



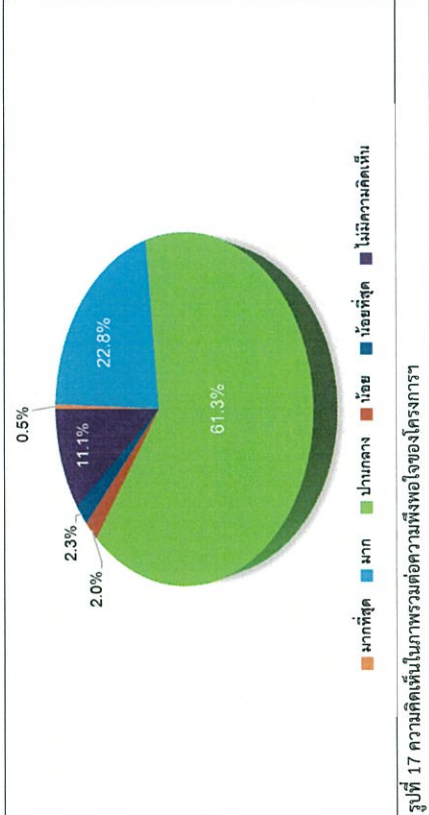
6) ผลกระทบและทัศนคติต่อการดำเนินงานของโครงการฯ ของบริษัท เน็กส์พี ราช เอ็นเนอร์จี้  
ระบอบ สร้าง

6.1) การดำเนินงานของโครงการฯ มีผลกระทบด้านสิ่งแวดล้อม และด้านสุขภาพอนามัยของ  
ชุมชน สามารถสรุปได้ดังนี้  
ด้านผลกระทบด้านสิ่งแวดล้อม และด้านสุขภาพอนามัยของชุมชนที่ผ่านมา พบว่า ผู้ให้สัมภาษณ์  
ส่วนใหญ่ระบุว่าไม่มีผลกระทบจากการดำเนินงานของโครงการฯ ของบริษัท เน็กส์พี ราช เอ็นเนอร์จี้ ระยะเวลา 5 ปี  
ร้อยละ 99.0 และระบุว่าได้ผลกระทบจากการดำเนินงานของโครงการฯ ร้อยละ 1.0 โดยสามารถสรุปผลกระทบได้ดังนี้

- ปัญหาฝุ่นละออง พบว่า มีระดับของผลกระทบที่ได้รับในระดับปานกลาง ร้อยละ 75.0 โดย  
ไม่ได้รับข้อเสนอแนะเพื่อลดผลกระทบ

6.2) ทัศนคติเห็นในภาพรวมต่อความพึงพอใจของโครงการฯ

สำหรับความคิดเห็นในภาพรวมต่อความพึงพอใจของโครงการฯ ของบริษัท เน็กส์พี ราช เอ็น  
เนอร์จี้ ระยะเวลา 5 ปี ผู้ให้สัมภาษณ์ส่วนใหญ่มีความพึงพอใจในระดับปานกลาง ร้อยละ 61.3 รองลงมาคือความ  
พอใจในระดับมาก ร้อยละ 22.8 ไม่มีความคิดเห็น ร้อยละ 11.1 มีความพึงพอใจในระดับน้อยที่สุด ร้อยละ 2.3 และมี  
ความพึงพอใจในระดับน้อย ร้อยละ 2.0 และมีความพึงพอใจในระดับมากที่สุด ร้อยละ 0.5 ตามลำดับ โดยมีรายละเอียดดัง  
รูปที่ 17



สำหรับข้อเสนอแนะอื่นๆ ที่เกี่ยวกับโครงการฯ สามารถสรุปเป็นประเด็นสำคัญได้ดังนี้

- ให้ตระหนักผลกระทบในระยะยาวให้มากขึ้น ร้อยละ 14.3
- อยากให้เข้ามาเสริมสร้างเครื่องออกกำลังกายตามหมู่บ้านต่างๆ ร้อยละ 2.0
- อยากให้จัดกิจกรรมในชุมชน ร้อยละ 42.9
- อยากให้ช่วยงบประมาณให้คนในชุมชนได้อย่างทั่วถึง ร้อยละ 2.0
- อยากให้ประชาสัมพันธ์ข้อมูลให้มากกว่านี้ ร้อยละ 8.2
- อยากให้นำจัดการหมุนเวียนการศึกษาและสาธารณะประโยชน์แก่ชุมชน ร้อยละ 10.2
- อยากให้ระดมทรัพยากรบุคคลในชุมชนเวลาที่เกิดเหตุฉุกเฉินในชุมชนก่อนก่อสร้าง  
ร้อยละ 2.0
- อยากให้รักษาสีสิ่งแวดล้อม/อยากให้หาทรัพยากรลดฝุ่นละออง ร้อยละ 18.4



ภาคผนวก ง

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ใบรับรองการสอบเทียบเครื่องมือ





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### รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Stack	Oxides of Nitrogen	Console Control Unit	BKK_FS0468	12-Jan-22	12-Jul-22	6
Stack	Oxides of Nitrogen	Vacuum Gauge	BKK_FS0435	9-Apr-21	8-Oct-22	18
Stack	Oxides of Nitrogen	SPECTROPHOTOMETER	RYG_EN0179	2-Nov-21	2-Nov-22	12
Stack	Sulfur Dioxide	Console Control Unit	BKK_FS0468	12-Jan-22	12-Jul-22	6
Stack	Sulfur Dioxide	Dry Gas	BKK_FS0534	12-Jan-22	12-Jul-22	6
Stack	Total Suspended Particulate	Console Control Unit	BKK_FS0468	12-Jan-22	12-Jul-22	6
Stack	Total Suspended Particulate	Digital Balance	RYG_EN0003	23-Mar-22	23-Mar-23	12
Stack (CEMs)	Oxides of Nitrogen	Analyzer , System calibration, Stand	-	-	-	-
Stack (CEMs)	Oxygen	Analyzer , System calibration, Stand	-	-	-	-
Ambient	Particulate Matter (PM-10)	High Volume	RYG_FS0192	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	RYG_FS0294	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	RYG_FS0183	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	Digital Balance	RYG_EN0001	23-Mar-22	23-Mar-23	12
Ambient	Total Suspended Particulate	High Volume	RYG_FS0178	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	RYG_FS0176	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	RYG_FS0175	-	-	On site Calibration
Ambient	Total Suspended Particulate	Digital Balance	RYG_EN0001	23-Mar-22	23-Mar-23	12
Ambient	Nitrogen Dioxide	NO <sub>2</sub> Analyzer	BKK_FS0797	4-Jan-22	4-Jul-22	6
Ambient	Nitrogen Dioxide	NO <sub>2</sub> Analyzer	RYG_FS0272	4-Jan-22	4-Jul-22	6
Ambient	Nitrogen Dioxide	NO <sub>2</sub> Analyzer	RYG_FS0252	4-Jan-22	4-Jul-22	6
Ambient	Sulfur Dioxide	SO <sub>2</sub> Analyzer	BKK_FS0796	4-Jan-22	4-Jul-22	6
Ambient	Sulfur Dioxide	SO <sub>2</sub> Analyzer	RYG_FS0271	4-Jan-22	4-Jul-22	6
Ambient	Sulfur Dioxide	SO <sub>2</sub> Analyzer	RYG_FS0251	4-Jan-22	4-Jul-22	6
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	BKK_FS0141	7-Jun-21	6-Dec-22	18
Noise	Leq 24 hrs	Sound Calibrator	RYG_FS0496	10-Jan-22	10-Jan-23	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0020	10-Jan-22	10-Jan-23	12
Noise	Leq 24 hrs	Sound Level Meter	RYG_FS0019	10-Jan-22	10-Jan-23	12
Noise	Leq 8 hrs	Sound Calibrator	RYG_FS0213	26-Apr-22	26-Apr-23	12
Noise	Leq 8 hrs	Sound Level Meter	RYG_FS0495	10-Jan-22	10-Jan-23	12
Noise	Leq 8 hrs	Sound Level Meter	RYG_FS0494	10-Jan-22	10-Jan-23	12
Noise	Leq 8 hrs	Sound Level Meter	RYG_FS0492	10-Jan-22	10-Jan-23	12
Rayong Lab	BOD (5 days at 20°C)	DO meter with Sensor	RYG_EN0140	2-Feb-21	3-Aug-22	18
Rayong Lab	BOD (5 days at 20°C)	Incubator	RYG_EN0154	22-Apr-22	21-Oct-23	12
Rayong Lab	Oil & Grease	Electronic Balance	RYG_EN0002	23-Mar-22	23-Mar-23	12
Rayong Lab	Oil & Grease	Hot Air Oven	RYG_EN0006	5-May-21	3-Nov-22	18
Rayong Lab	Oil & Grease	Water Bath	RYG_EN0061	5-May-21	3-Nov-22	18
Rayong Lab	pH at 25 °C	pH meter	RYG_EN0183	17-Mar-22	17-Mar-23	12
Rayong Lab	Temperature	Digital Thermometer	RYG_FS0467	7-Jul-21	7-Jul-22	18
Rayong Lab	Total Suspended Solids	Electronic Balance	RYG_EN0002	23-Mar-22	23-Mar-23	12
Rayong Lab	Total Suspended Solids	Hot Air Oven	RYG_EN0010	5-May-21	3-Nov-22	18
Rayong Lab	Total Dissolved Solids 180°C	Electronic Balance	RYG_EN0002	23-Mar-22	23-Mar-23	12
Rayong Lab	Total Dissolved Solids 180°C	Hot Air Oven	RYG_EN0010	5-May-21	3-Nov-22	18
Rayong Lab	Nitrate	SPECTROPHOTOMETER	RYG_EN0037	1-Apr-21	1-Oct-22	18
Rayong Lab	Dissolved Oxygen	Chamber (Cold Room)	RYG_EN0184	22-Feb-22	22-Feb-23	12
Water Lab	Total Trihalomethanes	Gas Chromatography (MSD)	BKK_EN0059	24-Dec-20	24-Jun-22	18
Water Lab	SAR	ICP-MS	BKK_EL0043	30-Sep-21	29-Mar-23	18
Water Lab	SAR	Hot Block	BKK_EL0054	7-Apr-22	7-Oct-23	18
Water Lab	SAR	Chamber (Cold Room)	BKK_EN0167	18-May-21	16-Nov-22	18
Rayong Lab	BOD (Azide Method)	Incubator	RYG_EN0154	22-Apr-22	21-Oct-23	18
Rayong Lab	BOD (Azide Method)	Burette	243007	21-Sep-18	21-Sep-23	60
Rayong Lab	Conductivity	Conductivity meter	RYG_EN0029	23-Feb-22	24-Aug-23	18





