	

Repeatability Test: Weight to be 1/2 \leq L₁ \leq Maximum capacity

Determination of the standard deviation of weighing balance, Readability 0.0001 (g)

Nominal test value (g)	Standard Deviation
100	0.00000

Error of indication: from nominal value, Readability 0.0001 (g)

Nominal Value (g)	Conventional Mass (g)	Indication (g)	Correction of Balance (g)	Uncertainty (g)	k
65	65.00006	65.00000	0.00001	0.00013	2.00
70	70.00007	70.00000	0.00001	0.00013	2.00
75	75.00009	75.00000	0.00001	0.00014	2.00
80	80.00008	80.00000	0.00001	0.00014	2.00
85	85.00009	85.00000	0.00001	0.00015	2.00
90	90.00010	90.00000	0.00001	0.00015	2.00
95	95.00012	95.00000	0.00001	0.00016	2.00
100	100.00004	100.00000	0.00000	0.00014	2.00
110	110.00004	110.00000	0.00000	0.00015	2.00
120	120.00007	120.00000	0.00001	0.00016	2.00

Note: Weight of adjust - (g)

The End of Certificate

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Certificate of System Qualification

GC-00

System ID: GC-00
Organization Name: ALS Laboratory Group (Thailand) Co., Ltd.
Digestion Location: 154 Phatthanaburi 40, Phatthanaburi R2, Sam Luang, Bangkok 10250

Date: October 21, 2021 10:05:40 AM
EOP Name: Agilent Recommended
ICP Name: GC-00-00
Overall Qualification Status: Pass

REVIEWED BY: *Sachida T.*
APPROVED BY: *Sachida T.*
NEXT CAL DATE: 31 May 2023

System Inspection and Basic Safety and Operation

Name: 7890
Equipment Status: Pass

Overall System Inspection and Basic Safety and Operation Test Status

Pass

Inlet Pressure Decay

Name: 7890
Front: SSL

Setpoint Status: Pass
Pressure: 25.0 psi
Pressure Change: 0.0 psi / 5 minutes
Agilent Recommended: ± 2.0 and ± 0.5

Overall Inlet Pressure Decay Test Status

Pass

Inlet Pressure Accuracy

Name: 7890
Front: SSL

Date: October 21, 2021 10:05:40 AM

System ID: GC-00

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Setpoint Status: Pass
Setpoint: 25.0 psi
Actual: 24.9 psi
Accuracy: 0.1 psi
Agilent Recommended: ± 2.0

Overall Inlet Pressure Accuracy Test Status

Pass

Inlet Pressure Decay

Name: 7890
Back: SSL
Setpoint Status: Pass
Pressure: 25.0 psi
Pressure Change: 0.0 psi / 5 minutes
Agilent Recommended: ± 2.0 and ± 0.5

Overall Inlet Pressure Decay Test Status

Pass

Inlet Pressure Accuracy

Name: 7890
Back: SSL
Setpoint Status: Pass
Setpoint: 25.0 psi
Actual: 24.9 psi
Accuracy: 0.1 psi
Agilent Recommended: ± 2.0

Overall Inlet Pressure Accuracy Test Status

Pass

Detector Flow Accuracy

Date: October 21, 2021 10:05:40 AM
System ID: GC-00

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Name: 7890
Front: FID
Setpoint Status: Pass
Flow Type: FID
Setpoint: 30.0 mL/min
Measured Flow: 30.5 mL/min
Accuracy: 0.5 mL/min
Agilent Recommended: ± 15.0 % setpoint (3.0 mL/min)
Limit is percentage of setpoint or 0.5 mL/min, whichever is target.

Setpoint Status: Pass
Flow Type: Oxidation
Setpoint: 400.0 mL/min
Measured Flow: 394.0 mL/min
Accuracy: 6.0 mL/min
Agilent Recommended: ± 10.0 % setpoint (40.0 mL/min)
Limit is percentage of setpoint or 0.5 mL/min, whichever is target.

Setpoint Status: Pass
Flow Type: Nitrogen
Setpoint: 25.0 mL/min
Measured Flow: 24.2 mL/min
Accuracy: 0.8 mL/min
Agilent Recommended: ± 15.0 % setpoint (3.8 mL/min)
Limit is percentage of setpoint or 0.5 mL/min, whichever is target.

Overall Detector Flow Accuracy Test Status

Pass

Detector Flow Accuracy

Name: 7890
Back: FID

Date: October 21, 2021 10:05:40 AM
System ID: GC-00

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Agilent CrossLab Compliance Services

Setpoint Status: Pass
Flow Type: FID
Setpoint: 30.0 mL/min
Measured Flow: 29.1 mL/min
Accuracy: 0.9 mL/min
Agilent Recommended: ± 15.0 % setpoint (4.5 mL/min)
Limit is percentage of setpoint or 0.5 mL/min, whichever is target.

Setpoint Status: Pass
Flow Type: Oxidation
Setpoint: 400.0 mL/min
Measured Flow: 397.3 mL/min
Accuracy: 2.7 mL/min
Agilent Recommended: ± 10.0 % setpoint (40.0 mL/min)
Limit is percentage of setpoint or 0.5 mL/min, whichever is target.

Setpoint Status: Pass
Flow Type: Nitrogen
Setpoint: 25.0 mL/min
Measured Flow: 24.4 mL/min
Accuracy: 0.6 mL/min
Agilent Recommended: ± 15.0 % setpoint (3.8 mL/min)
Limit is percentage of setpoint or 0.5 mL/min, whichever is target.

Overall Detector Flow Accuracy Test Status

Pass

GC Oven Temperature Accuracy

Name: 7890

Date: October 21, 2021 10:05:40 AM
System ID: GC-00

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Setpoint Status: Pass

Zone: Oven

Temperature: 230.0 231.5 °C

Accuracy: 1.5 °C

Agilent Recommended: ±2.0 °C setpoint in K (±3.0 °C)

±1.0 °C setpoint in K (±3.0 °C)

Setpoint Status: Pass

Zone: Oven

Temperature: 100.0 100.5 °C

Accuracy: 0.5 °C

Agilent Recommended: ±1.0 °C setpoint in K (±3.7 °C)

±1.0 °C setpoint in K (±3.7 °C)

Overall GC Oven Temperature Accuracy Test Status: Pass

GC Oven Temperature Stability

Name: 7890

Setpoint Status: Pass

Setpoint/Average: 100.0 100.4867 °C

Temperature: 100.0 100.4867 °C

Stability: 0.1 °C

Agilent Recommended: ±0.5 °C

Overall GC Oven Temperature Stability Test Status: Pass

Scouting Run

Tested Combination1: Front SSL / Front FID

Injection Tower

Name: 7893A

Date: October 21, 2021 10:05:40 AM

System ID: GC-6

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Setpoint Status: Completed

Injection Volume on Column: 1.0 µL

Overall Scouting Run Status: Completed

Noise and Drift

Tested Combination1: Front SSL / Front FID

Name: 7890

Setpoint Status: Pass

Base Signal: 12.7 pA

ASTM Noise: 0.06 pA

Drift: 0.10 pA/hr

Agilent Recommended: ≤0.10 pA ≤2.50 pA/hr

Status: Pass

Overall Noise and Drift Test Status: Pass

Injection Precision

Tested Combination1: Front SSL / Front FID

Name: 7893A

Setpoint Status: Pass

Injection Volume on Column: 1.0 µL

Area RSD: 0.42 %

Retention Time RSD: 0.18 %

Agilent Recommended: ≤3.00 % ≤1.00 %

Overall Injection Precision Test Status: Pass

Signal to Noise

Date: October 21, 2021 10:05:40 AM

System ID: GC-6

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Tested Combination1: Front SSL / Front FID

Injection Tower

Name: 7890

Setpoint Status: Pass

Signal to Noise: 1174863

Agilent Recommended: ≥300000

Overall Signal to Noise Test Status: Pass

Scouting Run

Tested Combination2: Back SSL / Back FID

Injection Tower

Name: 7893A

Setpoint Status: Completed

Injection Volume on Column: 1.0 µL

Overall Scouting Run Status: Completed

Noise and Drift

Tested Combination2: Back SSL / Back FID

Name: 7890

Setpoint Status: Pass

Base Signal: 10.4 pA

ASTM Noise: 0.05 pA

Drift: 0.00 pA/hr

Agilent Recommended: ≤0.05 pA ≤2.50 pA/hr

Status: Pass

Date: October 21, 2021 10:05:40 AM

System ID: GC-6

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Overall Noise and Drift Test Status: Pass

Injection Precision

Tested Combination2: Back SSL / Back FID

Name: 7893A

Setpoint Status: Pass

Injection Volume on Column: 1.0 µL

Area RSD: 1.16 %

Retention Time RSD: 0.12 %

Agilent Recommended: ≤3.00 % ≤1.00 %

Overall Injection Precision Test Status: Pass

Signal to Noise

Tested Combination2: Back SSL / Back FID

Injection Tower

Name: 7890

Setpoint Status: Pass

Signal to Noise: 300446

Agilent Recommended: ≥300000

Overall Signal to Noise Test Status: Pass

Date: October 21, 2021 10:05:40 AM

System ID: GC-6

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Instrument Details

Purpose: This section describes the at-hand system configuration.

Details

System ID: GC-6

Manufacturer: Agilent Technologies

Name: 7890

Flow Data Input: Manual Data

Temperature Data Input: Manual Data or Other Data Logging

Tested Combination1

Injection Technique: Injection Tower

Sampler Identifier: Sampler 2

Inlet: Front

Detector: Front

LTM Included?: No

Tested Combination2

Injection Technique: Injection Tower

Sampler Identifier: Sampler 3

Inlet: Back

Detector: Back

LTM Included?: No

Sampler 1

Manufacturer: Agilent Technologies

Type: Tray

Name: 7893A

Model Number: G4314A

Serial Number: CH15300038

Firmware Revision: A.1.1.01

Vial Heater: Not Installed

Date: October 21, 2021 10:05:40 AM

System ID: GC-6

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Sampler 2

Manufacturer: Agilent Technologies

Type: Injection Tower

Name: 7893A

Model Number: G4313A

Serial Number: CN10340103

Firmware Revision: A.10.06

Usage: Sample Injection

Location: Back

Syringe Volume (µL): 10

Sampler 3

Manufacturer: Agilent Technologies

Type: Injection Tower

Name: 7893A

Model Number: G4313A

Serial Number: CN10340103

Firmware Revision: A.10.06

Usage: Sample Injection

Location: Back

Syringe Volume (µL): 10

Multistep 1

Manufacturer: Agilent Technologies

Name: 7890

Model Number: G4345A

Serial Number: CN11481066

Firmware Revision: Version 4.27

Component ID/Asset No.: GC-6

Open Type: Standard

Date: October 21, 2021 10:05:40 AM

System ID: GC-6

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Printed 11/10

Manufacturer	Agilent Technologies
Name	7890
Type	SSL
Location	Front
Carrier Gas	Helium
Control Type	Electronic Pressure Control (EPC)
Purged Inlet	Yes

inlet 2

Manufacturer	Agilent Technologies
Name	7890
Type	GC
Location	Back
Carrier Gas	Helium
Control Type	Electronic Pressure Control (EPC)
Purged Inlet	Yes

Detector 1

Manufacturer	Agilent Technologies
Name	7892
Type	FID
Adapter	Capillary
Control Type	Electronic Pressure Control (EPC)
Location	Front
Makeup Gas	Nitrogen

Detector 2

Manufacturer	Agilent Technologies
Name	7890
Type	FID
Adapter	Capillary
Control Type	Electronic Pressure Control (EPC)
Location	Back
Makesup Gas	Nitrogen

Date:	December 31, 2021 10:52:40 AM
System ID:	GC-6

Electronic Signature

Purpose

This signature page was created and published because the ACE sign-off action was unneeded, which is valid for the entire document, including attachments. The ACE sign-off is an electronic signature that requires two distinct identification components: unique identifiers and personal placement. The Agent representative who has delivered this service understands the meaning and legal effect of an electronic signature. As a shared official operation, the Agent representative has a unique identifier and known location (ACE) and electronically sign this document. (Other e-signatures can be applied to this document using a Document Content Management or other suitable method defined in your data access and control procedures.)

Conclusion

Full Name of Signer:	Suriya Thongkawe
Logged On User Name:	suriya.thongkawe@nen.agilent.com
Signature Creation Date:	October 21, 2021
Reason for Signature:	Executed protocol and published this original version of document

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Date: October 21, 2021 10:05:40 AM
System ID: GC-6

[illegible]

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Date: 10/26/2011 10:06:42 AM
 System ID: GC-6

Issue Number	Issue Title	Issue Status	Issue Date	Issue Type	Issue Category	Issue Sub-category	Issue Description	Issue Resolution	Issue Comments
001	Issue Title	Open	2023-01-01	Bug	UI/UX	Navigation	Issue Description	Issue Resolution	Issue Comments
002	Issue Title	Open	2023-01-05	Feature	Backend	Database	Issue Description	Issue Resolution	Issue Comments
003	Issue Title	Open	2023-01-10	Bug	API	Authentication	Issue Description	Issue Resolution	Issue Comments
004	Issue Title	Open	2023-01-15	Feature	Frontend	Reporting	Issue Description	Issue Resolution	Issue Comments
005	Issue Title	Open	2023-01-20	Bug	Backend	Logging	Issue Description	Issue Resolution	Issue Comments
006	Issue Title	Open	2023-01-25	Feature	API	Integration	Issue Description	Issue Resolution	Issue Comments
007	Issue Title	Open	2023-02-01	Bug	UI/UX	Accessibility	Issue Description	Issue Resolution	Issue Comments
008	Issue Title	Open	2023-02-05	Feature	Backend	Monitoring	Issue Description	Issue Resolution	Issue Comments
009	Issue Title	Open	2023-02-10	Bug	API	Performance	Issue Description	Issue Resolution	Issue Comments
010	Issue Title	Open	2023-02-15	Feature	Frontend	Localization	Issue Description	Issue Resolution	Issue Comments
011	Issue Title	Open	2023-02-20	Bug	Backend	Security	Issue Description	Issue Resolution	Issue Comments
012	Issue Title	Open	2023-02-25	Feature	API	Documentation	Issue Description	Issue Resolution	Issue Comments
013	Issue Title	Open	2023-03-01	Bug	UI/UX	Performance	Issue Description	Issue Resolution	Issue Comments
014	Issue Title	Open	2023-03-05	Feature	Backend	Analytics	Issue Description	Issue Resolution	Issue Comments
015	Issue Title	Open	2023-03-10	Bug	API	Integration	Issue Description	Issue Resolution	Issue Comments
016	Issue Title	Open	2023-03-15	Feature	Frontend	Reporting	Issue Description	Issue Resolution	Issue Comments
017	Issue Title	Open	2023-03-20	Bug	Backend	Logging	Issue Description	Issue Resolution	Issue Comments
018	Issue Title	Open	2023-03-25	Feature	API	Integration	Issue Description	Issue Resolution	Issue Comments
019	Issue Title	Open	2023-04-01	Bug	UI/UX	Accessibility	Issue Description	Issue Resolution	Issue Comments
020	Issue Title	Open	2023-04-05	Feature	Backend	Monitoring	Issue Description	Issue Resolution	Issue Comments
021	Issue Title	Open	2023-04-10	Bug	API	Performance	Issue Description	Issue Resolution	Issue Comments
022	Issue Title	Open	2023-04-15	Feature	Frontend	Localization	Issue Description	Issue Resolution	Issue Comments
023	Issue Title	Open	2023-04-20	Bug	Backend	Security	Issue Description	Issue Resolution	Issue Comments
024	Issue Title	Open	2023-04-25	Feature	API	Documentation	Issue Description	Issue Resolution	Issue Comments
025	Issue Title	Open	2023-05-01	Bug	UI/UX	Performance	Issue Description	Issue Resolution	Issue Comments
026	Issue Title	Open	2023-05-05	Feature	Backend	Analytics	Issue Description	Issue Resolution	Issue Comments
027	Issue Title	Open	2023-05-10	Bug	API	Integration	Issue Description	Issue Resolution	Issue Comments
028	Issue Title	Open	2023-05-15	Feature	Frontend	Reporting	Issue Description	Issue Resolution	Issue Comments
029	Issue Title	Open	2023-05-20	Bug	Backend	Logging	Issue Description	Issue Resolution	Issue Comments
030	Issue Title	Open	2023-05-25	Feature	API	Integration	Issue Description	Issue Resolution	Issue Comments

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Date: October 21, 2021 10:05:40 AM
System ID: GC-6

Source: [Bureau of Economic Analysis](#)
[Historical: 1959-2019](#)

Expires on: [12/31/2024](#)
 Print Date: October 01, 2024 10:59 AM EDT

OD C.A.B. CONTAINER Transaction log

Time	Transaction time	Activity	Type of Transaction	Optional Information
October 25, 2024 1:23:29	Start	Execution	Initialize Flow Accounts - Force	None
			FAC - Force - Duration: 0.400 s	
			no error - 100.00% success	
October 25, 2024 1:23:57	Auto FAC	Data	Initialize Flow Accounts - Force	Manual Data Entry
			FAC - Force - Duration: 0.400 s	
			no error - 100.00% success	
October 25, 2024 1:23:59	End	Execution	Initialize Flow Accounts - Force (End)	
			FAC - Force - Duration: 0.400 s	
			no error - 100.00% success	
October 25, 2024 1:23:59	Start	Execution	Uninitialize Flow Accounts - Force	None
			FAC - Force - Duration: 0.000 s	
			no error - 100.00% success	
October 25, 2024 1:27:06	Auto FAC	Data	Uninitialize Flow Accounts - Force	Manual Data Entry
			FAC - Force - Duration: 0.200 s	
			no error - 100.00% success	
October 25, 2024 1:27:42	End	Execution	Uninitialize Flow Accounts - Force (End)	
			FAC - Force - Duration: 0.200 s	
			no error - 100.00% success	
October 25, 2024 1:27:46	Start FAC	Execution	Initialize Flow Accounts - Blank	None
			FAC - Force - Duration: 0.400 s	
			no error - 100.00% success	
October 25, 2024 1:32:14	Auto FAC	Data	Initialize Flow Accounts - Blank	Manual Data Entry
			FAC - Force - Duration: 0.200 s	
			no error - 100.00% success	
October 25, 2024 1:32:16	End	Execution	Initialize Flow Accounts - Blank (End)	
			FAC - Force - Duration: 0.200 s	
			no error - 100.00% success	
October 25, 2024 1:32:18	Start FAC	Execution	Uninitialize Flow Accounts - Blank	None
			FAC - Force - Duration: 0.400 s	
			no error - 100.00% success	
October 25, 2024 1:36:19	Auto FAC	Data	Uninitialize Flow Accounts - Blank	Manual Data Entry
			FAC - Force - Duration: 0.400 s	
			no error - 100.00% success	

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Date: 08/04/2015 10:02:49 AM
System ID: GC-6

[illegible]

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Class: CERNAM 01, 2021/10/05/03 AM
System ID: GC-6

[illegible][illegible][illegible]

User Name: karthi.sridhar

Timestamp: 2024-07-07 10:15

Report ID: 2024

Host Name: Gateway-01 | 2024-07-08 10:15 AM

QC QCS AL3 01148-0088 Transaction log

Time	Transaction Date	Activity Priority	Type of Transaction	Optional Information
AM	October 21, 2023 03:07	End	Execution	[Updated] [Status: Succeeded] Name: [QCS_AL3_01148_0088] [QCS_AL3_01148_0088] < 1.0000 [QCS_AL3_01148_0088] < 1.0000 [QCS_AL3_01148_0088] < 1.0000
AM	October 21, 2023 03:23	Start	AM	
AM	October 21, 2023 03:41	Start	AM	
AM	October 21, 2023 03:58	Start	AM	
AM	October 21, 2023 04:15	Start	AM	
AM	October 21, 2023 04:32	Start	AM	
AM	October 21, 2023 04:49	Start	AM	
AM	October 21, 2023 05:06	Start	AM	
AM	October 21, 2023 05:23	Start	AM	
AM	October 21, 2023 05:40	Start	AM	
AM	October 21, 2023 05:57	Start	AM	
AM	October 21, 2023 06:14	Start	AM	
AM	October 21, 2023 06:31	Start	AM	
AM	October 21, 2023 06:48	Start	AM	
AM	October 21, 2023 07:05	Start	AM	
AM	October 21, 2023 07:22	Start	AM	
AM	October 21, 2023 07:39	Start	AM	
AM	October 21, 2023 07:56	Start	AM	
AM	October 21, 2023 08:13	Start	AM	
AM	October 21, 2023 08:30	Start	AM	
AM	October 21, 2023 08:47	Start	AM	
AM	October 21, 2023 09:04	Start	AM	
AM	October 21, 2023 09:21	Start	AM	
AM	October 21, 2023 09:38	Start	AM	
AM	October 21, 2023 09:55	Start	AM	
AM	October 21, 2023 10:12	Start	AM	
AM	October 21, 2023 10:29	Start	AM	
AM	October 21, 2023 10:46	Start	AM	
AM	October 21, 2023 11:03	Start	AM	
AM	October 21, 2023 11:20	Start	AM	
AM	October 21, 2023 11:37	Start	AM	
AM	October 21, 2023 11:54	Start	AM	
AM	October 21, 2023 12:11	Start	AM	
AM	October 21, 2023 12:28	Start	AM	
AM	October 21, 2023 12:45	Start	AM	
AM	October 21, 2023 13:02	Start	AM	
AM	October 21, 2023 13:19	Start	AM	
AM	October 21, 2023 13:36	Start	AM	
AM	October 21, 2023 13:53	Start	AM	
AM	October 21, 2023 14:10	Start	AM	
AM	October 21, 2023 14:27	Start	AM	
AM	October 21, 2023 14:44	Start	AM	
AM	October 21, 2023 15:01	Start	AM	
AM	October 21, 2023 15:18	Start	AM	
AM	October 21, 2023 15:35	Start	AM	
AM	October 21, 2023 15:52	Start	AM	
AM	October 21, 2023 16:09	Start	AM	
AM	October 21, 2023 16:26	Start	AM	
AM	October 21, 2023 16:43	Start	AM	
AM	October 21, 2023 17:00	Start	AM	
AM	October 21, 2023 17:17	Start	AM	
AM	October 21, 2023 17:34	Start	AM	
AM	October 21, 2023 17:51	Start	AM	
AM	October 21, 2023 18:08	Start	AM	
AM	October 21, 2023 18:25	Start	AM	
AM	October 21, 2023 18:42	Start	AM	
AM	October 21, 2023 18:59	Start	AM	
AM	October 21, 2023 19:16	Start	AM	
AM	October 21, 2023 19:33	Start	AM	
AM	October 21, 2023 19:50	Start	AM	
AM	October 21, 2023 20:07	Start	AM	
AM	October 21, 2023 20:24	Start	AM	
AM	October 21, 2023 20:41	Start	AM	
AM	October 21, 2023 20:58	Start	AM	
AM	October 21, 2023 21:15	Start	AM	
AM	October 21, 2023 21:32	Start	AM	
AM	October 21, 2023 21:49	Start	AM	
AM	October 21, 2023 22:06	Start	AM	
AM	October 21, 2023 22:23	Start	AM	
AM	October 21, 2023 22:40	Start	AM	
AM	October 21, 2023 22:57	Start	AM	
AM	October 21, 2023 23:14	Start	AM	
AM	October 21, 2023 23:31	Start	AM	
AM	October 21, 2023 23:48	Start	AM	
AM	October 21, 2023 24:05	Start	AM	
AM	October 21, 2023 24:22	Start	AM	
AM	October 21, 2023 24:39	Start	AM	
AM	October 21, 2023 24:56	Start	AM	
AM	October 21, 2023 25:13	Start	AM	
AM	October 21, 2023 25:30	Start	AM	
AM	October 21, 2023 25:47	Start	AM	
AM	October 21, 2023 26:04	Start	AM	
AM	October 21, 2023 26:21	Start	AM	
AM	October 21, 2023 26:38	Start	AM	
AM	October 21, 2023 26:55	Start	AM	
AM	October 21, 2023 27:12	Start	AM	
AM	October 21, 2023 27:29	Start	AM	
AM	October 21, 2023 27:46	Start	AM	
AM	October 21, 2023 28:03	Start	AM	
AM	October 21, 2023 28:20	Start	AM	
AM	October 21, 2023 28:37	Start	AM	
AM	October 21, 2023 28:54	Start	AM	
AM	October 21, 2023 29:11	Start	AM	
AM	October 21, 2023 29:28	Start	AM	
AM	October 21, 2023 29:45	Start	AM	
AM	October 21, 2023 30:02	Start	AM	
AM	October 21, 2023 30:19	Start	AM	
AM	October 21, 2023 30:36	Start	AM	
AM	October 21, 2023 30:53	Start	AM	
AM	October 21, 2023 31:10	Start	AM	
AM	October 21, 2023 31:27	Start	AM	
AM	October 21, 2023 31:44	Start	AM	
AM	October 21, 2023 32:01	Start	AM	
AM	October 21, 2023 32:18	Start	AM	
AM	October 21, 2023 32:35	Start	AM	
AM	October 21, 2023 32:52	Start	AM	
AM	October 21, 2023 33:09	Start	AM	
AM	October 21, 2023 33:26	Start	AM	
AM	October 21, 2023 33:43	Start	AM	
AM	October 21, 2023 34:00	Start	AM	
AM	October 21, 2023 34:17	Start	AM	
AM	October 21, 2023 34:34	Start	AM	
AM	October 21, 2023 34:51	Start	AM	
AM	October 21, 2023 35:08	Start	AM	
AM	October 21, 2023 35:25	Start	AM	
AM	October 21, 2023 35:42	Start	AM	
AM	October 21, 2023 35:59	Start	AM	
AM	October 21, 2023 36:16	Start	AM	
AM	October 21, 2023 36:33	Start	AM	
AM	October 21, 2023 36:50	Start	AM	
AM	October 21, 2023 37:07	Start	AM	
AM	October 21, 2023 37:24	Start	AM	
AM	October 21, 2023 37:41	Start	AM	
AM	October 21, 2023 37:58	Start	AM	
AM	October 21, 2023 38:15	Start	AM	
AM	October 21, 2023 38:32	Start	AM	
AM	October 21, 2023 38:49	Start	AM	
AM	October 21, 2023 39:06	Start	AM	
AM	October 21, 2023 39:23	Start	AM	
AM	October 21, 2023 39:40	Start	AM	
AM	October 21, 2023 39:57	Start	AM	
AM	October 21, 2023 40:14	Start	AM	
AM	October 21, 2023 40:31	Start	AM	
AM	October 21, 2023 40:48	Start	AM	
AM	October 21, 2023 41:05	Start	AM	
AM	October 21, 2023 41:22	Start	AM	
AM	October 21, 2023 41:39	Start	AM	
AM	October 21, 2023 41:56	Start	AM	
AM	October 21, 2023 42:13	Start	AM	
AM	October 21, 2023 42:30	Start	AM	
AM	October 21, 2023 42:47	Start	AM	
AM	October 21, 2023 43:04	Start	AM	
AM	October 21, 2023 43:21	Start	AM	
AM	October 21, 2023 43:38	Start	AM	
AM	October 21, 2023 43:55	Start	AM	
AM	October 21, 2023 44:12	Start	AM	
AM	October 21, 2023 44:29	Start	AM	
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CERTIFICATE OF CALIBRATION

Certificate No.: CL-048-B4
Page 1 of 2

Equipment Name: Heat Stress Monitor with Sensor
Manufacturer: DataCell
Model: HS32.2
Serial No.: 15020736
ID No.: RYD_F50231

Customer:
Name: A.S. laboratory group (thailand) Co.Ltd.
Address: 104 Phramnuan 40, Phramnuan Rd., Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.

Received date: 09 Jul 2022
Calibration date: 13 Jul 2022
Issue date: 13 Jul 2022

Reference Used During Calibration:
1. Standard Temperature Probe Model: STD-100-A500, Serial No.: 607682-09, Due date: 25 Mar 2022
2. Digital Temperature Indicator Model: DT-1000-A-MK 5, Serial No.: 671407-00093, Due date: 04 Jun 2022

Calibration Condition:
Temperature: (23±0.2) °C
Relative Humidity: (55±15)%

Calibration Procedure:
The temperature calibration was done by surface conduction method as per ISO 17025, according to comparison method with standard digital temperature indicator and standard temperature probe. The temperature scale was based on ITS-90.

Traceability:
The measurement results are traceable to the international system of units (SI) through National Institute of Metrology, Thailand (NIMT). Certificate number: TT-0036-21, Certificate number: ER-0032-21

Calibrated by:
☐ Mr. Somchai Thachaporn
☐ Miss Oranrat Wiroonratana

Approved Signature:
Mr. Panyra Boonchaisri
Technical Support
Any Calibration Manager

REVIEW BY: Panyra P.
APPROVED BY: Panyra P.
NEXT CAL DATE: 13/7/22

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CERTIFICATE OF CALIBRATION

Certificate No.: CL-048-B4
Page 2 of 2

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment
Calibration Range: 20 °C ~ 40 °C
Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 15035050.
Dimension: Diameter 14 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
30	20.042	20.1	0.1	0.099
30	25.043	25.1	0.1	0.099
30	30.032	30.0	0.0	0.14
30	35.027	35.0	0.0	0.099
30	40.031	40.1	0.1	0.099

Table 2: This equipment was connected with temperature probe Model: TP3207.2 S/N: 15033221.
Dimension: Diameter 14 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
70	20.036	20.1	0.1	0.099
70	24.857	24.8	0.1	0.099
70	29.804	29.7	-0.1	0.099
70	34.755	34.6	-0.2	0.099
70	39.709	39.4	-0.3	0.099

Table 3: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 17032315.
Dimension: Diameter 8 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.042	20.1	0.1	0.099
110	25.043	25.1	0.1	0.099
110	30.032	30.1	0.1	0.099
110	35.027	35.1	0.1	0.099
110	40.031	40.1	0.1	0.099

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

★ End of Certificate ★

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CERTIFICATE OF CALIBRATION

Certificate No.: CL-048-B4
Page 1 of 2

Equipment Name: Heat Stress Monitor with Sensor
Manufacturer: DataCell
Model: HS32.2
Serial No.: 15020736
ID No.: RYD_F50231

Customer:
Name: A.S. laboratory group (thailand) Co.Ltd.
Address: 104 Phramnuan 40, Phramnuan Rd., Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.

Received date: 09 Jul 2022
Calibration date: 13 Jul 2022
Issue date: 13 Jul 2022

Reference Used During Calibration:
1. Standard Temperature Probe Model: STD-100-A500, Serial No.: 607682-09, Due date: 25 Mar 2022
2. Digital Temperature Indicator Model: DT-1000-A-MK 5, Serial No.: 671407-00093, Due date: 04 Jun 2022

Calibration Condition:
Temperature: (23±0.2) °C
Relative Humidity: (55±15)%

Calibration Procedure:
The temperature calibration was done by in-house calibration method as per ISO 17025, according to comparison method with standard digital temperature indicator and standard temperature probe. The temperature scale was based on ITS-90.

Traceability:
The measurement results are traceable to the international system of units (SI) through National Institute of Metrology, Thailand (NIMT). Certificate number: TT-0036-21, Certificate number: ER-0032-21

Calibrated by:
☐ Mr. Somchai Thachaporn
☐ Miss Oranrat Wiroonratana

Approved Signature:
Mr. Panyra Boonchaisri
Technical Support
Any Calibration Manager

REVIEW BY: Panyra P.
APPROVED BY: Panyra P.
NEXT CAL DATE: 13/7/22

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CERTIFICATE OF CALIBRATION

Certificate No.: CL-048-B4
Page 2 of 2

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment
Calibration Range: 20 °C ~ 40 °C
Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 15027737.
Dimension: Diameter 14 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
30	20.045	20.1	0.1	0.099
30	25.042	25.1	0.1	0.099
30	30.034	30.1	0.1	0.16
30	35.029	35.1	0.1	0.099
30	40.031	40.1	0.0	0.30

Table 2: This equipment was connected with temperature probe Model: TP3207.2 S/N: 15015503.
Dimension: Diameter 14 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
70	20.036	20.1	0.1	0.099
70	24.856	24.9	0.0	0.099
70	29.810	29.8	0.0	0.099
70	34.759	34.8	0.2	0.099
70	39.700	39.5	-0.2	0.30

Table 3: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 15031164.
Dimension: Diameter 8 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.045	20.1	0.1	0.099
110	25.042	25.1	0.1	0.099
110	30.034	30.1	0.0	0.16
110	35.029	35.1	0.1	0.099
110	40.031	40.1	0.0	0.30

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

★ End of Certificate ★

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CERTIFICATE OF CALIBRATION

Certificate No.: CL-048-B4
Page 2 of 2

Equipment Name: Digital Thermometer with RTD
Manufacturer: DataCell
Model: HS32.2
Serial No.: 20030242
ID No.: RYD_F50233

Customer:
Name: A.S. laboratory group (thailand) Co.Ltd.
Address: 104 Phramnuan 40, Phramnuan Rd., Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.