# CONSOLE CONTROL UNIT CALIBRATION TEST REPORT

Calibration of Date 12 Jan 22 Barometric Pressure (mm Hg) 760  
 Next Cal Date 12 Jul 22 Relative Humidity (%) 55.0  
 Temperature (°C) 28.0

**Console Control Meter Data**  
 Calibration No. C-120122-BKK\_FS0468  
 Dry Gas Meter No. BKK\_FS0468  
 Console Serial No. 1302005  
 Console Model No. XC-672-V

**Reference Dry Gas Meter Data**  
 Serial No. 1607009  
 Model No. 5x-20E-15R-Q-05  
 Correction Factor (%) 1.0060  
 Next Calibration Date 8 Apr 22

ΔH (mm H <sub>2</sub> O)	θ (Minutes)	Reference Dry Gas Meter Calibration						Console Control Dry Gas Meter						Dry Gas Meter Correction Factor (%)	Office Calibration Factor Δ%
		Final	Initial	Total	Tr	Tr	Tr	Final	Initial	Total	Tr	Tr	Tr		
15	12.38	150.00	0.00	150.00	30.0	2544504.0	2544505.0	149.00	29.0	29.0	29.0	1.9079	47.8425		
25	8.26	150.00	0.00	150.00	31.0	2544461.0	2544470.0	147.00	30.0	30.0	30.0	0.9360	44.6713		
50	6.57	150.00	0.00	150.00	31.0	2544517.0	2544570.0	151.00	31.0	31.0	31.0	0.9546	44.1625		
80	5.14	150.00	0.00	150.00	31.0	2544503.0	2544500.0	153.00	32.0	32.0	32.0	0.9819	43.1080		
100	4.18	150.00	0.00	150.00	32.0	2544449.0	2544495.0	154.00	32.0	32.0	32.0	0.9699	43.0440		
												Avg	0.9893	44.4500	

ΔH = Rate of reading of reference to dry gas meter. Tolerance for individual values ± 0.02 from average.  
 Δθ = Office pressure differential. That requires 10.21.14 mm of air @ 25°C and 760 mm of mercury. mm H<sub>2</sub>O. Tolerance for individual values ± 0.08 from average.  
 Procedure: 40 CFR 63 APP A METRIC SEC 5.9.8.9

Calibrated by Saksit Phaisanphist Approved by Wichan Choonharat  
 (Mr Saksit Phaisanphist) (Mr Wichan Choonharat)  
 Field Scientist (4) Manager



# DIGITAL TEMPERATURE CALIBRATION DATA SHEET

Calibration Date :	12-Jan-22	Ambient Temperature (°C) :	28
Calibration sheet No. :	C-120122-BKK_FS0469	Relative Humidity (%) :	55
Digital Temperature ID	BKK_FS0469	Reference Temperature ID	BKK_FS0609
Serial No. :	1302005	Serial No. :	7888004
Model :	XC-572-V	Model :	FLUKE 714
		Next Calibrate :	13 Jan 22

Location	Reference Temperature °C	Digital Temperature °C	Error °C	Remark
Stack	0	0	0	
	25	24	-1	
	50	49	-1	
	100	98	-2	
	150	148	-2	
	200	197	-3	
	250	247	-3	
	300	297	-3	
	500	497	-3	
	1000	997	-3	
Probe	1200	1197	-3	
	100	99	-1	
	125	124	-1	
	150	149	-1	
Oven	100	99	-1	
	125	124	-1	
	150	149	-1	
Filter	100	100	0	
	125	125	0	
	150	149	-1	
Exit	0	0	0	
	10	11	1	
	20	21	1	
Meter	0	0	0	
	25	25	0	
	50	50	0	
	0	0	0	
AUX	25	25	0	
	50	50	0	

Calibrated by Saksit Phaisanphist Approved by Wichan Choonharat  
 (Mr Saksit Phaisanphist) (Mr Wichan Choonharat)  
 Field Scientist (4) Manager

Form 281-048 (04/03/02)



# Pitot Tube Calibration Data

Pitot Tube Identification Number : BKK\_FS0472 Calibration Date : 12 Jan 22  
 Lab test duct Number : 258-1-13-01 Standard Pitot ID : BKK\_FS0441  
 Calibration Sheet No. : C-120122-BKK\_FS0472 Cp Standard : 0.99

Type S Pitot Tube Coefficient Data					
	Type s pitot tube Leg A,B	Standard pitot tube (ΔP, mm H <sub>2</sub> O)	Type s pitot tube (ΔP, mm H <sub>2</sub> O)	Cp (s) Leg A	Cp (s) Leg B
Test 1	A	12.00	16.60	0.842	-
	B	12.00	16.60	-	0.842
Test 2	A	12.00	16.60	0.842	-
	B	12.00	16.60	-	0.842
Test 3	A	12.00	16.60	0.842	-
	B	12.00	16.60	-	0.842
			Cp	0.842	0.842

$$Cp(S) = Cp \cdot \sqrt{\frac{\Delta P(Std)}{\Delta P(S)}}$$

$$Cp(A) - Cp(B) \text{ must BE } \leq 0.01$$

$$\text{Average deviation(A or B)} = \frac{\sum [Cp(S) - Cp(A \text{ or } B)]}{3} \text{ must BE } \leq 0.01$$