Received date: 25 Feb 2022
Calibration date: 7 Mar 2022
Issue date: 10 Mar 2022

Reference Used During Calibration:
1. Standard Temperature Probe Model: STD-100-A500, Serial No.: 607682-09, Due date: 25 Mar 2022
2. Digital Temperature Indicator Model: DT-1000-A-MK 5, Serial No.: 671407-00093, Due date: 04 Jun 2022

Calibration Condition:
Temperature: (23±0.2) °C
Relative Humidity: (55±15)%

Calibration Procedure:
The temperature calibration was done by in-house calibration method as per ISO 17025, according to comparison method with standard digital temperature indicator and standard temperature probe. The temperature scale was based on ITS-90.

Traceability:
The measurement results are traceable to the international system of units (SI) through National Institute of Metrology, Thailand (NIMT). Certificate number: TT-0036-21, Certificate number: ER-0032-21

Calibrated by:
☐ Mr. Somchai Thachaporn
☐ Miss Oranrat Wiroonratana

Approved Signature:
Mr. Panyra Boonchaisri
Technical Support
Any Calibration Manager

REVIEW BY: Panyra P.
APPROVED BY: Panyra P.
NEXT CAL DATE: 7/3/23

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CERTIFICATE OF CALIBRATION

Certificate No.: CL-041-05
Page 2 of 2

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment
Calibration Range: 20 ~ 40 °C
Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 21001206.
Dimension: Diameter 14 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
30	20.058	20.0	-0.1	0.099
30	25.049	25.0	0.0	0.099
30	30.045	30.0	0.0	0.099
30	35.030	35.0	0.0	0.099
30	39.999	40.0	0.0	0.099

Table 2: This equipment was connected with temperature probe Model: TP3207.2 S/N: 21001796.
Dimension: Diameter 14 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
70	20.036	20.2	1.0	0.099
70	25.049	25.0	0.0	0.099
70	30.032	30.1	0.3	0.099
70	35.011	34.6	-0.4	0.099
70	40.000	39.5	-0.5	0.099

Table 3: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 21001250.
Dimension: Diameter 8 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.058	20.0	0.0	0.099
110	25.048	25.0	-0.1	0.099
110	30.031	30.0	0.0	0.099
110	35.020	35.0	0.0	0.099
110	40.000	40.0	0.0	0.099

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

★ End of Certificate ★

65/14 16.6/26-36, Soi Pathakarn 7/74, Pathakarn Rd.
Wathana, Bangkok, Bangkok 10500 Thailand.
Tel: (66) 02-66081241 Fax: (66) 02-6608660 www.jnatec.com

CERTIFICATE OF CALIBRATION

Certificate No.: C-04265
Page 1 of 2

Equipment Name: Digital thermometer with probe
Manufacturer: Yokogawa
Model: PT232.2
Serial No: 2002243
ID No: J00223

Customer:
Name: A.S. University Group (Thailand) Co., Ltd.
Address: 144 Petchaburi Rd. Petchaburi
Rd., Khwaeng San Luang, Bangkok
10250 Thailand.

Received date: 28 Feb 2022
Calibration date: 7 Mar 2022
Issue date: 10 Mar 2022

Reference Used During Calibration:
1. Standard Temperature Probe Model: STS-100 K905
Serial No: 607802-09, Exp. date: 28 Mar 2022
2. Digital Temperature Indicator Model: UT11003A Mk II, Serial No: (GT1451-0201) Exp. date: 24 Jan 2023

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

Calibration Procedure:
The temperature calibration was done by immersing calibration material in water bath according to comparison method with standard digital thermometer and standard temperature probe. The temperature probe was used on RS-90.

Traceability:
The measurement results are traceable to the international system of units (SI) through National Institute of Metrology (NIMT), Certificate number: TT-0038-21, Certificate number: E1-0032-21

Calibrated by:
ID No: Gopand Thacharol
ID No: Misa Othair Wierattabai

Approved Signature:
Mr. Pongsak Boonprasom
Calibration Department Manager

REVIEW BY: *Thacharol*
APPROVED BY: *Thacharol*
NEXT CAL DATE: 7/3/23

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Certificate No.: C-04265
Page 2 of 2

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment
Calibration Range: 20 ~ 40 °C

Table 1: The equipment was connected with test probe Model: HP3201.2 S/N: 21001219.
Dimension: Diameter 14 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
20	20.000	20.0	0.0	0.009
30	25.047	25.0	0.0	0.009
30	30.034	30.0	0.0	0.009
30	35.021	35.0	0.0	0.009
30	40.007	40.0	0.0	0.009

Table 2: This equipment was connected with temperature probe Model: TP3207.2 S/N: 21001786.
Dimension: Diameter 1.4 mm, Length 320 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
70	20.058	20.2	0.1	0.009
70	25.045	25.1	0.1	0.009
70	30.032	30.0	0.0	0.009
70	35.021	35.0	0.1	0.009
70	40.001	39.7	-0.3	0.009

Table 3: This equipment was connected with Glass Thermometer probe Model: TP3276.2 S/N: 21001243.
Dimension: Diameter 8 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.059	20.0	-0.1	0.009
110	25.047	25.0	0.0	0.009
110	30.032	30.0	0.0	0.009
110	35.016	35.0	0.0	0.009
110	40.007	40.0	0.0	0.009

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

End of Certificate

Calibrated by:
ID No: Gopand Thacharol
ID No: Misa Othair Wierattabai

Approved Signature:
Mr. Pongsak Boonprasom
Calibration Department Manager

REVIEW BY: *Thacharol*
APPROVED BY: *Thacharol*
NEXT CAL DATE: 7/3/23

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
1444 PETCHABURI ROAD SOI 14, BANJAKONG, BANGKOK 10250 THAILAND
TEL: 02-66081241 FAX: 02-6608660

Certificate No.: 22CH405
Page: 1 of 3

Certificate of Calibration

Equipment: pH Meter
Manufacturer: Metrohm
Model: Seven Compact 5220
Serial No.: C104059460
ID No.: RYD_EN0183
Condition As-Received: Used Item
Received Date: 16 March 2022
Calibration Date: 17 March 2022
Reference: 2203-001100C-4
Submitted by: ALS Laboratory Group (Thailand) Co., Ltd.
Rayong Branch
616/10 Moo 5 T. Maenam Khu.
A. Phakdang, Rayong 21140, Thailand

Ambient Temperature: (25 ± 2.5) °C
Relative Humidity: (50 ± 15) %
Calibration Procedure:
- CP-CHS by direct measurement with standard voltage calibrator and direct measurement with certified reference material (CRM)
- CP-GHS by comparison with standard thermometer

Calibrated by: Watsorn Lenggrakul

Approved by: *Watsorn Lenggrakul*
Approved Signature

Issue Date: 22 March 2022
The Uncertainty is for a confidence probability of approximately 95%
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Approved by the head of Corporate Services & Equipment Calibration and Testing Services.

REVIEW BY: *N. Bangkit*
APPROVED BY: *N. Bangkit*
NEXT CAL DATE: 17/3/23

Cert. No.: 22CH405
Page: 2 of 3

Condition of this calibration result:
1. Reference Standard Instrument:
Instrument: Serial No. ID No. Cert. No. Due Date
1) Document Process Calibrator 54030048 1304C116 21E2682 25 Aug 2022
2) Ref. Standard Thermometer 4860056 1108C044 211201 26 Oct 2022
This certification is traceable to the International System of Unit maintained at:
- Traceable to National Institute of Metrology (Thailand), NIMT

2. Certified Reference Materials: The measured results are traceable to SI through CPA chem Ltd., ANSI-ASQ National Accreditation Board, Accredited No. AN-1835

Buffer Solution: Manufacturer: Lot No. Exp. date
pH 4.008 CPA chem 788985 01 Jan 2024
pH 8.982 CPA chem 761017 02 Aug 2022
pH 10.015 CPA chem 788824 04 Sep 2022

3. This certificate is valid only to the item calibrated on date and place of calibration.

Calibration Results:
Function: mV Measurement
Performing standard curve by Fluke at pH (4.7,16)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading	Uncertainty of Measurement (mV)	Coverage factor
pH Meter	4.000	177.48	17.4	0.058	2.00
SN: C104059460	7.000	0.00	-1.1	0.058	2.00
	10.000	-177.48	-17.5	0.058	2.00

Cert. No.: 22CH405
Page: 3 of 3

Calibration Results:
Function: pH Measurement
Performing three buffers standard curve by using buffer nominal pH (4.7,16)

Unit Under Calibration	Standard pH buffer solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement (±)	Coverage factor
pH Electrode	4.008	4.016	177.7	0.0046	2.00
SN: 1453404	8.982	8.984	-3.4	0.0048	2.00
	10.015	10.019	-172.9	0.0073	2.00

Function: Temperature Measurement
(*) Without adjustment
This equipment was connected with Temperature Probe:
- Model: InLab Expert Pro-ISM
- Serial No.: 1453404
Dimension of probe:
- Length: 129 mm
- Diameter: 12 mm
- Immersion Depth: 100 mm

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor
25.0	25.002	24.9	-0.102	0.13	2.00

Remark: * UUC* = Unit Under Calibration
The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95%.

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CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
1444 PETCHABURI ROAD SOI 14, BANJAKONG, BANGKOK 10250 THAILAND
TEL: 02-66081241 FAX: 02-6608660

Certificate No.: 22CH405
Page: 1 of 4

Certificate of Calibration

Equipment: pH Meter
Manufacturer: Metrohm
Model: Seven Compact 5220
Serial No.: C104059460
ID No.: RYD_EN0183
Condition As-Received: Used Item
Received Date: 16 March 2022
Calibration Date: 21 March 2022
Reference: 2203-001100C-4
Submitted by: ALS Laboratory Group (Thailand) Co., Ltd. Rayong Branch
Ambient Temperature: (25 ± 2.5) °C
Relative Humidity: (50 ± 15) %
616/10 Moo 5 T. Maenam Khu. A. Phakdang, Rayong 21140, Thailand

Procedure used: Calibration were conducted using in-house calibration procedure CP-E17 According to direct measurement method with Multi-Product Calibrator

Condition of this result of calibration:
1. Reference standards instruments:
Instrument: Serial No. Certificate No. Due Date
1) Multi-Product Calibrator 500A 846002 21E1444 07 May 2022
2. The result of calibration was made on requested at the point specified by customer.
3. The certificate is valid only to the item calibrated on date and place of calibration.
4. This Certification is traceable to the International System of Unit maintained at:
- National Institute of Metrology (Thailand) (NIMT)

Calibrated by: Pongsak Boonprasom
Issue Date: 22 March 2022

Approved Signature:
Mr. Pongsak Boonprasom
Calibration Department Manager

REVIEW BY: *N. Bangkit*
APPROVED BY: *N. Bangkit*
NEXT CAL DATE: 17/3/23

Certificate No. T22038401

Page 2 of 4

Calibration Report

Equipment : Chamber (Cold Room)
Date of Calibration : 22 February 2022
Environment : Temperature : 232-24.3 °C
Line Voltage : 22.9-227.2 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. The equipment was calibrated by insert 16 standard thermocouples type T into its chamber , the other one standard thermocouple type T use for ambient temperature measurement . The calibration was done in according to WI-T20 (based on ASTM E145-94 (Reapproved 2002) and AS2853-1986).
All data show below were final values and the initial data from customer request . The temperature scale used was based on ITS - 90 .

2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	TYPE T	TN141-TN150	T210743	21 April 2022
TC	TYPE T	TN151-TN160	T210743	21 April 2022
DATA LOGGER	34970A	T151	T210743	21 April 2022

3. This certificate is traceable to :

National Institute of Metrology (Thailand) through Metrological Center (NSC-TISI-TIS 17025 CALIBRATION 6244)

4. Condition of calibrated item : good

Equipment Description :

Time Constant : Hour 40 Minute 40 3 °C
Fresh Air Damper : ☐ Open ☐ Min ☐ Medium ☐ Max
☒ Close ☐ Not Available

5. Adjustment :

(X) without adjustment () after adjustment

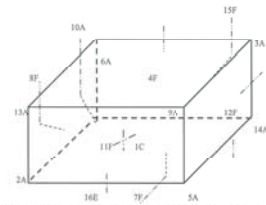
Approved By: _____

PKA-L12 17112-02-42

Certificate No. T22038401

Page 3 of 4

Calibration Report



C = Centre, F = Centre of Face, A = Corner, E = Centre of Edge

1C = TN141	17F = TN152
2A = TN142	13A = TN153
3A = TN143	14A = TN154
4F = TN144	15F = TN155
5A = TN145	16I = TN156
6A = TN146	
7F = TN147	
8F = TN148	
9A = TN149	
10A = TN150	
11F = TN151	

Approved By: _____

PKA-L12 17112-02-42

Certificate No. T22038401

Page 4 of 4

Calibration Report

Measurement Results

Calibration Point	Average Standard Reading at each position (°C)															
	TN141	TN142	TN143	TN144	TN145	TN146	TN147	TN148	TN149	TN150	TN151	TN152	TN153	TN154	TN155	TN156
3.0	2.80	2.86	2.98	2.97	3.8	3.29	2.95	3.14	3.10	3.45						
	TN151	TN152	TN153	TN154	TN155	TN156										
	3.04	3.19	3.03	3.34	3.31	3.11										

Chamber (Cold Room)		Temperature Distribution				
Setting (°C)	Reading (°C)	Average (°C)		Stability (± °C)	Uniformity (°C)	Uncertainty (± °C)
		Min	Max			
3.0	2.7, 4.1	3.5	3.11	1.30	1.30	2.00
						2.05

* The Assessed uncertainty exclude "uniformity"

The calibration result apply only the above calibrated item.

The result of test was found accurate as shown on date and place of test only.

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

Approved By: _____

PKA-L12 17112-02-42

Cert. No.: 22TW04
Page: 1 of 2

Certificate of Testing

Equipment : DO Meter
Manufacturer : YSI
Model : 3000-115V
Serial No.: 15E102796
ID No.: RYG_EN0032
Received Date : 11 February 2022
Test Date : 14 February 2022
Reference : 9202-0484/SC-4
Submitted by : NLS Laboratory Group (Thailand) Co., Ltd.
Rajayong Branch
116/10 Moo 5 T.Maeam Khui, A.Phuakdiang,
Rajayong 21140, Thailand.
Laboratory Condition : Temperature : (25 ± 5) °C
Humidity : (50 ± 20) %
Test Procedure : n - Insure method : DP-018
by Comparison technique with Azide Modification Method
Tested by : Watsakul Siriporn
Approved by : _____
() Mokee Butthas
() Sathira Meenomai
() Watsakul Lenggaikul
Issue Date : 14 February 2022

REVIEW BY: N. B. Siriporn
APPROVED BY: D. Siriporn
NEXT CAL. DATE: 15/8/25

0281285

Cert. No.: 22TW04
Page: 1 of 2

Result : Dissolved Oxygen Meter Adjustment With Air 100 %
Dissolved Oxygen Probe No.: 15E100484

Titration Method (Azide Modification Method)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.02	8.02	0.0084

This report was certified only for the instrument we tested. It is allowable to use for study the system efficiency. The environmental impact control and present to organization it may concerned intend in use for advertising and referral purpose is prohibited. This report may not be reproduced other in full without written approval of the laboratory.

-00-

Sathira

1094744

Cert. No.: 22LM12
Page: 1 of 2

Certificate of Calibration

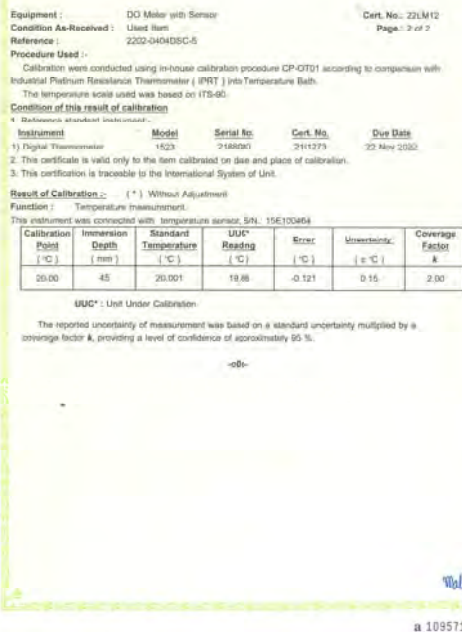
Equipment : DO Meter with Sensor
Manufacturer : YSI
Model : 3000-115V
Serial No.: 15E102796
ID No.: RYG_EN0032
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd. (Rajayong Branch)
816/10 Moo 5 T.Maeam Khui, A.Phuakdiang,
Rajayong 21140, Thailand
Location : TPA On Site Calibration Laboratory
Received Order : 11 February 2022
Calibrated Date : 21 February 2022
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
AC Line Voltage : (220 ± 22) V
Calibrated by : Watsakul Siriporn
Approved by : _____
() Pongthipha Tameyikul
() Mokee Butthas
() Sathira Meenomai
Issue Date : 21 February 2022

The Uncertainties are for a confidence probability of approximately 95%

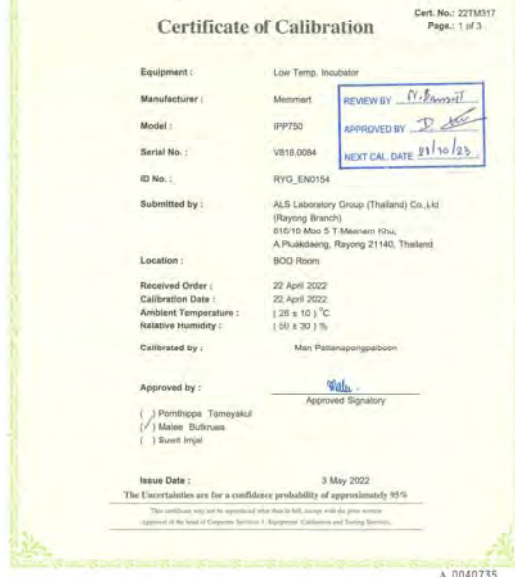
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Approved by the head of Corporate Services : Equipment Calibration and Testing Services

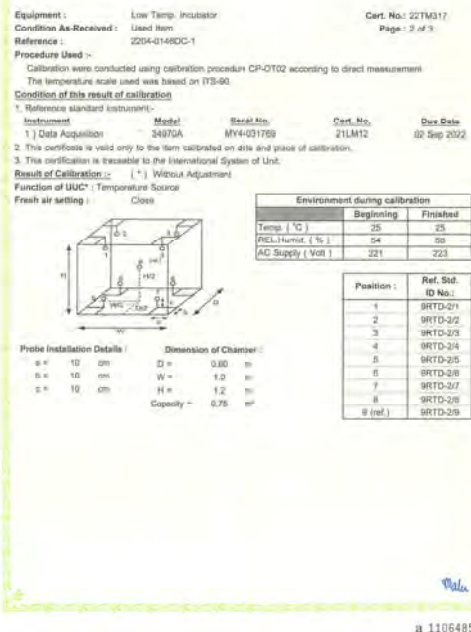
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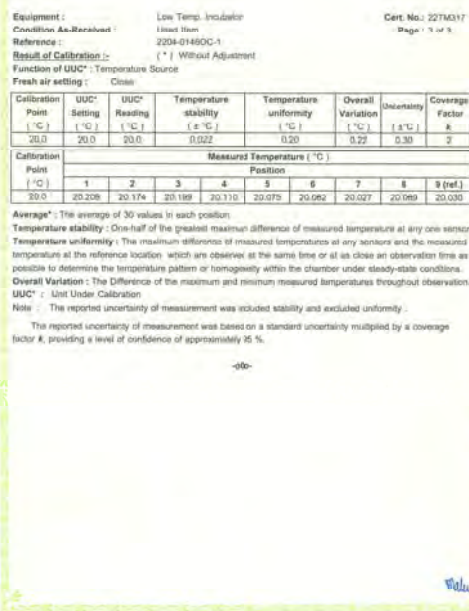
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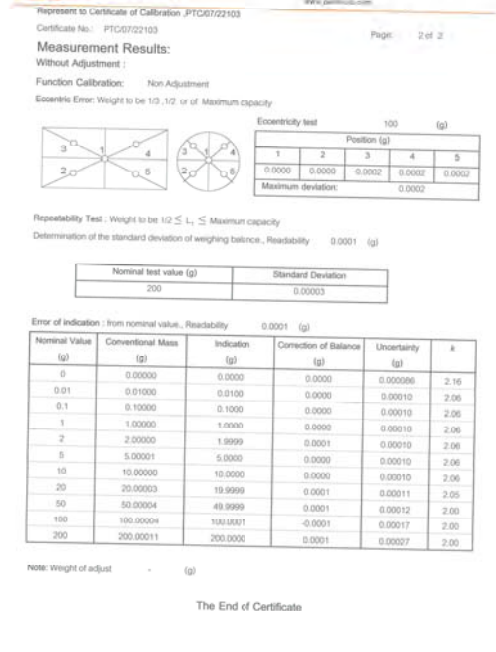
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W 1106485



1106484



RYG_EN0010

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
1344 PATTANAKARN ROAD SOI 18, HUANLUANG, HUANLUANG RANGKOK 10250
TEL. 0-2315-3000-27 FAX 0-2315-4844

Cert. No.: 21TM827
Page: 1 of 3

Certificate of Calibration

Equipment : Hot Air Oven
Manufacturer : Memmert
Model : UFE 500
Serial No. : 0511.1572
ID No. : RYG_EN0010
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch)
610/10 Moo 5 T. Maenam Khu,
A. Phukdaeng,
Rayong 21140 Thailand
Location : Oven Room
Received Order : 5 May 2021
Calibration Date : 5 May 2021
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Khit Ruttanaprapachai
Approved by : Approved Signatory
() Pomsitpa Tameyakul
() Malee Sukrua
() Suwit Imjai
Issue Date : 14 May 2021

The Uncertainties are for a confidence probability of approximately 95%
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Approval of the head of Corporate Services : Equipment Calibration and Testing Services.

A 0028099

Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2105-0005OC-4
Procedure Used :-
Calibration was conducted using calibration procedure CIP-0Y02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD) and Thermocouple Type T.
The temperature scale used was based on ITS-90.
Condition of this result of calibration
1. Reference standard instrument:-
Instrument Model Serial No. Cert. No. Due Date
1) Data Acquisition 34972A MYS7013823 21LM3 26 Feb 2022
2. This certificate is valid only to the item calibrated on date and place of calibration.
Result of Calibration :- (°) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Environment during calibration
Temp. (°C) Beginning Finished
REL Humid. (%) 59 56
AC Supply (Volt) 220 221

Probe Installation Details : Dimension of Chamber :
a = 5.0 cm D = 0.48 m
b = 5.0 cm W = 0.56 m
c = 5.0 cm H = 0.48 m
Capacity = 0.11 m³

Ref. Std. ID No. : @
Calibration Point
Position (164) °C (189) °C
1 21-17RTD-01 19-17TC-01
2 21-17RTD-02 19-17TC-02
3 17RTD-03 19-17TC-03
4 17RTD-04 19-17TC-04
5 17RTD-05 19-17TC-05
6 17RTD-06 19-17TC-06
7 17RTD-07 19-17TC-07
8 17RTD-08 19-17TC-08
9 (ref.) 17RTD-09 19-17TC-09

a 1054267

Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2105-0005OC-4
Result of Calibration :- (°) Without Adjustment
Function of UUC* : Temperature Source

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor k
104.0	104.0	104.0	0.063	0.54	0.70	0.42	2
180.0	180.0	180.0	0.15	0.99	1.3	1.1	2

Calibration Point (°C) Measured Temperature (°C)
Position
1 2 3 4 5 6 7 8 9 (ref.)
104.0 104.243 103.732 103.760 103.742 103.863 103.743 104.311 103.689 103.815
180.0 180.101 180.481 179.401 179.692 179.980 179.943 180.127 179.915 179.709

Average* : The average of 30 values in each position.
Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor.
Temperature 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 or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.
Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation.
UUC* : Unit Under Calibration
Note : The reported uncertainty of measurement was included stability and excluded uniformity.
The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k, providing a level of confidence of approximately 95 %.

-o/o-

a 1054266

RYG_EN0006

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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Cert. No.: 21TM829
Page: 1 of 3

Certificate of Calibration

Equipment : Hot Air Oven
Manufacturer : Memmert
Model : UM 400
Serial No. : b495.0899
ID No. : RYG_EN0006
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch)
610/10 Moo 5 T. Maenam Khu,
A. Phukdaeng,
Rayong 21140 Thailand
Location : Oven Room
Received Order : 5 May 2021
Calibration Date : 5 - 6 May 2021
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Khit Ruttanaprapachai
Approved by : Approved Signatory
() Pomsitpa Tameyakul
() Malee Sukrua
() Suwit Imjai
Issue Date : 14 May 2021

The Uncertainties are for a confidence probability of approximately 95%
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Approval of the head of Corporate Services : Equipment Calibration and Testing Services.

A 0028096

Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2105-0005OC-1
Procedure Used :-
Calibration was conducted using calibration procedure CIP-0Y02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD) .
The temperature scale used was based on ITS-90.
Condition of this result of calibration
1. Reference standard instrument:-
Instrument Model Serial No. Cert. No. Due Date
1) Data Acquisition 34972A MYS7013823 21LM3 26 Feb 2022
2. This certificate is valid only to the item calibrated on date and place of calibration.
Result of Calibration :- (°) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Environment during calibration
Temp. (°C) Beginning Finished
REL Humid. (%) 56 58
AC Supply (Volt) 221 222

Probe Installation Details : Dimension of Chamber :
a = 5.0 cm D = 0.33 m
b = 5.0 cm W = 0.40 m
c = 5.0 cm H = 0.40 m
Capacity = 0.053 m³

Ref. Std. ID No. :
Position :
1 21-17RTD-01
2 21-17RTD-02
3 17RTD-03
4 17RTD-04
5 17RTD-05
6 17RTD-06
7 17RTD-07
8 17RTD-08
9 (ref.) 17RTD-09

a 1054310

Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2105-0005OC-1
Result of Calibration :- (°) Without Adjustment
Function of UUC* : Temperature Source

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor k
70.0	70.0	70.0	0.21	1.8	2.0	0.55	2

Calibration Point (°C) Measured Temperature (°C)
Position
1 2 3 4 5 6 7 8 9 (ref.)
70.0 70.404 70.277 70.607 70.307 68.789 69.257 68.846 69.331 70.495

Average* : The average of 30 values in each position.
Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor.
Temperature 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 or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.
Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation.
UUC* : Unit Under Calibration
Note : The reported uncertainty of measurement was included stability and excluded uniformity.
The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k, providing a level of confidence of approximately 95 %.

-o/o-

a 1054309

RYG_EN0061

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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1344 PATTANAKARN ROAD BOX 18, SUANLUANG, BANGKOK 10250
TEL: 0-2317-3000-27 FAX: 0-2317-9484

Cert. No.: 21TM673
Page: 1 of 3

Certificate of Calibration

Equipment: Water Bath

Manufacturer: Memmert

Model: W8822

Serial No.: L513.0648

ID No.: RYG_EN0061

Submitted by: ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch)
619/10 Moo 5 T. Maenam Khu,
A. Phukdaeng,
Rayong 21140 Thailand
WU Chemistry Lab

Location:

Received Order: 5 May 2021

Calibration Date: 5 May 2021

Ambient Temperature: (26 ± 10) °C

Relative Humidity: (50 ± 30) %

Calibrated by: Tawatchai Pama

Approved by:
Approved Signatory

Issue Date: 14 May 2021

REVIEW BY:

APPROVED BY:

NEXT CAL DATE: 3/1/22

The Uncertainties are for a confidence probability of approximately 95%

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A 0028098

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TEL: 0-2317-3000-27 FAX: 0-2317-9484

Cert. No.: 21TM673
Page: 2 of 3

Equipment: Water Bath
Condition As-Received: Used Item
Reference: 2105-0005OC-3
Procedure Used >:

Calibration were conducted using in-house calibration procedure CP-OT04 according to direct measurement method with Data Acquisition which connected with Industrial Platinum Resistance Thermometer (IPRT).

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34970A	MY44060450	21LM4	06 Mar 2022

2. This certificate is valid only to the item calibrated on date and place of calibration.

3. This certificate is traceable to the International System of Unit.

Result of Calibration >: (°) Without Adjustment

Function of UUC*: Temperature Source

	Environmental (°C)	(%R.H.)	AC Voltage Supply (Volt)
Beginning of Calibration	22	68	230
Finished of Calibration	20	64	231

Position	Ref. Std. S/N:
1	4803988-001
2	4803988-002
3	4803988-003
4	4803988-004
5(ref.)	4803988-005

Front

a 1054269

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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1344 PATTANAKARN ROAD BOX 18, SUANLUANG, BANGKOK 10250
TEL: 0-2317-3000-27 FAX: 0-2317-9484

Cert. No.: 21TM673
Page: 3 of 3

Equipment: Water Bath
Condition As-Received: Used Item
Reference: 2105-0005OC-3
Result of Calibration >: (°) Without Adjustment
Function of UUC*: Temperature Source

Calibration point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Average* Standard Reading (°C)				
			Position				
			1	2	3	4	5 (ref.)
85.0	85.0	85.0	84.891	84.893	84.880	84.892	84.917

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Uncertainty (± °C)	Coverage Factor k
85.0	0.089	0.052	1.22	2

Average*: The average of 30 values in each position.

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 or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.

Stability: One-half of the greatest maximum difference of measured temperature at any one probe.

UUC*: Unit Under Calibration

Note: The reported uncertainty of measurement was included stability and excluded uniformity.

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

-00-

a 1054268

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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1344 PATTANAKARN ROAD BOX 18, SUANLUANG, BANGKOK 10250
TEL: 0-2317-3000-27 FAX: 0-2317-9484

Cert. No.: 21T1003
Page: 1 of 2

Certificate of Calibration

Equipment: Digital Thermometer With Sensor

Manufacturer: Testo

Model: 106

Serial No.: 3126140404

ID No.: RYGL_F100407

Condition As-Received: Used Item

Received Date: 02 July 2021

Calibration Date: 07 July 2021

Reference: 2107-0005OC-3

Ambient Temperature: (25 ± 3) °C

Relative Humidity: (50 ± 25) %

Submitted by: ALS Laboratory Group (Thailand) Co., Ltd. Rayong Branch
619/10 Moo 5 T. Maenam Khu, A. Phukdaeng, Rayong
21140, Thailand

Procedure used: Calibration were conducted using in-house calibration procedure CP-T01 according to comparison with Platinum Resistance Thermometer (IPRT) in liquid bath temperature controls.
The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Digital Thermometer	106-A	819520	21680	26 Jun 2022
2) Platinum Resistance Thermometer	95-14-95	281028/1	21680	26 Jun 2022

2. This certificate is valid only to the item calibrated on date and place of calibration.

3. This Calibration is traceable to the International System of Unit maintained at:

National Institute of Metrology, Thailand (NIMT)

REVIEW BY:

APPROVED BY:

NEXT CAL DATE: 3/1/22

The Uncertainties are for a confidence probability of approximately 95%

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a 0265214

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
1344 PATTANAKARN ROAD BOX 18, SUANLUANG, BANGKOK 10250
TEL: 0-2317-3000-27 FAX: 0-2317-9484

Cert. No.: 21T1200
Page: 2 of 2

Result of Calibration >: Without Adjustment

Function: Temperature measurement

Dimension of probe : Diameter 3 mm, Length 55 mm. Sheath material : Stainless Steel

Immersion Depth (mm)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (± °C)
30	28.0029	24.9	-0.1029	0.12
50	30.0018	29.6	-0.1018	0.12
50	40.0036	40.0	-0.0035	0.12

UUC*: Unit Under Calibration

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

-00-

a 1063351

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
1344 PATTANAKARN ROAD BOX 18, SUANLUANG, BANGKOK 10250
TEL: 0-2317-3000-27 FAX: 0-2317-9484

Cert. No.: 21T1200
Page: 2 of 2

Certificate of System Qualification

GC-00 > GCMS-00

System ID: GA-7
Organization Name: ALS Laboratory Group (Thailand) Co., Ltd.
Organization Location: 104 Pattanakarn Rd., Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250

Date: December 24, 2020 2:51:10 PM

EQP Name: Agilent/Recommended, Agilent/Recommended

EQP Revision: GC-02 50, GCMS-02 50

Overall Qualification Status: Pass

System Inspection and Basic Safety and Operation

Name: T890

Setup Status: Pass

Overall System Inspection and Basic Safety and Operation Test Status

Pass

Inlet Pressure Accuracy

Name: T890

Front: SSL

Setup Status: Pass

Inlet Pressure: Setpoint 25.0 psi, Actual 25.3 psi

Accuracy: 0.3 psi

Agilent Recommended: ± 1.2

Overall Inlet Pressure Accuracy Test Status

Pass

GC Oven Temperature Accuracy

Name: T890

Date: December 24, 2020 2:51:10 PM

System ID: GA-7

Page 1 / 13

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Setpoint Status: Pass

Zone: Oven

Temperature: 230.0 230.6 °C

Accuracy: 0.6 °C

Agilent Recommended: >= -1.0 °C / Setpoint in K (-5.0 °C)
<= 1.0 °C / Setpoint in K (5.0 °C)

Data for this setpoint was entered manually.