Calibrated by Saksit Phaisanphist Approved by Wichan Choonharat  
 (Mr Saksit Phaisanphist) (Mr Wichan Choonharat)  
 Field Scientist (4) Manager

Form 281-048 (04/03/02)



# Pitot Tube Calibration Data

Pitot Tube Identification Number : BKK\_FS0473 Calibration Date : 12 Jan 22  
 Lab test duct Number : 258-1-13-01 Standard Pitot ID : BKK\_FS0441  
 Calibration Sheet No. : C-120122-BKK\_FS0473 Cp Standard : 0.99

Type S Pitot Tube Coefficient Data					
	Type s pitot tube Leg A,B	Standard pitot tube (ΔP, mm H <sub>2</sub> O)	Type s pitot tube (ΔP, mm H <sub>2</sub> O)	Cp (s) Leg A	Cp (s) Leg B
Test 1	A	12.00	16.60	0.842	-
	B	12.00	16.60	-	0.842
Test 2	A	12.00	16.60	0.842	-
	B	12.00	16.60	-	0.842
Test 3	A	12.00	16.60	0.842	-
	B	12.00	16.60	-	0.842
			Cp	0.842	0.842

$$Cp(S) = Cp \cdot \sqrt{\frac{\Delta P(Std)}{\Delta P(S)}}$$

$$Cp(A) - Cp(B) \text{ must BE } \leq 0.01$$

$$\text{Average deviation(A or B)} = \frac{\sum [Cp(S) - Cp(A \text{ or } B)]}{3} \text{ must BE } \leq 0.01$$

Calibrated by Saksit Phaisanphist Approved by Wichan Choonharat  
 (Mr Saksit Phaisanphist) (Mr Wichan Choonharat)  
 Field Scientist (4) Manager

Form 281-048 (04/03/02)



PROBE NOZZLE DIAMETER  
CALIBRATION DATA SHEET

Calibration Date	12 Jan 22	Nozzle Set ID :	BKK_FS0474
Calibration Sheet No. :	C-120122-BKK_FS0474	Vernier Caliper ID. :	BKK_FS0526

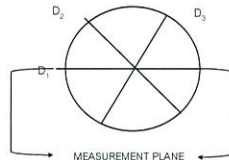
Nozzle ID #	Nozzle Diameter (cm.)			Hi - Lo $\Delta D$	$(D_1 + D_2 + D_3) / 3$ $D_{avg}$
	$D_1$	$D_2$	$D_3$		
1	0.300	0.300	0.300	0.000	0.300
2	0.450	0.450	0.450	0.000	0.450
3	0.600	0.600	0.600	0.000	0.600
4	0.780	0.780	0.780	0.000	0.780
5	0.932	0.932	0.932	0.000	0.932
6	1.094	1.094	1.094	0.000	1.094
7	1.264	1.264	1.264	0.000	1.264

Where :

$D_1, D_2, D_3$  = Three different nozzle diameters at 60 degrees to each other, each measured the nearest 0.025 mm.

$\Delta D$  = Maximum distance between any two diameters, must be  $\leq 0.100$  mm.

$D_{avg}$  =  $(D_1 + D_2 + D_3) / 3$



Calibrated by : Saksit Phaisanphisit Approved by : Wichan Choonharat  
(Mr. Saksit Phaisanphisit) (Mr. Wichan Choonharat)  
Field Scientist (4) Manager

Form No. CS 281-029 (13/01/63)



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATANAKARN ROAD SOI 18, SUANLUANG, BANGKOK 10250  
TEL. 0-2717-3000-24 FAX. 0-2719-9484



Certificate of Calibration

Certificate No. : 21P1350  
Page : 1 of 2

Equipment : Digital Vacuum Gauge  
Manufacturer : Dwyer  
Model : DPGA-00  
Serial No. : DVG03  
ID No. : BKK\_FS0435

This certificate may not be reproduced other than in full, except with the prior written approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

Condition As-Received: Used Item  
Received Date: 09 April 2021  
Calibration Date: 20 April 2021

Reference: 2104-0323WSC  
Ambient Temperature:  $(23 \pm 2) ^\circ C$   
Relative Humidity:  $(50 \pm 15) \%$   
Atmospheric Pressure: 1010 mbar

Submitted by: ALS Laboratory Group (Thailand) Co., Ltd.

104 Phatthanakan 40, Phatthanakan Rd.,  
Khwaeng Phatthanakan, Khet Suan Luang,  
Bangkok 10250 Thailand

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to in-house calibration procedure CP-P06, using "DKD-R 6-1 : Calibration of Pressure Gauges, Edition 03/2014" as a guidelines.

Condition of this result of calibration

1. Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Pressure Calibrator	PC106P	1189	MP-0113-20	14 Jul 2021

2. This instrument was installed in vertical orientation and lower groove of pressure sensor was used as the reference level.  
3. This result of calibration was made on requested at the point specified by customer.  
4. Scale and conversion factor is 1 kPa = 0.2953 inHg  
5. This instrument was used clean air as pressure media.  
6. The certificate is valid only to the item calibrated on date and place of calibration.  
7. This Certification is traceable to the International System of Unit maintained at:-  
National Institute of Metrology Thailand (NIMT)



Calibrated by : Suwit Aussarree  
Issue Date : 21 April 2021

Approved Signatory : Attapol P.  
[ ] Phalinee Prabpaipal  
[ ] Sura Suwanasri  
[x] Attapol Panurach

B 0256843



Cert. No.: 21P1350  
Page: 2 of 2

Result of calibration: Without adjustment  
Function: Vacuum Pressure Measurement

Range: 0 inHg to -30 inHg  
Resolution: 0.01 inHg

Increasing Pressure

Applied Pressure (inHg)	0.000	-4.998	-9.996	-14.994	-19.992	-24.987
UUC* Indication (inHg)	0.00	-5.05	-10.10	-15.20	-20.30	-26.90
Error (inHg)	0.000	-0.052	-0.104	-0.206	-0.308	-0.413

Decreasing Pressure

Applied Pressure (inHg)	-25.487	-19.992	-14.994	-9.998	-4.998	0.000
UUC* Indication (inHg)	-26.90	-20.30	-15.20	-10.10	-5.05	0.00
Error (inHg)	-0.413	-0.308	-0.206	-0.104	-0.052	0.000

The uncertainty of measurement was  $\pm 0.090$  inHg  
\* 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 %.

-000-

Attapol P.

a 1046981

SPC Calibration Center



Certificate of Calibration

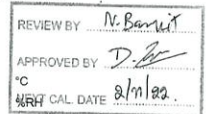
SERT  
Part of DKSH Group

Equipment : SPECTROPHOTOMETER  
Model : DR3900  
Serial No. (or ID.): 2021761 (RYG\_EN0179)  
Manufacturer : HACH  
Condition : In Condition

Certificate No.: C06210513  
Issued Date: 02 November 2021  
Job No.: KSPR2114660  
Page: 1 of 2

Customer : ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch)  
616/10 Moo 5 T. Maenam Khu,  
A. Pluakdaeng, Rayong 21140, Thailand.

Environment Condition: Temperature 22.2  $^\circ C$   $\pm$  0.6  $^\circ C$   
Humidity 61.8 %RH  $\pm$  2.5



Calibration Place: ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch) ( Wet Chemistry )  
616/10 Moo 5 T. Maenam Khu,  
A. Pluakdaeng, Rayong 21140, Thailand.

Calibration By: Mr. Chattaphon Fothong  
Calibration Date: 02 November 2021  
The Method used: In house method, SPCC-WI-24, based on ASTM E 275-08 and ASTM E 387-04  
Traceability: This certificate is traceable to the CRM maintained by National Institute of Standards and Technology (NIST) through Sarna Scientific Limited.