Reason: Data logging currently not available.

Setpoint Status: Pass

Zone: Oven

Temperature: 190.0 190.9 °C

Accuracy: 0.9 °C

Agilent Recommended: >= -1.0 °C / Setpoint in K (-3.7 °C)
<= 1.0 °C / Setpoint in K (3.7 °C)

Data for this setpoint was entered manually.

Reason: Data logging solution currently not available.

Overall GC Oven Temperature Accuracy Test Status

Pass

GC Oven Temperature Stability

Name: 7890

Setpoint Status: Pass

Temperature: 100.0 100.9 °C

Stability: 0.0 °C

Agilent Recommended: <= 0.5 °C

Data for this setpoint was entered manually.

Reason: Data logging solution currently not available.

Date: December 24, 2020 2:51:10 PM

System ID: GM-7

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Overall GC Oven Temperature Stability Test Status

Pass

Log Amp

Tested Combination1: Front SSL / External SQ

Name: 5977A

Setpoint Status: Pass

Overall Log Amp Test Status

Pass

RFPA

Tested Combination1: Front SSL / External SQ

Name: 5977A

Setpoint Status: Pass

Amu: 1000 m/z

Drift After Five Minutes: 16 mV

RFPA Voltage: 518 mV

Agilent Recommended: >= -100 and <= 100 <= 1100

Overall RFPA Test Status

Pass

Tune EI

Tested Combination1: Front SSL / External SQ

Name: 5977A

Setpoint Status: Pass

Filament: 1

Setpoint Status: Pass

Filament: 2

Overall Tune EI Test Status

Pass

Date: December 24, 2020 2:51:10 PM

System ID: GM-7

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Signal to Noise EI

Tested Combination1: Front SSL / External SQ

Name: 5977A

Source: EI - Extractor Filament: 1

Setpoint Status: Pass

Signal to Noise: 1472

Agilent Recommended: >= 1000

Source: EI - Extractor Filament: 2

Setpoint Status: Pass

Signal to Noise: 3400

Agilent Recommended: >= 1200

Overall Signal to Noise EI Test Status

Pass

Date: December 24, 2020 2:51:10 PM

System ID: GM-7

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Instrument Details

Purpose: This section describes the as found system configuration.

Details

System:

System ID: GM-7

Manufacturer: Agilent Technologies

Name: 7890

Tested Combination1:

Injection Technique: Manual Injection

Inlet: Front

Detector: External

LTM included? No

Sampler 1:

Manufacturer: Agilent Technologies

Type: Manual Injection

Usage: Sample Injection

Syringe Volume (µL): 10

Mainframe 1:

Manufacturer: Agilent Technologies

Name: 7890

Model Number: G3442B

Serial Number: CN14133181

Firmware Revision: B.02.03

Oven Type: Standard

Date: December 24, 2020 2:51:10 PM

System ID: GM-7

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Inlet 1

Manufacturer: Agilent Technologies

Name: Inlet

Type: SSL

Location: Front

Carrier Gas: Helium

Control Type: Electronic Pressure Control (EPC)

Purged Inlet: Yes

Detector 1

Manufacturer: Agilent Technologies

Name: Mass Spectrometer

Type: Mass Spectrometer

Location: External

Mass Spectrometer 1

Manufacturer: Agilent Technologies

Type: SQ

Name: 5977A

Serial Number: US1415M209

Firmware Revision: 5977 6.00.21

High Vacuum System: Turbo Pump

Scouting Run Standard: OFN Std

MS EI Source 1

Manufacturer: Agilent Technologies

Source Type: EI - Extractor

Number of filaments: 2

Date: December 24, 2020 2:51:10 PM

System ID: GM-7

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Electronic Signature

Purpose: This signature page was created and published because the ACE sign-off action was executed, which is valid for the entire document, including attachments. The ACE sign-off is an electronic signature that requires two distinct identification components: unique username and personal password. The Agilent representative who has delivered this service understands the meaning and legal status of an electronic signature. As a trained official operator, the Agilent representative has a unique password and login to access ACE and electronically sign this document. (Other e-signatures can be applied to this document using a Document Content Management or other suitable method defined in your data access and control procedures.)

Details

Full Name of Signer: Supasak Nimsongthum

Logged On User Name: supasak.nimsongthum@agilent.com

Signature Creation Date: December 24, 2020

Reason for Signature: Executed protocol and published this original version of document.

Regulatory Disclaimer

This document provides a protocol to verify and record instrument configuration and evidence of proper operation. It has been prepared from our interpretation of applicable regulations as well as industry best practices. The document is designed to provide an important component of a complete compliance package. Validation depends upon many factors and use of this protocol alone does not assure compliance. Agilent Technologies makes no promises or representations as to its sufficiency for any specific regulatory program.

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System ID: GM-7

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Certificate of System Qualification

QC-00

System ID: QC-5
Organization Name: Agilent Technologies (Thailand) Co., Ltd.
Organization Location: 104 Phrasuwan Rd., Suan Luang, Bangkok 10250

Prepared: Phrasuwan Rd. 104 Phrasuwan Rd.
ECP Name: Agilent Recommended
ECP Version: 1.0 (by 10)
Overall Qualification Status: Pass

System Inspection and Basic Safety and Operation

Name: 7890
Setpoint Status: Pass

Overall System Inspection and Basic Safety and Operation Test Status
Pass

Inlet Pressure Decay

Name: 7890
Flow Type: Front SSL
Setpoint Status: Pass
Pressure: 25.0 psi
Pressure Change: 0.3 psi
Agilent Recommended: ± 2.0 and ± 0.5 minutes

Overall Inlet Pressure Decay Test Status
Pass

Inlet Pressure Accuracy

Name: 7890
Flow Type: Front SSL

Date: October 20, 2021 10:15:57 AM
System ID: QC-5
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Setpoint Status: Pass

Inst Pressure: 25.0 psi
Accuracy: 0.1 psi
Agilent Recommended: ± 1.2

Overall Inlet Pressure Accuracy Test Status
Pass

Detector Flow Accuracy

Name: 7890
Flow Type: Front FID
Setpoint Status: Pass
Flow Type: Fuel
Setpoint: 20.0 mL/min
Accuracy: 0.0 mL/min
Agilent Recommended: ± 10.0 % setpoint (3.0 min)
Limit is percentage of setpoint or 0.5 minute, whichever is largest

Setpoint Status: Pass
Flow Type: Oxidizer
Setpoint: 400.0 mL/min
Accuracy: 0.7 mL/min
Agilent Recommended: ± 10.0 % setpoint (40.0 min)
Limit is percentage of setpoint or 0.5 minute, whichever is largest

Setpoint Status: Pass
Flow Type: Makeup
Setpoint: 25.0 mL/min
Accuracy: 0.5 mL/min
Agilent Recommended: ± 10.0 % setpoint (2.5 min)
Limit is percentage of setpoint or 0.5 minute, whichever is largest

Date: October 20, 2021 10:15:57 AM
System ID: QC-5
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Overall Detector Flow Accuracy Test Status
Pass

GC Oven Temperature Accuracy

Name: 7890
Setpoint Status: Pass
Zone: Oven
Temperature: 230.0 231.2 °C
Accuracy: 1.2 °C
Agilent Recommended: ± 1.0 % setpoint in K (-5.0 °C)
 ± 1.0 % setpoint in K (5.0 °C)

Setpoint Status: Pass
Zone: Oven
Temperature: 150.0 150.4 °C
Accuracy: 0.4 °C
Agilent Recommended: ± 1.0 % setpoint in K (-3.1 °C)
 ± 1.0 % setpoint in K (3.1 °C)

Overall GC Oven Temperature Accuracy Test Status
Pass

GC Oven Temperature Stability

Name: 7890
Setpoint Status: Pass
Temperature: 150.0 150.4 °C
Stability: 0.0 °C
Agilent Recommended: ± 0.5

Overall GC Oven Temperature Stability Test Status
Pass

Date: October 20, 2021 10:15:57 AM
System ID: QC-5
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Scouting Run

Tested Combination: Front SSL / Front FID
Name: 7890
Setpoint Status: Completed
Injection Volume to Column: 1.0 µL
Overall Scouting Run Status
Completed

Noise and Drift

Tested Combination: Front SSL / Front FID
Name: 7890
Setpoint Status: Pass
Base Signal: 20.2 pA
ACTM Noise: 0.05 pA
Drift: 0.00 pA/hr
Agilent Recommended: ± 0.10 and ± 2.00

Overall Noise and Drift Test Status
Pass

Injection Precision

Tested Combination: Front SSL / Front FID
Name: 7890

Date: October 20, 2021 10:15:57 AM
System ID: QC-5
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Setpoint Status: Pass

Injection Volume on Column: 1.0 µL
Area RSD: 0.52 %
Retention Time RSD: 0.22 %
Agilent Recommended: ± 3.00 and ± 1.00

Overall Injection Precision Test Status
Pass

Signal to Noise

Tested Combination: Front SSL / Front FID
Name: 7890
Setpoint Status: Pass
Signal to Noise: 1258310
Agilent Recommended: ± 300000

Overall Signal to Noise Test Status
Pass

Date: October 20, 2021 10:15:57 AM
System ID: QC-5
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Instrument Details

Purpose: This section describes the as found system configuration.

Details:

System

System ID: QC-5
Manufacturer: Agilent Technologies
Name: 7890
Flow Rate Input: Manual Data
Temperature Data Input: Manual Data or Other Data Logging

Tested Combination: Injection Tower
Front
Detector: Front
LTM VENT: No

Sample 1

Manufacturer: Agilent Technologies
Type: Injection Tower
Name: 7890
Model Number: G2013A
Serial Number: C502258643
Firmware Revision: A.11.02
Usage: Sample Injection
Location: Front
Bottle Volume (mL): 10

Sample 2

Manufacturer: Agilent Technologies
Type: Tray
Name: 7890
Model Number: G2014A
Serial Number: C501347892
Firmware Revision: A.02.01

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System ID: QC-5
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Mainframe 1

Manufacturer	Agilent Technologies
Name	7890
Model Number	G3440A
Serial Number	U510813027
Firmware Revision	A.01.12.1
Component ID/Asset No.	GC-5
Oven Type	Standard

Inlet 1

Manufacturer	Agilent Technologies
Name	7890
Type	SSIL
Location	Front
Carrier Gas	Helium
Control Type	Electronic Pressure Control (EPC)
Purged Inlet	Yes
Detector 1	
Manufacturer	Agilent Technologies
Name	7890
Type	FID
Adapter	Capillary
Control Type	Electronic Pressure Control (EPC)
Location	Front
Makeup Gas	Nitrogen

Date: October 20, 2021 10:15:57 AM
System ID: GC-5

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Electronic Signature

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Details

Full Name of Signer:	Suriya Thongkuew
Logged On User Name:	suriya.thongkuew@fron.agilent.com
Signature Creation Date:	October 20, 2021
Reason for Signature:	Executed protocol and published this original version of document

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Date: October 20, 2021 10:15:57 AM
System ID: GC-5

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User Name: surya.thiruganar System ID: 100-0

DOI: 10.1002/anie.200701267

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Date: October 20, 2021 10:15:57 AM
System ID: GC-5

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Date: October 20, 2021 10:15:57 AM
System ID: GC-5

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Date: October 20, 2021 10:13:57 AM
System ID: GC-5

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Star Name: Kanya Shikshak			Roll No: 2024	
Kanyasulk: AAD00000000			Print Date: October 20, 2024 10:58 AM	
PG 02, ALB (04/09/2024) - Issuance Log				
Time	Transaction Date	Activity	Type of Transaction	Comments/Information
October 19, 2024 10:23:53	Star	Execution	CGC System Population (Global)	None
PG			100% - Temperature: Closes	
			0 (0.00%) - 1 (0.00%)	
October 19, 2024 10:24:46	Auto	State	CGC System Population (Global)	Internal State Entry
PG			100% - Temperature: Closes	
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October 19, 2024 10:25:00	Star	Execution	CGC System Population (Global)	Star Closes: 1
PG			100% - Temperature: Closes	
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October 19, 2024 10:26:00	Star	Execution	CGC System Population (Global)	None
PG			100% - Temperature: Closes	
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October 19, 2024 10:26:00	Auto	State	CGC System Population (Global)	Internal State Entry
PG			100% - Temperature: Closes	
			0 (0.00%) - 1 (0.00%)	
October 19, 2024 10:26:00	Auto	State	CGC System Population (Global)	Internal State Entry
PG			100% - Temperature: Closes	
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October 19, 2024 10:26:00	Auto	State	CGC System Population (Global)	Internal State Entry
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October 19, 2024 10:26:00	Auto	State	CGC System Population (Global)	Internal State Entry
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October 19, 2024 10:26:00	Auto	State	CGC System Population (Global)	Internal State Entry
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October 19, 2024 10:26:00	Auto	State	CGC System Population (Global)	Internal State Entry
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October 19, 2024 10:26:00	Auto	State	CGC System Population (Global)	Internal State Entry
PG			100% - Temperature: Closes	
			0 (

Page 4 / 7

Date: October 20, 2021 10:15:57 AM
System ID: CC-8

Abstract

[illegible][illegible]

Data Name: audit08.dongluhe
Innocence: ADMINISTRATION

System ID: GC-4
Print Date: October 26, 2021 10:16:00 AM

DQI QC & CS UNREVIEWED Transactions Log:

Total	Transmitted (User)	Awaiting Processing	Type of Transaction	Optional Information
October 27, 2021 8:34:53 - 094 AM		Completed	Session	OO
October 25, 2021 8:08:23 - AM	Sher	Pending	Session	Note
October 25, 2021 12:12:14 - Ault AM		Pending	Session	Report Generated Certificate

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ภาคผนวก จ

สำเนาหนังสืออนุญาตขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน



ที่ อก ๐๓๑๐(๑)/ ๑๐๖๕

กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ เขตราชเทวี
กรุงเทพมหานคร ๑๐๕๐๐

๒๘ มกราคม ๒๕๖๕

เรื่อง ต่อยานหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๓๐ กรกฎาคม ๒๕๖๓

- สิ่งที่ส่งมาด้วย ๑. รายชื่อผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๑ แผ่น
๒. รายชื่อเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๕ แผ่น
๓. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๓๑ แผ่น

ตามหนังสือที่อ้างถึง บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ขอต่ออายุ
หนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ว-๒๐๔ สถานที่ตั้งเลขที่ ๑๐๔
ซอยพัฒนาการ ๔๐ ถนนพัฒนาการ แขวงพัฒนาการ เขตสวนหลวง กรุงเทพมหานคร
ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย)
จำกัด ต่อยานหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน โดยมีองค์ประกอบดังนี้

- ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๖ ราย ตามสิ่งที่ส่งมาด้วย ๑
ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๖๒ ราย ตามสิ่งที่ส่งมาด้วย ๒
ค. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย จำนวน ๕๙ รายการ น้ำใต้ดิน
จำนวน ๑๒๖ รายการ อากาศเสีย ๑๖ รายการ สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน ๓๕ รายการ และดิน
จำนวน ๑๒๕ รายการ รวมทั้งสิ้นจำนวน ๓๖๑ รายการ ตามสิ่งที่ส่งมาด้วย ๓

หนังสือฉบับนี้จะหมดอายุในวันที่ ๒ กันยายน ๒๕๖๖ หากประสงค์จะต่ออายุหนังสือ
รับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอ
ต่อกรมโรงงานอุตสาหกรรม ภายใน ๓๐ วัน ก่อนวันสิ้นสุดอายุของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์
เอกชน ซึ่งคำขอต่ออายุดังกล่าวขอรับได้ที่กรมโรงงานอุตสาหกรรม

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

วจจ.

(นายศิระ จันทร์เจ็ด)

นักวิทยาศาสตร์ชำนาญการพิเศษ วิชาการการแพทย์
ผู้อำนวยการกองวิจัยและเฝ้าระวังมลพิษโรงงาน
ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

กองวิจัยและเฝ้าระวังมลพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๒๐๒ ๔๑๔๖ ๐ ๒๒๐๒ ๔๐๐๒

โทรสาร ๐ ๒๓๕๔ ๓๒๐๘ ๐ ๒๓๕๔ ๓๔๑๕

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

เลขทะเบียน ว-๒๐๔

ที่ อก ๐๓๑๐(๑)/

ลงวันที่ ๒๘ มกราคม ๒๕๖๕

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๖ ราย

- | | |
|--------------------------------|----------------------------|
| ๑) นางสาวยุพาพร จันทร์เปล่ง | ทะเบียนเลขที่ ว-๒๐๔-ค-๔๗๐๐ |
| ๒) นางสาวฉันทย์ โกมารกุล ณ นคร | ทะเบียนเลขที่ ว-๒๐๔-ค-๔๗๐๑ |
| ๓) นายศรายุทธ จิตรานนท์ | ทะเบียนเลขที่ ว-๒๐๔-ค-๔๗๐๒ |
| ๔) นางสาวกนกกร เอนก | ทะเบียนเลขที่ ว-๒๐๔-ค-๖๑๑๑ |
| ๕) นายสุริยา สอนแก้ว | ทะเบียนเลขที่ ว-๒๐๔-ค-๖๑๑๒ |
| ๖) นายวิชาญ ชุมทรัพย์ | ทะเบียนเลขที่ ว-๒๐๔-ค-๖๑๑๓ |

วจจ.

(นายศิระ จันทร์เจ็ด)

นักวิทยาศาสตร์ชำนาญการพิเศษ วิชาการการแพทย์

ผู้อำนวยการกองวิจัยและเฝ้าระวังมลพิษโรงงาน

ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

๗๒) นายสมบุรณ์ บุตรจันทร์
๗๓) นายวิรัตน์ ไชยนระรา
๗๔) นายณนุศม์ เพิ่มพูน
๗๕) นายจิรณัฐ ขาวละออ
๗๖) นายสมโภช วันลา
๗๗) นายอัสรี นามบุรี
๗๘) นายณัฐนันท์ ปานประเสริฐ
๗๙) นายอัครเศรฐ จ้อสาว
๘๐) นายประเสริฐ สุระขันธ
๘๑) นายบุญล จันทรเนียม
๘๒) นายพิรพงษ์ ทองคุณปรีดา
๘๓) นายณัฐพล ทองนุช
๘๔) นายอนุวัฒน์ ม่วงแพ
๘๕) นายเจตศรวุฒิ ปิตตะมะ
๘๖) นายกฤษณะ สายวรรณ
๘๗) นายพิชัย บุญยงค์
๘๘) นายภาณุพงศ์ โอเมวงศ์
๘๙) นายสามารถ คุ่มปลี
๙๐) นายสฤษดิ์ โกศรนาม
๙๑) นายณัฐวุฒิ ศรีประเสริฐ
๙๒) นายชวลิต นาคพนม
๙๓) นายพงศธร ชัยทิพย์
๙๔) ว่าที่ร้อยตรี ภาณุพงศ์ แสนศรี
๙๕) นายสิทธิโชค หาสิดา
๙๖) นายธนากร อินสุตา
๙๗) นางสาววรรณิษา ขาติวันชัย
๙๘) นางสาวพิมพ์ตะวัน มินากุล
๙๙) นางสาวเพชรรัตน์ สิงห์สมบัติ
๑๐๐) นางสาวชญาณี พรหมจันทร์
๑๐๑) นายกิตติ ทวีราช
๑๐๒) นายจักริน หนันวิชา
๑๐๓) นายฉัตรชัย สุขเปีย
๑๐๔) นายณรนนท์ ต๊ะทองคำ
๑๐๕) นายศุภผล สมนอก
๑๐๖) นายทักษ์ดนัย อุบลศรี
๑๐๗) นายธนศร นามะกุลณา
๑๐๘) นายอติพงศ์ บัวแดง

ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๑๔
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๑๕
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๑๖
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ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๒๒
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๒๓
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ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๓๗
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๓๘
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ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๔๐
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๔๑
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๔๒
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๔๓

(นายศิระ จันทรเจ็ด)

นักวิทยาศาสตร์ชำนาญการพิเศษ วิชาการการแพทย์
ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน
เปิดให้บริการเฉพาะเวลาราชการ

๑๐๙) นายณนทชัย...

๑๐๙) นายณนทชัย อุปลัมภ์
๑๑๐) นายณัฐพล คุณสุทธิ
๑๑๑) นายณันท์วัฒน์ สาริน
๑๑๒) นายปิยะนัฐ พลมะศรี
๑๑๓) นายพงศ์สิริ โสมเขียว
๑๑๔) นายพีรพัฒน์ กำคำ
๑๑๕) นายภาณุพงศ์ มานิตย์
๑๑๖) นายมงคล ผลาทิพย์
๑๑๗) นายมนันท์ พูลศิริ
๑๑๘) นายสิรินันท์ ทองอิน
๑๑๙) นายอเนชา ทันสมัย
๑๒๐) นายอติศักดิ์ ผมไผ
๑๒๑) นายอนันตชัย วิสุม
๑๒๒) นายณัฐดนัย เจือละออง
๑๒๓) นายวราวุธ คีนึก
๑๒๔) นายแสงตะวัน นตะสัด
๑๒๕) นายยุทธพงศ์ รัตนะ
๑๒๖) นายชัยวุฒิ ไชยชนะ
๑๒๗) นายวิศรุต ศรีธรรมมา
๑๒๘) นายณนทกร เมื่อผ่อง
๑๒๙) นายคำชัย สุทธะ
๑๓๐) นางสาวณัฐกรณีย์ รักทะเล
๑๓๑) นางสาวประภาภรณ์ บุตรพรม
๑๓๒) นางสาวนิลาวัลย์ นามพรม
๑๓๓) นางสาวพัชรินทร์ แสนสร้อย
๑๓๔) นายไพโรจน์ เปี่ยมพิมาย
๑๓๕) นางสาวศุภมาศ ทองมาก
๑๓๖) นางสาวลลิตา จิตรสว่าง
๑๓๗) นางสาวไมพร เลิกภูเขียว
๑๓๘) นางสาวกฤติมาพร คำมีแก่น
๑๓๙) นางสาวสฤติรัตน์ ภาคภูมิ
๑๔๐) นางสาวกาญจนา คงคุณ
๑๔๑) นางสาวไพรินทร์ ศรีรูปี
๑๔๒) นางสาวทิพนันดา ฤทัยปัญญา
๑๔๓) นางสาวสาธิตา ปานทอง
๑๔๔) นางสาวอรวิสา ทองนวล
๑๔๕) นางสาวอริยา คำคล่อง

ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๔๔
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๔๕
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๔๖
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ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๖๙
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ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๗๒
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๗๓
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๗๔
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๗๕
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๗๖
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๗๗
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๗๘
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๗๙
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๘๐
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ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๘๒
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๘๓
ทะเบียนเลขที่ ๖-๒๐๔-จ-๗๕๘๔

(นายศิระ จันทรเจ็ด)

นักวิทยาศาสตร์ชำนาญการพิเศษ วิชาการการแพทย์
ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน
เปิดให้บริการเฉพาะเวลาราชการ

๑๔๖) นางสาวชุตานกร...

๑๔๖) นางสาวชฎาภรณ์ สุนทรสนาม	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๕
๑๔๗) นางสาวสุภารัตน์ นนทประสาท	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๖
๑๔๘) นางสาวรัชนิกร เนียมกลาง	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๗
๑๔๙) นางสาวกัญญารัตน์ ศรีนิลหา	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๘
๑๕๐) นางสาวอัญชลี คำจันทร์	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๙
๑๕๑) นายบุญฤทธิ์ เอี่ยมเทศ	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๐
๑๕๒) นายศิริวัฒน์ พานิชย์	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๑
๑๕๓) นางสาวศุภรดา ปันมยุรา	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๒
๑๕๔) นางสาวพาณดี คุณนาน	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๓
๑๕๕) นางสาวจิราเจต พองศา	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๔
๑๕๖) นางสาวกนกภรณ์ อูระ	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๕
๑๕๗) นางสาวอารยา มีชัย	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๖
๑๕๘) นางสาวจิตสุภา ประเทืองสุข	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๗
๑๕๙) นางสาวอริสา วิริยขันติธรรม	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๘
๑๖๐) นางสาววิษุตา นาคผจญ	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๙
๑๖๑) นางสาวพนิดา ยอดอินทร์	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๕๐
๑๖๒) นางสาวนันทิยา จันทะสุน	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๕๑



(นายศิริระ จันทรเจ็ด)

นักวิทยาศาสตร์ชำนาญการพิเศษ วิชาการกรมพิษ
ผู้อำนวยการกองวิจัยและเฝ้าระวังมลพิษทางอากาศ
ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท เอแอลเอส แลบลอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

เลขทะเบียน ว-๒๐๔

ที่ อก ๐๓๑๐(๑) ๑๐๖๕

ลงวันที่ ๒๘ มกราคม ๒๕๖๕

ขอขยายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๓๖๑ รายการ

น้ำเสีย จำนวน 59 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Aldicarb	High-Performance Liquid Chromatographic Method ^[4]
2	Aldicarb Sulfone	High-Performance Liquid Chromatographic Method ^[4]
3	Aldicarb Sulfoxide	High-Performance Liquid Chromatographic Method ^[4]
4	Aldrin	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
5	Arsenic	1) Digestion, Inductively Coupled Plasma Method ^[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4]
6	Barium	1) Digestion, Inductively Coupled Plasma Method ^[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4]
7	α-BHC	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
8	β-BHC	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
9	δ-BHC	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
10	γ-BHC	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
11	Biochemical Oxygen Demand	1) 5-Day BOD Test, Azide Modification Method ^[4] 2) 5-Day BOD Test, Membrane Electrode Method ^[4]
12	Carbaryl	High-Performance Liquid Chromatographic Method ^[4]
13	Carbofuran	High-Performance Liquid Chromatographic Method ^[4]
14	Cadmium	1) Digestion, Inductively Coupled Plasma Method ^[4] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[4]
15	Chemical Oxygen Demand	1) Closed Reflux, Colorimetric Method ^[4] 2) Closed Reflux, Titrimetric Method ^[4]
16	Chlordane	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
17	Chromium	1) Digestion, Inductively Coupled Plasma Method ^[4] 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[4]
18	Color	ADMI Weighted-Ordinate Spectrophotometric Method




(นางริกาภรณ์ จันทรสุทวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ
และทะเบียนห้องปฏิบัติการ

19 Copper...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
19	Copper	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
20	Cyanide	Distillation, Colorimetric Method ⁽⁴⁾
21	2,4'-DDD	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
22	4,4'-DDD	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
23	2,4'-DDE	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
24	4,4'-DDE	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
25	2,4'-DDT	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
26	4,4'-DDT	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
27	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
28	Endosulfan Sulfate	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
29	Endosulfan I	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
30	Endosulfan II	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
31	Endrin	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
32	Endrin Aldehyde	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
33	Formaldehyde	Distillation, Colorimetric Method ⁽³⁾
34	Free Chlorine	1) DPD Ferrous Titrimetric Method ⁽⁴⁾ 2) Iodometric Method ⁽⁴⁾
35	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
36	Heptachlor epoxide	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
37	Hexavalent Chromium	Filtration, Colorimetric Method ⁽⁴⁾
38	3-Hydroxycarbofuran	High-Performance Liquid Chromatographic Method ⁽⁴⁾
39	Lead	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
40	Manganese	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
41	Mercury	1) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/Mass spectrometric Method ⁽⁴⁾
42	Methiocarb	High-Performance Liquid Chromatographic Method ⁽⁴⁾
43	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾



 (นางริกาญจน์ จิตร์สกุลไชย)
 ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์หัตถ์มลพิษ
 ...และทะเบียนห้องปฏิบัติการ

44 Methomyl...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
44	Methomyl	High-Performance Liquid Chromatographic Method ⁽⁴⁾
45	Nickel	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
46	Oil & Grease	1) Liquid-Liquid, Partition-Gravimetric Method ⁽⁴⁾ 2) Soxhlet Extraction Method ⁽⁴⁾
47	Oxamyl	High-Performance Liquid Chromatographic Method ⁽⁴⁾
48	Propoxur	High-Performance Liquid Chromatographic Method ⁽⁴⁾
49	pH	Electrometric Method ⁽⁴⁾
50	Phenols	1) Distillation, Chloroform Extraction Method ⁽⁴⁾ 2) Distillation, Direct Photometric Method ⁽⁴⁾
51	Selenium	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
52	Sulfide	Iodometric Method ⁽⁴⁾
53	Temperature	Laboratory and Field Methods ⁽⁴⁾
54	Total Dissolved Solids	Dried at 180 °C ⁽⁴⁾
55	Total Kjeldahl Nitrogen	Semi-Micro Kjeldahl Method ⁽⁴⁾
56	Total Suspended Solids	Dried at 103-105 °C ⁽⁴⁾
57	Toxaphene	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
58	Trivalent Chromium	1) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method; Colorimetric Method; Calculation ⁽⁴⁾
59	Zinc	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁴⁾

น้ำใต้ดิน จำนวน 126 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
2	Acetone	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾


 (นางริกาญจน์ จิตร์สกุลไชย)
 ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์หัตถ์มลพิษ
 และทะเบียนห้องปฏิบัติการ

3 Aldrin...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
3	Aldrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
4	Anthracene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
5	Antimony	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
6	Arsenic	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
7	Atrazine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
8	Barium	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
9	Benz(a)anthracene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
10	Benzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
11	Benzo(b)fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
12	Benzo(k)fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
13	Benzoic Acid	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
14	Benzo(a)pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
15	Benzo(g,h,i)perylene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
16	Beryllium	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
17	Bis(2-chloroethyl)ether	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾

วิมล

18 Bis(2-ethylhexyl)phthalate...

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ
กรมควบคุมมลพิษ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
18	Bis(2-ethylhexyl)phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
19	Bromodichloromethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
20	Bromoform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
21	Butanol	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
22	Butyl Benzyl Phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
23	Cadmium	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
24	Carbazole	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
25	Carbon Disulfide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
26	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
27	Chlordane	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
28	p-Chloroaniline	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
29	Chlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
30	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
31	Chloroform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
32	2-Chlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
33	Chromium	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾

วิมล

34 Chromium (III)...

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ
กรมควบคุมมลพิษ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
34	Chromium (III)	1) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method; Colorimetric Method; Calculation ⁽⁴⁾
35	Chromium (VI)	Colorimetric Method ⁽⁴⁾
36	Chrysene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
37	Cyanide	Distillation, Colorimetric Method ⁽⁴⁾
38	2,4-D	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
39	DDD	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
40	DDE	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
41	DDT	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
42	Dibenz(a,h)anthracene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
43	Di-n-Butyl Phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
44	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
45	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
46	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
47	3,3-Dichlorobenzidine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
48	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
49	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
50	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾

วิธีพิมพ์

51 cis-1,2-Dichloroethylene...