The standard for Wavelength Certificate No. 87146 and 87152  
The standard for Photometric Certificate No. 87220

(Mr. Chattaphon Fothong)  
Person in charge

SERT  
บริษัท เอสอาร์ที จำกัด  
SPC RT Co., Ltd.

(Mr. Dumrong Boonsopon)  
Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.  
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor ( $k=2$ ) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).  
These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced in full without approval of SPC RT Co., Ltd.

บริษัท เอสอาร์ที จำกัด  
SPC RT CO., LTD.  
เลขที่ 0009 1154 หมู่ 5 ตำบลนาเกลือ อำเภอนาเกลือ จังหวัดระยอง 21140  
เบอร์โทร 02-000 1154 ต่อ 1000-1000 1154 ต่อ 1000-1000 1154 ต่อ 1000-1000 1154 ต่อ 1000-1000  
Tel. 0 2185 4333 Ext. 3330-3338 Fax. 0 2185 4424 E-mail: info@spc-rt.com Website: www.spc-rt.com

SPCC-FM-C06-12 23 Nov 2020



Calibration Results:  
Without Adjustment

Wavelength Accuracy (nm), The spectral bandwidth of Std at 5 nm and UUC at 5 nm				
Standard Wavelength	Unit Under Calibration	Correction	Uncertainty	
418.40	418	0.40	0.59	
537.00	536	1.00	0.59	
638.00	638	0.00	0.59	
747.61	748	-0.39	0.59	
807.04	807	0.04	0.59	
Photometric Accuracy (Absorbance)				
Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
420 nm	0.0000	0.000	0.0000	0.0045
	0.5890	0.587	0.0020	0.0045
	0.7616	0.759	0.0026	0.0045
	1.0263	1.023	0.0033	0.0045
440 nm	0.0000	0.000	0.0000	0.0045
	0.5787	0.575	0.0037	0.0045
	0.7442	0.741	0.0032	0.0045
	1.0039	1.000	0.0039	0.0045
465 nm	0.0000	0.000	0.0000	0.0045
	0.5292	0.528	0.0012	0.0045
	0.6865	0.686	0.0005	0.0045
	0.9534	0.952	0.0014	0.0045
546.1 nm	0.0000	0.000	0.0000	0.0045
	0.5468	0.545	0.0018	0.0045
	0.6957	0.694	0.0017	0.0045
	0.9991	0.998	0.0011	0.0045
590 nm	0.0000	0.000	0.0000	0.0045
	0.5851	0.582	0.0031	0.0045
	0.7238	0.721	0.0028	0.0045
	1.0957	1.091	0.0047	0.0045
635 nm	0.0000	0.000	0.0000	0.0045
	0.5692	0.567	0.0022	0.0045
	0.6914	0.690	0.0014	0.0045
	1.0881	1.086	0.0021	0.0045

The End of Certificate

SPC RT CO., LTD.  
เลขที่ 00003 194 ซอยสุขุมวิท 57 แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260  
เบอร์ 02-2185 4333 Fax: 02-2185 4424 E-mail: info.spc@spc-rt.com Website: www.spc-rt.com

SPCC-FM-C06-12 23 Nov 2020

## ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: KSPR2114660

ชนิดเครื่องมือ: SPECTROPHOTOMETER รุ่น: DR3900

หมายเลขเครื่อง: 2021761

ตรวจสอบ (รับ)		ตรวจสอบ (ส่ง)		หมายเหตุ
02 Nov 2021	รายการตรวจเช็ค	02 Nov 2021		
ปกติ	ไม่ปกติ	ปกติ	ไม่ปกติ	
General				
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. ความสมบูรณ์เครื่อง
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสะอาด (ช่องใส่ตัวอย่าง, ภายในนอกเครื่อง)
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. สวิตช์ ปิด - เปิด เครื่อง (On-Off Switch)
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. ปุ่มกด (Keypad)
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. หน้าจอ (Display, Screen Contrast)
Spectrophotometer				
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	6. แรงดันไฟฟ้า (Battery Backup) >= 2.5 VDC
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	7. ตัวหมุนเลือกความยาวคลื่น (Wavelength Control)
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. ความยาวคลื่น (Wavelength Check)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	9. แหล่งกำเนิดแสง (UV < 3,000 hour)
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. แหล่งกำเนิดแสง (Visible < 5,000 hour)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	11. ช่องวัดหลายตัวอย่าง (Carousel Module)
pH Meter and Conductivity Meter				
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	12. ขั้วไฟฟ้า (Electrode and Connection Cable)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	13. ระดับสารละลาย Electrode (Level KCl)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	14. ฝาปิดกันปลาย Electrode (Dust Protection Hood)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	15. ขาตั้งขั้วไฟฟ้า (Stand)
Turbidimeter				
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	16. ค่าความขุ่นที่ใส่ (No Sample)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	17. ระดับการส่องสว่างของแสง (>= 2.5 ไม่นเกิน 3.0)
Automatic titrator				
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	18. สภาพ Piston Burettes
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	19. Function Rinsing and Dosing
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	20. ระบบท่อสายยางและอุปกรณ์ประกอบ

เพิ่มเติม/ข้อแนะนำ:

Mr. Chattuphon Foithong  
Service Engineer

SPC RT CO., LTD.  
เลขที่ 00003 194 ซอยสุขุมวิท 57 แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260  
เบอร์ 02-2185 4333 Fax: 02-2185 4424 E-mail: info.spc@spc-rt.com Website: www.spc-rt.com

SPCC-FM-R31-02 23 Nov 2020



## DIGITAL TEMPERATURE CALIBRATION DATA SHEET

Calibration Date : 12 Jan 22		Ambient Temperature (°C) : 28		
Calibration sheet No. : C-120122-BKK_FS0534		Relative Humidity (%) : 55		
Digital Temperature ID BKK_FS0534		Reference Temperature ID BKK_FS0609		
Console Serial No. : 1509020		Serial No. : 7688004		
Model : XC-60-CV		Model : FLUKE 714		
		Next Calibrate : 13 Jan 22		
Location	Reference Temperature °C	Digital Temperature °C	Error °C	Remark
Stack	0	1	1	
	25	26	1	
	50	51	1	
	100	101	1	
	150	151	1	
	200	201	1	
	250	252	2	
	300	302	2	
	500	502	2	
	1000	1002	2	
Probe	1200	1202	2	
	100	101	1	
	125	126	1	
Filter	150	151	1	
	100	101	1	
	125	126	1	
Exit	150	151	1	
	0	1	1	
	10	11	1	
Meter	20	21	1	
	0	1	1	
	25	26	1	
AUX	50	51	1	
	0	1	1	
	25	26	1	
	50	51	1	

Calibrated by

Mr. Warawut Pulpap  
Field Scientist (3)

Approved by

Mr. Wichan Choonharat  
Manager

Form 281-048 (02/05/02)



## DRY GAS METER CALIBRATION TEST REPORT

Calibration of Date : 12 Jan 22	Barometric Pressure (mm.Hg) : 760
Next Calibration Date : 12 Jul 22	Relative Humidity (%) : 55.0
	Temperature (°C) : 28.0
Dry Gas Meter Data	
Calibration sheet No. : C-120122-BKK_FS0534	Reference Dry Gas Meter Data
Dry Gas Meter No. : BKK_FS0534	Serial No. : 1607009
Serial No. : 1509020	Model No. : DGM-SK25RM-QS8
Model No. : XE-60-CV	Correction Factor (Yr) : 1.0060
	Next Calibration Date : 8 Apr 22

Reference Dry Gas Meter Calibration				Dry Gas Meter				Dry Gas Meter Correction Factor (Y)
Vr (Liters)			Tr (°C)	Vm (Liters)			Ti (°C)	
Final	Initial	Total		Final	Initial	Total	To (°C)	Avg. Tm (°C)
30.00	0.00	30.00	29.0	29.53	0.00	29.53	28.0	28.0
30.00	0.00	30.00	29.0	29.62	0.00	29.62	29.0	29.0
60.00	0.00	60.00	29.0	59.35	0.00	59.35	30.0	30.0
60.00	0.00	60.00	29.0	59.40	0.00	59.40	30.0	30.0
90.00	0.00	90.00	31.0	88.69	0.00	88.69	33.0	33.0
90.00	0.00	90.00	30.0	88.91	0.00	88.91	32.0	32.0
								Avg. : 1.0217

Y = Ratio of reading of reference dry gas meter to dry gas meter ; tolerance for individual  $\pm 0.02$  from average.