(นางริกาญจน์ ฉัตรสกุลวิไล)

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กรมควบคุมมลพิษ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
51	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
52	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
53	2,4-Dichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
54	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
55	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
56	1,3-Dichloropropene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
57	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
58	Diethyl Phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
59	2,4-Dimethylphenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
60	2,4-Dinitrophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
61	2,4-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
62	2,6-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
63	Di-n-Octyl Phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
64	Endosulfan	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
65	Endrin	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
66	Ethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
67	Fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾

วิธีพิมพ์

68 Fluorene...

(นางริกาญจน์ ฉัตรสกุลวิไล)

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กรมควบคุมมลพิษ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
68	Fluorene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
69	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
70	Heptachlor epoxide	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
71	Hexachlorobenzene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
72	Hexachloro-1,3-butadiene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
73	n-Hexane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
74	α -HCH	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
75	β -HCH	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
76	γ -HCH	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
77	Hexachlorocyclopentadiene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
78	Hexachloroethane	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
79	Indeno(1,2,3-cd)pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
80	Isophorone	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
81	Lead	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
82	Manganese	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
83	Mercury	1) Cold Vapor Atomic Absorption Spectrometric Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾

วิธีใหม่

84 Methanol...

(นางริกาญจน์ ฉัตรสกุลวิไล)

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กรมส่งเสริมการค้าระหว่างประเทศ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
84	Methanol	1) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾ 2) Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
85	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
86	Methyl Bromide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
87	Methylene Chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
88	2-Methylphenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
89	2-Methylnaphthalene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
90	Methyl tert-Butyl Ether	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
91	Naphthalene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
92	Nickel	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
93	Nitrobenzene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
94	N-Nitrosodiphenylamine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
95	N-Nitrosodi-n-Propylamine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
96	Polychlorinated Biphenyls - PCB 1016 - PCB 1221 - PCB 1232 - PCB 1242 - PCB 1248 - PCB 1254 - PCB 1260	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾

วิธีใหม่

97 Pentachlorophenol...

(นางริกาญจน์ ฉัตรสกุลวิไล)

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กรมส่งเสริมการค้าระหว่างประเทศ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
97	Pentachlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
98	pH	Electrometric Method ⁽⁴⁾
99	Phenanthrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
100	Phenol	1) Distillation, Direct Photometric Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
101	Pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
102	Selenium	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
103	Silver	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
104	Styrene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
105	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
106	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
107	Toluene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
108	Toxaphene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
109	TPH (C ₅ -C ₉)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(13,24)
110	TPH (C ₈ -C ₁₆)	Solvent Extraction, Gas Chromatographic Method ^(9,21)
111	TPH (C ₁₆ -C ₃₅)	Solvent Extraction, Gas Chromatographic Method ^(9,21)
112	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
113	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾

วิมล

114 1,1,2-Trichloroethane...

(นางริกาญจน์ ฉัตรสกุลวิไล)

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และทะเบียนห้องปฏิบัติการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
114	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
115	Trichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
116	2,4,5-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
117	2,4,6-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
118	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
119	Vanadium	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
120	Vinyl Acetate	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
121	Vinyl Chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
122	m-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
123	o-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
124	p-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
125	Xylene (Total)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
126	Zinc	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾

อากาศเสีย (ปล่อยระบาย) จำนวน 16 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Antimony	Isokinetic, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾
2	Arsenic	Isokinetic, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾

วิมล

3 Carbon Monoxide...

(นางริกาญจน์ ฉัตรสกุลวิไล)

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และทะเบียนห้องปฏิบัติการ


ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
3	Carbon Monoxide	1) Sampling Bag Non-Dispersive Infrared Method ^[5] 2) Non-Dispersive Infrared Method ^[5] 3) Instrumental Analyzer Method ^[5]
4	Chlorine	1) Absorption Sampling, Ion Chromatographic Method ^[5] 2) Isokinetic Sampling, Ion Chromatographic Method ^[5]
5	Copper	Isokinetic, Digestion, Inductively Coupled Plasma Method ^[5]
6	Dioxins	Isokinetic Sampling, Analysis by ISO/IEC 17025 Accredited Laboratory or Analysis by Department of Industrial Works Registered Laboratory (Dioxins/Furans Analysis Approved) ^[5]
7	Hydrogen Chloride	1) Absorption Sampling, Ion Chromatographic Method ^[5] 2) Isokinetic Sampling, Ion Chromatographic Method ^[5]
8	Hydrogen Sulfide	Absorption Sampling, Iodometric Method ^[5]
9	Lead	Isokinetic, Digestion, Inductively Coupled Plasma Method ^[5]
10	Mercury	1) Isokinetic Sampling, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[5] 2) Isokinetic, Digestion, Inductively Coupled Plasma Method ^[5]
11	Opacity	Ringelmann's Method ^[2]
12	Oxides of Nitrogen	1) Absorption Sampling, Phenoldisulfonic Acid Method ^[5] 2) Chemiluminescence Method ^[5] 3) Instrumental Analyzer Method ^[5]
13	Sulfur Dioxide	1) Absorption Sampling, Barium-Thorin Titrimetric Method ^[5] 2) UV Fluorescence Method ^[5] 3) Instrumental Analyzer Method ^[5]
14	Sulfuric Acid	Isokinetic Sampling, Barium-Thorin Titrimetric Method ^[5]
15	Total Suspended Particulate	Isokinetic Sampling, Gravimetric Method ^[5]
16	Xylene	Adsorption Sampling, Gas Chromatographic Method ^[5]


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 กรมควบคุมมลพิษ

สิ่งปฏิกูล...

สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน 35 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Aldrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1,9,25] 2) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^[22,31]
2	Antimony	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,15] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,6,16] 3) Digestion, Inductively Coupled Plasma Method ^[7,15] 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[7,16]
3	Arsenic	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,15] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,6,16] 3) Digestion, Inductively Coupled Plasma Method ^[7,15] 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[7,16]
4	Barium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,15] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,6,16] 3) Digestion, Inductively Coupled Plasma Method ^[7,15] 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[7,16]
5	Beryllium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,15] 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[1,6,16] 3) Digestion, Inductively Coupled Plasma Method ^[7,15] 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^[7,16]


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 กรมควบคุมมลพิษ

6 Cadmium...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
6	Cadmium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,16) 3) Digestion, Inductively Coupled Plasma Method ^(7,15) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,16)
7	Chlordane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,19,25) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10,22) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(22,31)
8	Chromium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,16) 3) Digestion, Inductively Coupled Plasma Method ^(7,15) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,16)
9	Chromium (III)	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method; Waste Extraction, Colorimetric Method; Calculation Method ^(1,6,15,17) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method; Waste Extraction, Colorimetric Method; Calculation Method ^(1,6,16,17) 3) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^(7,8,15,17) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^(7,8,16,17)
10	Chromium (VI)	1) Waste Extraction, Colorimetric Method ^(1,6,17) 2) Alkaline Digestion, Colorimetric Method ^(8,17)

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
11	Cobalt	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,16) 3) Digestion, Inductively Coupled Plasma Method ^(7,15) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,16)
12	Copper	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,16) 3) Digestion, Inductively Coupled Plasma Method ^(7,15) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,16)
13	2,4-D	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,25) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10,22) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(22,31)
14	DDD	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,25) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10,22) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(22,31)
15	DDE	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,25) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10,22) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(22,31)
16	DDT	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,25)

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
17	Dieldrin	2) Soxhlet Extraction, Gas Chromatographic Method ^(10,22) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(22,31) 1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,25)
18	Endrin	2) Soxhlet Extraction, Gas Chromatographic Method ^(10,22) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(22,31) 1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,25)
19	Heptachlor	2) Soxhlet Extraction, Gas Chromatographic Method ^(10,22) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(22,31) 1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,25)
20	Lead	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,16) 3) Digestion, Inductively Coupled Plasma Method ^(7,15) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,16)
21	Lindane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,25) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10,22) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(22,31)
22	Mercury	1) Waste Extraction, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^(1,6,18)

วิมล

2) Waste Extraction...

(นางริกาญจน์ ฉัตรสกุลวิไล)

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ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
23	Methoxychlor	2) Waste Extraction, Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method ^(1,6,19) 3) Waste Extraction, Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method ^(1,6,20) 4) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽¹⁸⁾ 5) Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method ⁽¹⁹⁾ 6) Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method ⁽²⁰⁾
24	Mirex	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,25) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10,22) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(22,31)
25	Molybdenum	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,16) 3) Digestion, Inductively Coupled Plasma Method ^(7,15) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,16)
26	Nickel	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,16) 3) Digestion, Inductively Coupled Plasma Method ^(7,15) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,16)


วิมล

27 Polychlorinated...

(นางริกาญจน์ ฉัตรสกุลวิไล)


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ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
27	Polychlorinated biphenyls (PCBs) - Aroclor 1016 - Aroclor 1221 - Aroclor 1232 - Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1260 - 2-Chlorobiphenyl - 2,3-Dichlorobiphenyl - 2,2',5-Trichlorobiphenyl - 2,4',5-Trichlorobiphenyl - 2,2',3,5'-Tetrachlorobiphenyl - 2,2',5,5'-Tetrachlorobiphenyl - 2,3',4,4'-Tetrachlorobiphenyl - 2,2',3,4,5'-Pentachlorobiphenyl - 2,2',4,5,5'-Pentachlorobiphenyl - 2,3,3',4,6-Pentachlorobiphenyl - 2,2',3,4,4',5'-Hexachlorobiphenyl - 2,2',3,4,5,5'-Hexachlorobiphenyl - 2,2',3,5,5',6-Hexachlorobiphenyl - 2,2',4,4',5,5'-Hexachlorobiphenyl - 2,2',3,3',4,4',5-Heptachlorobiphenyl - 2,2',3,4,4',5,5'-Heptachlorobiphenyl - 2,2',3,4,4',5,6-Heptachlorobiphenyl - 2,2',3,4',5,5',6-Heptachlorobiphenyl - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(1,9,23) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10,23) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(22,31)


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28 Pentachlorophenol...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
28	Pentachlorophenol	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,25) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10,22) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(22,31)
29	pH	Electrometric Method ^(29,30)
30	Selenium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,16) 3) Digestion, Inductively Coupled Plasma Method ^(7,15) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,16)
31	Silver	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,16)
32	Thallium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,16) 3) Digestion, Inductively Coupled Plasma Method ^(7,15) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,16)
33	Toxaphene	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,25) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10,22) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(22,31)
34	Vanadium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,16) 3) Digestion, Inductively Coupled Plasma Method ^(7,15)


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4) Digestion...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
35	Zinc	4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,16) 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,16) 3) Digestion, Inductively Coupled Plasma Method ^(7,15) 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,16)

ดิน จำนวน 125 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
2	Acetone	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
3	Aldrin	1) Soxhlet Extraction, Gas Chromatographic Method ^(10,22) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
4	Anthracene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
5	Antimony	1) Digestion, Inductively Coupled Plasma Method ^(7,15) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,16)
6	Arsenic	1) Digestion, Inductively Coupled Plasma Method ^(7,15) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,16)
7	Atrazine	1) Soxhlet Extraction, Gas Chromatographic Method ^(10,22) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
8	Barium	1) Digestion, Inductively Coupled Plasma Method ^(7,15) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,16)

วิมล
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9 Benz(a)anthracene...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
9	Benz(a)anthracene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
10	Benzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
11	Benzo(b)fluoranthene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
12	Benzo(k)fluoranthene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
13	Benzoic acid	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
14	Benzo(a)pyrene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
15	Benzo(g,h,i)perylene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
16	Beryllium	1) Digestion, Inductively Coupled Plasma Method ^(7,15) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,16)
17	Bis(2-chloroethyl)ether	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
18	Bis(2-ethylhexyl)phthalate	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
19	Bromodichloromethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
20	Bromoform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
21	Butanol	Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method ^(12,26)
22	Butyl Benzyl Phthalate	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
23	Cadmium	1) Digestion, Inductively Coupled Plasma Method ^(7,15) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,16)
24	Carbazole	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
25	Carbon Disulfide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)

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26 Carbon tetrachloride...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
26	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
27	Chlordane	1) Soxhlet Extraction, Gas Chromatographic Method ^(10,22) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
28	p-Chloroaniline	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
29	Chlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
30	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
31	Chloroform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
32	2-Chlorophenol	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
33	Chromium	1) Digestion, Inductively Coupled Plasma Method ^(7,15) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,16)
34	Chromium (III)	1) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^(7,8,15,17) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^(7,8,16,17)
35	Chromium (VI)	Alkaline Digestion, Colorimetric Method ^(8,17)
36	Chrysene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
37	Cyanide	Extraction, Distillation, Colorimetric Method ^(26,27,28)
38	2,4-D	1) Soxhlet Extraction, Gas Chromatographic Method ^(10,22) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
39	DDD	1) Soxhlet Extraction, Gas Chromatographic Method ^(10,22) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)

วิภา
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40 DDE...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
40	DDE	1) Soxhlet Extraction, Gas Chromatographic Method ^(10,22) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
41	DDT	1) Soxhlet Extraction, Gas Chromatographic Method ^(10,22) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
42	Dibenz(a,h)anthracene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
43	Di-n-Butyl Phthalate	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
44	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
45	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
46	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
47	3,3-Dichlorobenzidine	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
48	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
49	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
50	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
51	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
52	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
53	2,4-Dichlorophenol	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
54	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
55	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
56	1,3-Dichloropropene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)

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57 Dieldrin...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
57	Dieldrin	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
58	Diethyl Phthalate	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
59	2,4-Dimethylphenol	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
60	2,4-Dinitrophenol	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
61	2,4-Dinitrotoluene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
62	2,6-Dinitrotoluene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
63	Di-n-Octyl Phthalate	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
64	Endosulfan	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
65	Endrin	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
66	Ethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
67	Fluoranthene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
68	Fluorene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
69	Heptachlor	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
70	Heptachlor Epoxide	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]

71 Hexachlorobenzene...

(นางริกาญจน์ ฉัตรสกุลวิไล)

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ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
71	Hexachlorobenzene	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
72	Hexachloro-1,3-butadiene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
73	n-Hexane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
74	α -HCH	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
75	β -HCH	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
76	γ -HCH	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
77	Hexachlorocyclopentadiene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
78	Hexachloroethane	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
79	Indeno(1,2,3-cd)pyrene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
80	Isophorone	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
81	Lead	1) Digestion, Inductively Coupled Plasma Method ^[7,15] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[7,16]
82	Manganese	1) Digestion, Inductively Coupled Plasma Method ^[7,15] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[7,16]
83	Mercury	1) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[18]

2) Thermal...

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการศูนย์มาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

นางสาวเนกนิจ ก้องนริศ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
84	Methanol	2) Thermal Decomposition, Amalgamation, and Atomic Absorption Spectrophotometry ⁽¹⁹⁾ 3) Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method ⁽²⁰⁾ Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method ^(12,24)
85	Methoxychlor	1) Soxhlet Extraction, Gas Chromatographic Method ^(10,22) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
86	Methyl Bromide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
87	Methylene Chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
88	2-methylphenol	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
89	2-Methylnaphthalene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
90	Methyl tert-Butyl Ether	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
91	Naphthalene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
92	Nickel	1) Digestion, Inductively Coupled Plasma Method ^(7,15) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,16)
93	Nitrobenzene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
94	N-Nitrosodiphenylamine	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
95	N-Nitrosodi-n-propylamine	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
96	Polychlorinated biphenyls (PCBs) - Aroclor 1016 - Aroclor 1221 - Aroclor 1232	1) Soxhlet Extraction, Gas Chromatographic Method ^(10,23) 2) Automated Soxhlet Extraction, Gas Chromatographic Method ^(23,32)

อิกพ
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- Aroclor 1242...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
	- Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1260 - 2-Chlorobiphenyl - 2,2',3,5'-Tetrachlorobiphenyl - 2,2',5,5'-Tetrachlorobiphenyl - 2,3',4,4'-Tetrachlorobiphenyl - 2,2',3,4,5'-Pentachlorobiphenyl - 2,2',4,5,5'-Pentachlorobiphenyl - 2,3,3',4',6-Pentachlorobiphenyl - 2,2',3,4,4',5'-Hexachlorobiphenyl - 2,2',3,4,5,5'-Hexachlorobiphenyl - 2,2',3,5,5',6-Hexachlorobiphenyl - 2,2',4,4',5,5'-Hexachlorobiphenyl - 2,2',3,3',4,4',5-Heptachlorobiphenyl - 2,2',3,4,4',5,5'-Heptachlorobiphenyl - 2,2',3,4,4',5,6-Heptachlorobiphenyl - 2,2',3,4',5,5',6-Heptachlorobiphenyl - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	
97	Pentachlorophenol	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
98	Phenanthrene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
99	Phenol	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
100	Pyrene	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)

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และทะเบียนห้องปฏิบัติการ

101 Selenium

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
101	Selenium	1) Digestion, Inductively Coupled Plasma Method ^[7,15] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[7,16]
102	Silver	1) Digestion, Inductively Coupled Plasma Method ^[7,15] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[7,16]
103	Styrene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
104	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
105	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
106	Toluene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
107	Toxaphene	1) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
108	TPH (C ₅ -C ₈)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
109	TPH (C ₈ -C ₁₆)	1) Solvent Extraction, Gas Chromatographic Method ^[11,21] 2) Automated Soxhlet Extraction, Gas Chromatographic Method ^[21,31]
110	TPH (C ₁₆ -C ₃₅)	1) Solvent Extraction, Gas Chromatographic Method ^[11,21] 2) Automated Soxhlet Extraction, Gas Chromatographic Method ^[21,31]
111	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
112	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
113	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
114	Trichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
115	2,4,5-Trichlorophenol	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]

วิมล

116 2,4,6-Trichlorophenol...