Calibrate by :

  
(Mr. Warawut Pulpap)  
Field Scientist (3)

roved by :

  
(Mr. Wichan Choonharat)  
Manager

Form No. 281-022 vls (08/02/02)



**PENTA CALIBRATION CO., LTD.**  
66/124 The Connect 33 Village Kanchanaphisek Road  
Dokmai Prwet Bangkok 10250  
Tel: +66 (0) 2069-9773  
www.pentalab.com

## Certificate of Calibration

Represent to Certificate of Calibration ,PTC/07/22099

Certificate No.: PTC/07/22099 Page: 1 of 2  
Equipment: Digital Balance Condition: Normal  
Manufacturer: Sartorius Serial No: 31709552  
Model: MSU224S-100-DU ID No: RYG\_EN0003  
Type of Balance: Single interval



Customer: ALS Laboratory Group (Thailand) Co.,Ltd.  
616/10 Moo 5 T.Maenamkoo, A.Pluakdaeng,  
Rayong 21140, Thailand

REVIEW BY *Thantit*  
APPROVED BY *D. S.*  
NEXT CAL. DATE *29/03/19*

Environment Condition: Temperature 23.9 °C ± 0.3 °C  
Humidity 58.1 %RH ± 4.4 %RH  
Air density 1.17 kg/m<sup>3</sup>

Calibration Place: ALS Laboratory Group (Thailand) Co.,Ltd.  
616/10 Moo 5 T.Maenamkoo, A.Pluakdaeng,  
Rayong 21140, Thailand

The Method used: In house method, PTC-WI-07, base on Euramet cg. 18

Traceability: This certificate is traceable to the SI Units through Thai Calibration Service Co.,Ltd  
, NSC-ONSAC Accreditation No. : Calibration 0189

Date Received: March 23, 2022

Calibration Date: March 23, 2022

Issued Date: March 25, 2022

Calibration By: Mr Rungroje Metakul



*Mr. Keattisak Kerdto*  
( Mr. Keattisak Kerdto )  
Reviewed by

Approved By : *Mr. Keattisak Kerdto*  
Laboratory Manager

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognised national standard laboratories.

The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM). The effect that the results relate only to the items calibrated.

This calibration certificate shall not be reproduced except in full only, without written approval from penta calibration co., ltd

PTC/FMC-07-02 2 Feb 2020



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66/124 The Connect 33 Village Kanchanaphisek Road  
Dokmai Prwet Bangkok 10250  
Tel: +66 (0) 2069-9773  
www.pentalab.com

Represent to Certificate of Calibration ,PTC/07/22099

Certificate No.: PTC/07/22099

Page: 2 of 2

Measurement Results:

Without Adjustment :

Function Calibration: Non Adjustment

Eccentric Error: Weight to be 1/3, 1/2 or of Maximum capacity

Eccentricity test 100 (g)				
Position (g)				
1	2	3	4	5
0.0000	0.0000	-0.0001	-0.0001	0.0001
Maximum deviation:				0.0001

Repeatability Test : Weight to be 1/2 ≤ L<sub>1</sub> ≤ Maximum capacity

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

Nominal test value (g)	Standard Deviation
200	0.00007

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
0	0.00000	0.0000	0.0000	0.00020	2.65
0.01	0.01000	0.0099	0.0001	0.00020	2.43
0.1	0.10000	0.1000	0.0000	0.00020	2.43
0.5	0.50000	0.5000	0.0000	0.00020	2.43
1	1.00000	1.0000	0.0000	0.00020	2.43
5	5.00001	5.0000	0.0000	0.00020	2.43
10	10.00000	10.0000	0.0000	0.00020	2.43
20	20.00003	20.0000	0.0000	0.00020	2.43
50	50.00004	50.0000	0.0000	0.00021	2.32
100	100.00004	99.9999	0.0001	0.00022	2.17
200	200.00011	200.0000	0.0001	0.00027	2.05

Note: Weight of adjust (g)

The End of Certificate

PTC/FMC-07-02 2 Feb 2020



Lot No. 2262276-1

## ANALYZER CALIBRATION DATA

Client : Nexit Ratch Energy Rayong Co., Ltd. Location : HRBG # 2  
Date : 17 Jun 22 Test Operator : Sakat P.

O<sub>2</sub> ANALYZER Model : TELEDYNE API 200EH Serial No. : 725  
Span (%) : 25

	Cylinder Value (%)	Initial Analyzers Calibration Response (%)	Final Analyzers Calibration Response (%)	Difference (Percent of Span)
Zero Gas	0.00	-0.05	-0.04	0.04
Low-Level Gas	8.04	8.00	8.00	0.00
Span Gas	16.00	15.95	15.96	0.04

NO<sub>x</sub> ANALYZER Model : TELEDYNE API 200EH Serial No. : 725  
Span (ppm) : 100

	Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	-0.03	-0.01	0.02
Low-Level Gas	54.96	54.93	54.94	0.01
Span Gas	79.42	79.39	79.40	0.01

Calibrated by

*Sakat P.*

( Mr. Sakat Phaisanphut )

Environmental Field Scientist (4)

FORM NO. F 06-104 REVISION NO. - ISSUE DATE 3/06/19

ALS Laboratory Group



Lot No. 2262276-1

## SYSTEM CALIBRATION BIAS AND DRIFT DATA

Client : Nexit Ratch Energy Rayong Co., Ltd. Location : HRBG # 2  
Date : 17 Jun 22 Test Operator : Sakat P.

O<sub>2</sub> ANALYZER Cylinder Conc. (%) : 18.00 Span (%) : 25

	O <sub>2</sub> Analyzer Calibration Response	Initial Values		Final Values		Drift (% of Span)
		System Calibration Response	System Cal Bias (% of Span)	System Calibration Response	System Cal Bias (% of Span)	
Zero Gas	-0.05	-0.05	0.00	-0.04	0.04	0.04
Upscale Gas	15.95	15.95	0.00	15.96	0.04	0.04

NO<sub>x</sub> ANALYZER Cylinder Conc. (ppm) : 79.42 Span (ppm) : 100

	NO <sub>x</sub> Analyzer Calibration Response	Initial Values		Final Values		Drift (% of Span)
		System Calibration Response	System Cal Bias (% of Span)	System Calibration Response	System Cal Bias (% of Span)	
Zero Gas	-0.03	-0.03	0.00	-0.01	0.02	0.02
Upscale Gas	79.39	79.39	0.00	79.40	0.01	0.01

Calibrated by

*Sakat P.*

( Mr. Sakat Phaisanphut )

Environmental Field Scientist (4)

FORM NO. F 06-104 REVISION NO. - ISSUE DATE 3/06/19

ALS Laboratory Group



### CEMs Data

Client Name Nexif Ratch Energy Rayong Co., Ltd  
Plant Name -

Date	17 Jun 2017
Location	HRSG #

Run No. 1		Time Base: 21 min					Run No. 2		Time Base: 21 min				
Date	Time	SO2	NOx	CO	SO2	CO2	Date	Time	SO2	NOx	CO	SO2	CO2
		ppm	ppm	ppm	ppm	%Vol			ppm	ppm	ppm	ppm	%Vol
17 Jan 22	11:30	-	32.78	-	11.96	-	17 Jan 22	11:51	-	32.81	-	11.96	-
17 Jan 22	11:31	-	32.96	-	11.97	-	17 Jan 22	11:52	-	32.48	-	11.94	-
17 Jan 22	11:32	-	33.01	-	11.94	-	17 Jan 22	11:53	-	32.26	-	11.93	-
17 Jan 22	11:33	-	32.82	-	11.92	-	17 Jan 22	11:54	-	32.16	-	11.96	-
17 Jan 22	11:34	-	33.81	-	11.92	-	17 Jan 22	11:55	-	32.12	-	11.92	-
17 Jan 22	11:36	-	33.84	-	11.92	-	17 Jan 22	11:56	-	33.36	-	11.92	-
17 Jan 22	11:36	-	33.16	-	11.93	-	17 Jan 22	11:57	-	32.85	-	11.94	-
17 Jan 22	11:37	-	33.12	-	11.93	-	17 Jan 22	11:58	-	32.45	-	11.93	-
17 Jan 22	11:38	-	32.99	-	11.95	-	17 Jan 22	11:59	-	32.45	-	11.93	-
17 Jan 22	11:39	-	32.46	-	11.94	-	17 Jan 22	12:00	-	31.96	-	11.94	-
17 Jan 22	11:40	-	32.98	-	11.94	-	17 Jan 22	12:01	-	32.63	-	11.93	-
17 Jan 22	11:41	-	33.68	-	11.94	-	17 Jan 22	12:02	-	33.29	-	11.93	-
17 Jan 22	11:42	-	33.62	-	11.92	-	17 Jan 22	12:03	-	32.88	-	11.93	-
17 Jan 22	11:43	-	33.27	-	11.91	-	17 Jan 22	12:04	-	32.88	-	11.96	-
17 Jan 22	11:44	-	33.00	-	11.96	-	17 Jan 22	12:05	-	32.83	-	11.95	-
17 Jan 22	11:45	-	33.22	-	11.96	-	17 Jan 22	12:06	-	32.88	-	11.94	-
17 Jan 22	11:46	-	33.03	-	11.93	-	17 Jan 22	12:07	-	32.88	-	11.96	-
17 Jan 22	11:47	-	33.21	-	11.96	-	17 Jan 22	12:08	-	32.47	-	11.95	-
17 Jan 22	11:48	-	33.21	-	11.96	-	17 Jan 22	12:09	-	32.47	-	11.95	-
17 Jan 22	11:49	-	33.01	-	11.92	-	17 Jan 22	12:10	-	36.03	-	11.93	-
17 Jan 22	11:50	-	33.06	-	11.92	-	17 Jan 22	12:11	-	32.88	-	11.95	-
Mean		32.94	33.56	11.98			Mean		32.98	32.88	11.94		
Avg		32.96	33.94	11.94			Avg		32.98	32.88	11.94		

Run No. 3							Time Base 21 min							Run No. 4							Time Base 21 min						
Sw	Tex	SO2	NOx	CO	O2	CO2	Sw	Tex	SO2	NOx	CO	O2	CO2	Sw	Tex	SO2	NOx	CO	O2	CO2	Sw	Tex	SO2	NOx	CO	O2	CO2
		SEC	PPM	PPM	PPM	Vol%			SEC	PPM	PPM	PPM	Vol%			SEC	PPM	PPM	PPM	Vol%			SEC	PPM	PPM	PPM	Vol%
17-Jan-22	12-12	32.67	32.79	11.96	11.96	11.96	17-Jan-22	12-30	32.84	32.84	11.96	11.96	11.96	17-Jan-22	12-12	32.84	32.84	11.96	11.96	11.96	17-Jan-22	12-12	32.84	32.84	11.96	11.96	11.96
17-Jan-22	12-13	32.67	32.67	11.96	11.96	11.96	17-Jan-22	12-34	32.86	32.86	11.96	11.96	11.96	17-Jan-22	12-14	32.84	32.84	11.96	11.96	11.96	17-Jan-22	12-14	32.84	32.84	11.96	11.96	11.96
17-Jan-22	12-14	32.67	32.67	11.96	11.96	11.96	17-Jan-22	12-38	32.86	32.86	11.96	11.96	11.96	17-Jan-22	12-16	32.84	32.84	11.96	11.96	11.96	17-Jan-22	12-16	32.84	32.84	11.96	11.96	11.96
17-Jan-22	12-15	32.67	32.67	11.96	11.96	11.96	17-Jan-22	12-42	32.86	32.86	11.96	11.96	11.96	17-Jan-22	12-18	32.84	32.84	11.96	11.96	11.96	17-Jan-22	12-18	32.84	32.84	11.96	11.96	11.96
17-Jan-22	12-16	32.67	32.67	11.96	11.96	11.96	17-Jan-22	12-46	32.86	32.86	11.96	11.96	11.96	17-Jan-22	12-20	32.84	32.84	11.96	11.96	11.96	17-Jan-22	12-20	32.84	32.84	11.96	11.96	11.96
17-Jan-22	12-17	32.67	32.67	11.96	11.96	11.96	17-Jan-22	12-50	32.86	32.86	11.96	11.96	11.96	17-Jan-22	12-22	32.84	32.84	11.96	11.96	11.96	17-Jan-22	12-22	32.84	32.84	11.96	11.96	11.96
17-Jan-22	12-18	32.67	32.67	11.96	11.96	11.96	17-Jan-22	12-54	32.86	32.86	11.96	11.96	11.96	17-Jan-22	12-24	32.84	32.84	11.96	11.96	11.96	17-Jan-22	12-24	32.84	32.84	11.96	11.96	11.96
17-Jan-22	12-19	32.67	32.67	11.96	11.96	11.96	17-Jan-22	12-58	32.86	32.86	11.96	11.96	11.96	17-Jan-22	12-26	32.84	32.84	11.96	11.96	11.96	17-Jan-22	12-26	32.84	32.84	11.96	11.96	11.96
17-Jan-22	12-20	32.67	32.67	11.96	11.96	11.96	17-Jan-22	12-02	32.86	32.86	11.96	11.96	11.96	17-Jan-22	12-28	32.84	32.84	11.96	11.96	11.96	17-Jan-22	12-28	32.84	32.84	11.96	11.96	11.96
17-Jan-22	12-21	32.67	32.67	11.96	11.96	11.96	17-Jan-22	12-06	32.86	32.86	11.96	11.96	11.96	17-Jan-22	12-30	32.84	32.84	11.96	11.96	11.96	17-Jan-22	12-30	32.84	32.84	11.96	11.96	11.96
17-Jan-22	12-22	32.67	32.67	11.96	11.96	11.96	17-Jan-22	12-10	32.86	32.86	11.96	11.96	11.96	17-Jan-22	12-32	32.84	32.84	11.96	11.96	11.96	17-Jan-22	12-32	32.84	32.84	11.96	11.96	11.96
17-Jan-22	12-23	32.67	32.67	11.96	11.96	11.96	17-Jan-22																				