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการศูนย์มาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
116	2,4,6-Trichlorophenol	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[25,31]
117	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
118	Vanadium	1) Digestion, Inductively Coupled Plasma Method ^[7,15] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[7,16]
119	Vinyl Acetate	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
120	Vinyl Chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
121	m-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
122	o-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
123	p-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
124	Xylene (Total)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[14,24]
125	Zinc	1) Digestion, Inductively Coupled Plasma Method ^[7,15] 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^[7,16]

เอกสารอ้างอิง

- กระทรวงอุตสาหกรรม. ประกาศกระทรวงอุตสาหกรรม, พ.ศ. 2548. เรื่อง การกำจัดการสิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว.ราชกิจจานุเบกษา. 25 มกราคม 2549. เล่มที่ 123 ตอนพิเศษ 11ง.
- กระทรวงอุตสาหกรรม. ประกาศกระทรวงอุตสาหกรรม, พ.ศ. 2549. เรื่อง กำหนดค่าปริมาณเขม่าควันที่เจือปนในอากาศที่ระบายออกจากปล่องของหม้อน้ำโรงสีข้าวที่ใช้แก๊สเป็นเชื้อเพลิง.ราชกิจจานุเบกษา. 4 ธันวาคม 2549. เล่มที่ 123 ตอนพิเศษ 125ง.
- สมาคมวิศวกรรมสิ่งแวดล้อมแห่งประเทศไทย. คู่มือวิเคราะห์น้ำเสีย. พิมพ์ครั้งที่ 4. กรุงเทพฯ:เรือนแก้วการพิมพ์, 2547.
- APHA, AWWA, WEF. Standard Methods for the Examination of Water and Wastewater, 23rd ed. Washington, DC: APHA, 2017.
- United States Environmental Protection Agency. Standards of Performance for New Stationary Sources. 40 CFR 60. Appendix A, 2019.
- United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. SW-846, 1997.


วิมล

7. United States..

(นางริกาญจน์ ฉัตรสกุลวิไล)


ผู้อำนวยการศูนย์มาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

7. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Acid Digestion of Sludges and Sediments and Soils. SW-846 Method 3050B, 1996.
8. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Alkaline Digestion for Hexavalent Chromium. SW-846 Method 3060A, 1996.
9. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Separatory Funnel Liquid-Liquid Extraction. SW-846 Method 3510C, 1996.
10. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Soxhlet Extraction. SW-846 Method 3540C, 1996.
11. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Microscale Solvent Extraction (MSE). SW-846 Method 3570, 2002.
12. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Volatile Organic Compounds (VOCs) in Various Sample Matrices Using Equilibrium Headspace Analysis. SW-846 Method 5021A, 2014.
13. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Purge-and-Trap for Aqueous Samples. SW-846 Method 5030B, 1996.
14. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Closed-System Purge-and-Trap and Extraction for Volatile Organics in Soil and Waste Samples. SW-846 Method 5035, 1996.
15. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Inductively Coupled Plasma- Atomic Emission Spectrometry. SW-846 Method 6010B, 1996.
16. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Inductively Coupled Plasma-Mass Spectrometry. SW-846 Method 6020A, 2007.
17. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Chromium, Hexavalent (Colorimetric). SW-846 Method 7196A, 1992.
18. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Mercury in Solid or Semisolid Waste (Manual Cold-Vapor Technique). SW-846 Method 7471B, 2007.
19. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Mercury in Solids and Solutions by Thermal Decomposition, Amalgamation, and Atomic Absorption Spectrophotometry. SW-846 Method 7473, 2007


(นางริการญจน์ จัตรสกุลวิไล)
ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ
และทะเบียนห้องปฏิบัติการ

20. United States...

20. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Mercury in Sediment and Tissue Sample by Atomic Fluorescence Spectrometry. SW-846 Method 7474, 2007.
21. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Nonhalogenated Organics Using GC/FID. SW-846 Method 8015B, 1996.
22. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Organochlorine Pesticides by Gas Chromatography. SW-846 Method 8081B, 2007.
23. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Polychlorinated Biphenyls (PCBs) by Gas Chromatography. SW-846 Method 8082, 1996.
24. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS). SW-846 Method 8260D, 2018.
25. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS). SW-846 Method 8270E, 2018.
26. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Total and Amenable Cyanide: Distillation SW-846 Method 9010B, 1996.
27. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Cyanide Extraction Procedure for Solids and Oil. SW-846 Method 9013A, 1996.
28. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Cyanide in Waters and Extracts Using Titrimetric and Manual Spectrophotometric Procedures. SW-846 Method 9014, 2014.
29. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. pH Electrometric Measurement. SW-846 Method 9040C, 2004.
30. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Soil and Waste pH. SW-846 Method 9045D, 2004.
31. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Automated Soxhlet Extraction. SW-846 Method 3541, 1994.


(นางริการญจน์ จัตรสกุลวิไล)
ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ
และทะเบียนห้องปฏิบัติการ



ที่ อก ๐๓๓๐(๓)/ ๖๔๗๐

กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๒๔ มิถุนายน ๒๕๖๕

เรื่อง ขันทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๒๙ เมษายน ๒๕๖๔

สิ่งที่ส่งมาด้วย เอกสารแนบท้ายหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท เอแอลเอส แลบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด จำนวน ๒ แผ่น

ตามหนังสือที่อ้างถึง บริษัท เอแอลเอส แลบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ขอขึ้นทะเบียน
ห้องปฏิบัติการวิเคราะห์เอกชน พร้อมรายชื่อผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ เจ้าหน้าที่ประจำ
ห้องปฏิบัติการวิเคราะห์ และรายการสารมลพิษที่จะทำการวิเคราะห์ ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท เอแอลเอส แลบอราทอรี กรุ๊ป
(ประเทศไทย) จำกัด ขันทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน มีเลขทะเบียน ว-๓๒๓ สถานที่ตั้งเลขที่
๖๑๖/๑๐ หมู่ที่ ๕ ตำบลแม่น้ำคู อำเภอบลวกแดง จังหวัดระยอง โดยมีองค์ประกอบดังนี้

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์

๑) นายเดช ช้างชน	ทะเบียนเลขที่	ว-๓๒๓-ค-๙๔๔๒
๒) นางวิลาวัลย์ บริรักษ์	ทะเบียนเลขที่	ว-๓๒๓-ค-๙๔๔๓
๓) นายสุพจน์ สลามเต๊ะ	ทะเบียนเลขที่	ว-๓๒๓-ค-๙๔๔๔

ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์

๑) นางสาวนฤมล บรรจงกิจ	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๔๕
๒) นางพจนา สีดา	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๔๖
๓) นางสาวธนิศา กุลสุริวงค์	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๔๗
๔) นายพิทยา ทองแดง	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๔๘
๕) นางชลธิชา สุบงกช	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๔๙
๖) ว่าที่ ร.ต.รณชัย ม่วงมา	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๕๐
๗) นายวราวุฒิ พับพา	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๕๑
๘) นายศักดิ์รินทร์ จรัสกาย	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๕๒
๙) นายสุรศักดิ์ สาชิน	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๕๓
๑๐) นางสาวเพชรคุณ ภาวุฒานนท์	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๕๔
๑๑) นายสถาพร ธาแก้ว	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๕๕
๑๒) นายสุทธิดำรงค์ โชคปิตินันท์	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๕๖

๑๓) นายวัลลภ...

-๒-

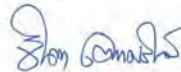
๑๓) นายวัลลภ หันไชยเนาว์	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๕๗
๑๔) นางสาวนาถิ์ เจริญตระกูล	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๕๘
๑๕) นางสาววนิดา ผดุงจิตต์	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๕๙
๑๖) นายธนสิทธิ์ วงศ์ไชย	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๖๐
๑๗) นายชัยนุสรณ์ เลิศนันทกุลชัย	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๖๑
๑๘) นายสังจา เพ็ชรแสง	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๖๒
๑๙) นายกัณตภณ มณีสัมพันธ์	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๖๓
๒๐) นางสาวจันทิพย์ โกเมนชนะ	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๖๔
๒๑) นายธารินทร์ อีอกจินดา	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๖๕
๒๒) นายคุณรัฐ พิสัยพันธ์	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๖๖
๒๓) นายศุภชัย วงศ์สุริยฉาย	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๖๗
๒๔) นายปฐมพงศ์ กรสวีสดี	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๖๘
๒๕) นายไสว ต้นโพธิ์	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๖๙
๒๖) นางสาวกิตติยา สัณญาอริยาภรณ์	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๗๐
๒๗) นางสาวเจษฎาพร ศรีบุญเรือง	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๗๑
๒๘) นางสาวมธุรินทร์ สิงห์เงา	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๗๒
๒๙) นางสาวธิดารัตน์ ศิริมงคลโร	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๗๓
๓๐) นายพิพัฒน์ นิภัทร์เศรษฐ์	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๗๔
๓๑) นายศิริวิทย์ เรืองสม	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๗๕
๓๒) นายปารเมศ สัตยาคุณ	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๗๖
๓๓) นายณนุภาพ ธรรมสยะโร	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๗๗
๓๔) นางสาวศุภรัตน์ โสจันทร์	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๗๘
๓๕) นายพชรกร อินทรเสนา	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๗๙
๓๖) นายทิวากร เชื้อมาก	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๘๐
๓๗) นายอนุรักษ์ ทองขจรศักดิ์	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๘๑
๓๘) นายอภิชาติ วิลาส	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๘๒
๓๙) นายจรัสระวี ศรีรักษา	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๘๓
๔๐) นายประสานมิตร เชื้อนเพชร	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๘๔
๔๑) นายภาณุวัฒน์ วังบง	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๘๕
๔๒) นายสันติ ชัยชนะ	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๘๖
๔๓) นายสิทธิชัย แก้วเกตุ	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๘๗
๔๔) นายทินกร กุลชาติ	ทะเบียนเลขที่	ว-๓๒๓-จ-๙๔๘๘

ค. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย จำนวน ๑๔ รายการ
อากาศเสีย (ปล่องระบาย) จำนวน ๗ รายการ และน้ำใต้ดิน จำนวน ๓ รายการ รวมทั้งสิ้นจำนวน ๒๔ รายการ
ตามสิ่งที่ส่งมาด้วย

หนังสือฉบับนี้มีอายุ ๓ ปี นับจากวันที่กรมโรงงานอุตสาหกรรมออกหนังสือ หากประสงค์จะต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอต่อกรมโรงงานอุตสาหกรรมภายใน ๓๐ วัน ก่อนวันสิ้นอายุของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ซึ่งคำขอต่ออายุดังกล่าวขอรับได้ที่กรมโรงงานอุตสาหกรรม

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ


(นางจินดา เคษะศรินทร์)
ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน
ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

๒๘ มิ.ย. ๒๕๖๔

กองวิจัยและเตือนภัยมลพิษโรงงาน
ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก
โทร. ๐ ๓๘๐๕ ๗๒๖๑-๓
ไปรษณีย์อิเล็กทรอนิกส์ eirw@diw.mail.go.th

เอกสารแนบท้ายหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท เอนแอลเอส แลบริทอรี กรุป (ประเทศไทย) จำกัด เลขทะเบียน ว-๓๒๓

ที่ อก ๐๓๑๐(๓)/

๖๔๗๐

ลงวันที่

๒๘ มิถุนายน ๒๕๖๔

ขอขยายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๒๔ รายการ

น้ำเสีย จำนวน 14 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Biochemical Oxygen Demand	1) 5-Day BOD Test, Membrane Electrode Method ^[2] 2) 5-Day BOD Test, Azide Modification Method ^[2]
2	Chemical Oxygen Demand	1) Open Reflux, Titrimetric Method ^[2] 2) Closed Reflux, Colorimetric Method ^[2] 3) Closed Reflux, Titrimetric Method ^[2]
3	Color	ADMI Weighted – Ordinate Spectrophotometric Method ^[2]
4	Cyanide	Distillation, Colorimetric Method ^[2]
5	Formaldehyde	Distillation, Colorimetric Method ^[1]
6	Free Chlorine	DPD-Ferrous Titrimetric Method ^[2]
7	Oil and Grease	Liquid-Liquid Partition-Gravimetric Method ^[2]
8	pH	Electrometric Method ^[2]
9	Phenols	1) Distillation, Chloroform Extraction Method ^[2] 2) Distillation, Direct Photometric Method ^[2]
10	Sulfide	ZnS Precipitation, Iodometric Method ^[2]
11	Temperature	Laboratory and Field Method ^[2]
12	Total Dissolved Solids	Dried at 180 °C ^[2]
13	Total Kjeldahl Nitrogen	Semi-Micro Kjeldahl Method ^[2]
14	Total Suspended Solids	Dried at 103-105 °C ^[2]

อากาศเสีย (ปล่องระบาย) จำนวน 7 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Carbon Monoxide	1) Sampling Bag, Non-Dispersive Infrared Method ^[5] 2) Instrumental Analyzer Method ^[8]
2	Hydrogen Sulfide	Absorption Sampling, Iodometric Method ^[5]
3	Opacity	Ringelmann's Method ^[3,4]
4	Oxide of Nitrogen	1) Absorption Sampling, Phenoldisulfonic Acid Method ^[6] 2) Instrumental Analyzer Method ^[9]
5	Sulfur Dioxide	1) Absorption Sampling, Barium-Thorin Titrimetric Method ^[5] 2) Instrumental Analyzer Method ^[10]

วิภา สัมฤทธิ์ผล

(นางสาววิชุดา สัมฤทธิ์ผล)

ผู้อำนวยการ

ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก

Sulfuric Acid...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
6	Sulfuric Acid	Isokinetic Sampling, Barium – Thorin Titrimetric Method ⁽⁶⁾
7	Total Suspended Particulate	Isokinetic Sampling, Gravimetric Method ⁽⁷⁾

น้ำใต้ดิน จำนวน 3 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Cyanide	Distillation, Colorimetric Method ⁽²⁾
2	pH	Electrometric Method ⁽²⁾
3	Phenols	Distillation, Direct Photometric Method ⁽²⁾

เอกสารอ้างอิง

1. จงชัย พรณสวัสดิ์ และวิบูลย์ลักษณ์ วิสุมธิดักดิ์, บรรณาธิการ. (2547) คู่มือวิเคราะห์น้ำเสีย. พิมพ์ครั้งที่ 4. กรุงเทพฯ: สมาคมวิศวกรรมสิ่งแวดล้อมแห่งประเทศไทย.
2. APHA, AWWA, WEF. Standard Methods for the Examination of Water and Wastewater. 23rd ed. Washington, DC : APHA, 2017
3. กระทรวงอุตสาหกรรม. ประกาศกระทรวงอุตสาหกรรม, พ.ศ. 2549. เรื่อง กำหนดค่าปริมาณเข้มข้นวันที่เจือปนในอากาศที่ระบายออกจากปล่องของหม้อน้ำโรงสีข้าวที่ใช้กลบเป็นเชื้อเพลิง. ราชกิจจานุเบกษา. 4 ธันวาคม 2549. เล่มที่ 123 ตอนพิเศษ 125ง.
4. กระทรวงอุตสาหกรรม. ประกาศกระทรวงอุตสาหกรรม, พ.ศ. 2549. เรื่อง กำหนดค่าปริมาณเข้มข้นวันที่เจือปนในอากาศที่ระบายออกจากปล่องของของหม้อน้ำของโรงงาน. ราชกิจจานุเบกษา. 4 ธันวาคม 2549. เล่มที่ 123 ตอนพิเศษ 125ง.
5. United States Environmental Protection. Standards of Performance for New Stationary Sources. 40 CFR 60. Appendix A, 2017.
6. United States Environmental Protection. Standards of Performance for New Stationary Sources. 40 CFR 60. Appendix A, 2019.
7. United States Environmental Protection. Standards of Performance for New Stationary Sources. 40 CFR 60. Appendix A, 2020.
8. United States Environmental Protection Agency. Determination of Carbon Monoxide Emissions from Stationary Sources; Instrumental Analyzer Procedure. 40 CFR 60. Appendix A Method 10, 2017.
9. United States Environmental Protection Agency. Determination of Oxide of Nitrogen Emissions from Stationary Sources; Instrumental Analyzer Procedure. 40 CFR 60. Appendix A Method 7E, 2019.
10. United States Environmental Protection Agency. Determination of Sulfur Dioxide Emissions from Stationary Sources; Instrumental Analyzer Procedure. 40 CFR 60. Appendix A Method 6C, 2017.

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ผู้อำนวยการ

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