Run No 5							Run No 6						
Time Base 21 min							Time Base 21 min						
Day	Time	SO2	NOx	CO	CO2		Day	Time	SO2	NOx	CO	CO2	
		ppm	ppm	ppm	%Vol	%Vol			ppm	ppm	ppm	%Vol	%Vol
17-Jan-22	12:54	-	33.79	-	11.98	-	17-Jan-22	13:18	-	32.81	-	11.98	-
17-Jan-22	12:57	-	33.54	-	11.94	-	17-Jan-22	13:19	-	32.42	-	11.94	-
17-Jan-22	12:58	-	32.54	-	11.98	-	17-Jan-22	13:17	-	30.87	-	11.94	-
17-Jan-22	12:57	-	32.50	-	11.95	-	17-Jan-22	13:18	-	32.48	-	11.97	-
17-Jan-22	12:58	-	32.50	-	11.97	-	17-Jan-22	13:19	-	31.74	-	11.94	-
17-Jan-22	12:59	-	32.74	-	11.94	-	17-Jan-22	13:20	-	32.54	-	11.97	-
17-Jan-22	13:00	-	32.72	-	11.94	-	17-Jan-22	13:21	-	32.39	-	11.94	-
17-Jan-22	13:01	-	32.48	-	11.95	-	17-Jan-22	13:22	-	31.32	-	11.94	-
17-Jan-22	13:02	-	32.83	-	11.96	-	17-Jan-22	13:23	-	32.36	-	11.95	-
17-Jan-22	13:03	-	32.83	-	11.94	-	17-Jan-22	13:24	-	32.36	-	11.94	-
17-Jan-22	13:04	-	33.81	-	11.96	-	17-Jan-22	13:25	-	31.88	-	11.97	-
17-Jan-22	13:05	-	32.83	-	11.94	-	17-Jan-22	13:26	-	32.48	-	11.95	-
17-Jan-22	13:06	-	32.83	-	11.96	-	17-Jan-22	13:27	-	32.48	-	11.96	-
17-Jan-22	13:07	-	32.63	-	11.98	-	17-Jan-22	13:28	-	32.87	-	11.93	-
17-Jan-22	13:08	-	32.49	-	11.95	-	17-Jan-22	13:29	-	32.21	-	11.96	-
17-Jan-22	13:09	-	32.54	-	11.94	-	17-Jan-22	13:30	-	31.86	-	11.94	-
17-Jan-22	13:10	-	32.43	-	11.96	-	17-Jan-22	13:31	-	32.07	-	11.97	-
17-Jan-22	13:11	-	32.49	-	11.92	-	17-Jan-22	13:32	-	32.29	-	11.99	-
17-Jan-22	13:12	-	32.59	-	11.93	-	17-Jan-22	13:33	-	32.48	-	11.96	-
17-Jan-22	13:13	-	32.75	-	11.96	-	17-Jan-22	13:34	-	34.02	-	11.99	-
17-Jan-22	13:14	-	32.81	-	11.97	-	17-Jan-22	13:35	-	32.54	-	11.94	-
Wed		-	31.96	-	11.97	-	Mon		-	31.96	-	11.96	-
Thu		-	32.87	-	11.93	-	Tue		-	30.18	-	11.94	-



### CEMs Data

Client Name Nexif Ratch Energy Rayong Co., Ltd.  
Plant Name \_\_\_\_\_

Date	17 Jun 22
Location	HRSG # 2

Run No. 7		Time Base: 21 min						Run No. 8		Time Base: 21 min					
Run Date	Time	SO2	NOx	CO	CO2	PM10	PM2.5	Run Date	Time	SO2	NOx	CO	CO2	PM10	PM2.5
		ppm	ppm	ppm	ppm	ppb	ppb			ppm	ppm	ppm	ppm	ppb	ppb
17-Jun-22	13:36	-	33.32	-	11.96	-	-	17-Jun-22	13:57	-	34.18	-	11.97	-	-
17-Jun-22	13:57	-	33.63	-	11.96	-	-	17-Jun-22	14:18	-	34.18	-	11.97	-	-
17-Jun-22	14:00	-	32.96	-	11.96	-	-	17-Jun-22	13:59	-	33.69	-	11.98	-	-
17-Jun-22	13:59	-	33.63	-	11.94	-	-	17-Jun-22	14:00	-	32.90	-	11.97	-	-
17-Jun-22	13:48	-	33.60	-	11.96	-	-	17-Jun-22	14:01	-	33.70	-	11.96	-	-
17-Jun-22	13:41	-	33.70	-	11.96	-	-	17-Jun-22	14:02	-	33.34	-	11.96	-	-
17-Jun-22	13:42	-	33.70	-	11.96	-	-	17-Jun-22	14:03	-	33.70	-	11.96	-	-
17-Jun-22	13:43	-	33.70	-	12.00	-	-	17-Jun-22	14:04	-	33.51	-	11.96	-	-
17-Jun-22	13:44	-	33.90	-	12.00	-	-	17-Jun-22	14:05	-	33.85	-	11.96	-	-
17-Jun-22	13:45	-	33.90	-	11.96	-	-	17-Jun-22	14:06	-	33.51	-	11.96	-	-
17-Jun-22	13:46	-	33.68	-	11.96	-	-	17-Jun-22	14:07	-	33.85	-	11.97	-	-
17-Jun-22	13:47	-	34.20	-	12.00	-	-	17-Jun-22	14:08	-	34.06	-	11.96	-	-
17-Jun-22	13:48	-	34.24	-	12.00	-	-	17-Jun-22	14:09	-	34.06	-	11.96	-	-
17-Jun-22	13:49	-	34.21	-	11.99	-	-	17-Jun-22	14:10	-	33.80	-	11.97	-	-
17-Jun-22	13:50	-	34.30	-	12.00	-	-	17-Jun-22	14:11	-	33.22	-	11.96	-	-
17-Jun-22	13:51	-	34.40	-	11.99	-	-	17-Jun-22	14:12	-	33.30	-	11.96	-	-
17-Jun-22	13:52	-	34.31	-	11.96	-	-	17-Jun-22	14:13	-	33.50	-	11.96	-	-
17-Jun-22	13:53	-	34.40	-	11.96	-	-	17-Jun-22	14:14	-	33.80	-	11.96	-	-
17-Jun-22	13:54	-	34.50	-	11.98	-	-	17-Jun-22	14:15	-	33.75	-	11.96	-	-
17-Jun-22	13:55	-	34.60	-	11.97	-	-	17-Jun-22	14:16	-	33.80	-	11.96	-	-
17-Jun-22	13:56	-	34.40	-	11.97	-	-	17-Jun-22	14:17	-	33.75	-	11.96	-	-
Min			33.86		12.00			Min			34.18		12.00		
Avg			34.21		11.96			Avg			33.76		11.97		

Run No. 9							Time Base: 21 min							Run No. 10							Time Base: 21 min						
Date	Time	S02	NOx	CO	O2	C02	Date	Time	S02	NOx	CO	O2	C02	Date	Time	S02	NOx	CO	O2	C02	Date	Time	S02	NOx	CO	O2	C02
		ppm	ppm	ppm	%Vol	%Vol			ppm	ppm	ppm	%Vol	%Vol			ppm	ppm	ppm	%Vol	%Vol			ppm	ppm	ppm	%Vol	%Vol
17 Jan 22	14:18	19.38	11.37	11.19	15.86	15.86	17 Jan 22	14:38	20.25	12.38	11.84	15.86	15.86	17 Jan 22	14:18	14.38	10.18	11.86	15.86	15.86	17 Jan 22	14:18	14.38	10.18	11.86	15.86	15.86
17 Jan 22	14:19	19.13	11.35	11.85			17 Jan 22	14:40	14.40	10.18	11.86	15.86	15.86	17 Jan 22	14:41	10.41	10.47	11.86	15.86	15.86	17 Jan 22	14:41	10.41	10.47	11.86	15.86	15.86
17 Jan 22	14:20	23.83	11.87	11.87	15.86	15.86	17 Jan 22	14:42	14.42	10.47	11.86	15.86	15.86	17 Jan 22	14:43	10.43	10.47	11.86	15.86	15.86	17 Jan 22	14:43	10.43	10.47	11.86	15.86	15.86
17 Jan 22	14:21	19.44	11.87	11.86			17 Jan 22	14:44	14.44	10.47	11.86	15.86	15.86	17 Jan 22	14:45	10.45	10.47	11.86	15.86	15.86	17 Jan 22	14:45	10.45	10.47	11.86	15.86	15.86
17 Jan 22	14:22	23.83	11.86	11.86			17 Jan 22	14:46	14.46	10.47	11.86	15.86	15.86	17 Jan 22	14:47	10.47	10.47	11.86	15.86	15.86	17 Jan 22	14:47	10.47	10.47	11.86	15.86	15.86
17 Jan 22	14:23	23.87	11.85				17 Jan 22	14:48	14.48	10.47	11.86	15.86	15.86	17 Jan 22	14:49	10.49	10.47	11.86	15.86	15.86	17 Jan 22	14:49	10.49	10.47	11.86	15.86	15.86
17 Jan 22	14:24	14.24	11.87				17 Jan 22	14:50	14.50	10.47	11.86	15.86	15.86	17 Jan 22	14:51	10.51	10.47	11.86	15.86	15.86	17 Jan 22	14:51	10.51	10.47	11.86	15.86	15.86
17 Jan 22	14:25	23.87	11.87				17 Jan 22	14:52	14.52	10.47	11.86	15.86	15.86	17 Jan 22	14:53	10.53	10.47	11.86	15.86	15.86	17 Jan 22	14:53	10.53	10.47	11.86	15.86	15.86
17 Jan 22	14:26	23.88	11.83				17 Jan 22	14:54	14.54	10.47	11.86	15.86	15.86	17 Jan 22	14:55	10.55	10.47	11.86	15.86	15.86	17 Jan 22	14:55	10.55	10.47	11.86	15.86	15.86
17 Jan 22	14:27	14.27	11.82				17 Jan 22	14:56	14.56	10.47	11.86	15.86	15.86	17 Jan 22	14:57	10.57	10.47	11.86	15.86	15.86	17 Jan 22	14:57	10.57	10.47	11.86	15.86	15.86
17 Jan 22	14:28	23.44	11.86				17 Jan 22	14:57	14.57	10.47	11.86	15.86	15.86	17 Jan 22	14:58	10.58	10.47	11.86	15.86	15.86	17 Jan 22	14:58	10.58	10.47	11.86	15.86	15.86
17 Jan 22	14:29	23.44	11.86				17 Jan 22	14:58	14.58	10.47	11.86	15.86	15.86	17 Jan 22	14:59	10.59	10.47	11.86	15.86	15.86	17 Jan 22	14:5					

Run No. 11		Time Base 21 min						Run No. 12		Time Base 21 min					
Date	Time	SG2	hNds	CG	CG	CG2		Date	Time	SG2	hNds	CG	CG	CG2	
		SEP	SEP	SEP	SEP	SEP	SEP			SEP	SEP	SEP	SEP	SEP	SEP
17 Jan 22	18:05		32.77		11.82			17 Jan 22	18:21		30.82		11.81		
17 Jan 22	18:01		33.03		11.84			17 Jan 22	18:22		30.86		11.84		
17 Jan 22	18:02		32.28		11.84			17 Jan 22	18:23		32.84		11.86		
17 Jan 22	18:03		32.40		11.82			17 Jan 22	18:24		32.82		11.84		
17 Jan 22	18:04		32.40		11.82			17 Jan 22	18:25		31.82		11.82		
17 Jan 22	18:05		32.27		11.83			17 Jan 22	18:26		30.86		11.86		
17 Jan 22	18:06		32.45		11.87			17 Jan 22	18:27		32.82		11.86		
17 Jan 22	18:07		33.13		11.87			17 Jan 22	18:28		32.28		11.84		
17 Jan 22	18:08		32.23		11.82			17 Jan 22	18:29		31.72		11.86		
17 Jan 22	18:09		32.53		11.82			17 Jan 22	18:30		32.82		11.82		
17 Jan 22	18:10		33.07		11.82			17 Jan 22	18:31		30.78		11.82		
17 Jan 22	18:11		33.00		11.81			17 Jan 22	18:32		32.83		11.83		
17 Jan 22	18:12		32.40		11.82			17 Jan 22	18:33		31.87		11.82		
17 Jan 22	18:13		32.44		11.81			17 Jan 22	18:34		32.40		11.82		
17 Jan 22	18:14		32.88		11.83			17 Jan 22	18:35		32.24		11.83		
17 Jan 22	18:15		33.15		11.84			17 Jan 22	18:36		31.87		11.82		
17 Jan 22	18:16		32.34		11.82			17 Jan 22	18:37		32.24		11.84		
17 Jan 22	18:17		32.82		11.83			17 Jan 22	18:38		32.18		11.83		
17 Jan 22	18:18		32.91		11.84			17 Jan 22	18:39		32.28		11.82		
17 Jan 22	18:19		31.12		11.80			17 Jan 22	18:40		32.27		11.84		
17 Jan 22	18:20		32.33		11.83			17 Jan 22	18:41		31.78		11.83		
Avg			32.37		11.84			Avg			32.63		11.83		
Aug			32.38		11.83			Aug			32.46		11.83		



### Reference Method Data

Client Name Nexif Ratch Energy Rayong Co., Ltd.  
Plant Name \_\_\_\_\_

Date	17 Jun 2017
Location	HRSQ #

Run No. 1							Run No. 2							
Time Base = 21 min							Time Base = 21 min							
Date	Time	S02	Temp	CO	CO2	CO2	Date	Time	S02	Temp	NOx	NOx	CO2	CO2
		ppm	deg	ppm	ppm	ppm			ppm	deg	ppm	ppm	ppm	ppm
7 Jan 22	13:30		31.88		11.87		7 Jan 22	11:51		32.18		11.84		
7 Jan 22	13:31		31.96		11.87		7 Jan 22	11:52		32.26		11.86		11.86
7 Jan 22	13:32		31.86		11.87		7 Jan 22	11:53		32.33		11.84		11.84
7 Jan 22	13:34		31.84		11.85		7 Jan 22	11:54		32.08		11.86		11.86
7 Jan 22	13:34		31.88		11.87		7 Jan 22	11:56		32.16		11.85		11.85
7 Jan 22	13:35		31.93		11.85		7 Jan 22	11:56		32.06		11.83		11.83
7 Jan 22	13:36		32.02		11.86		7 Jan 22	11:57		32.25		11.85		11.85
7 Jan 22	13:37		32.10		11.87		7 Jan 22	11:58		32.35		11.85		11.85
7 Jan 22	13:38		32.16		11.84		7 Jan 22	11:59		32.50		11.85		11.85
7 Jan 22	13:39		32.31		11.83		7 Jan 22	12:00		32.63		11.83		11.83
7 Jan 22	13:40		32.46		11.87		7 Jan 22	12:01		32.75		11.84		11.84
7 Jan 22	13:41		32.38		11.85		7 Jan 22	12:02		32.24		11.87		11.87
7 Jan 22	13:42		32.17		11.88		7 Jan 22	12:03		31.74		11.85		11.85
7 Jan 22	13:43		31.86		11.86		7 Jan 22	12:04		32.01		11.84		11.84
7 Jan 22	13:44		32.09		11.85		7 Jan 22	12:05		32.22		11.83		11.83
7 Jan 22	13:45		32.08		11.85		7 Jan 22	12:06		32.39		11.83		11.83
7 Jan 22	13:46		32.21		11.86		7 Jan 22	12:07		32.43		11.84		11.84
7 Jan 22	13:47		32.00		11.82		7 Jan 22	12:08		32.18		11.84		11.84
7 Jan 22	13:48		32.30		11.85		7 Jan 22	12:09		31.91		11.84		11.84
7 Jan 22	13:49		32.26		11.85		7 Jan 22	12:10		32.00		11.82		11.82
7 Jan 22	13:50		31.89		11.87		7 Jan 22	12:11		32.29		11.87		11.87
Max			32.46		11.87		Max			32.89		11.84		11.84
			32.30		11.85					32.22		11.84		11.84

Run No. 3						Time Base 21 min						Run No. 4						Time Base 21 min						
Date	Time	SO2	NOx	CO	CO2	Date	Time	SO2	NOx	CO	CO2	Date	Time	SO2	NOx	CO	CO2	Date	Time	SO2	NOx	CO	CO2	
		ppm	ppm	ppm	Vol%			ppm	ppm	ppm	Vol%			ppm	ppm	ppm	Vol%			ppm	ppm	ppm	Vol%	
17 Jan 22	12:12	-	38.18	-	11.65	-	17 Jan 22	12:35	32.06	-	11.62	-	17 Jan 22	12:58	32.06	-	11.62	-	17 Jan 22	13:21	32.06	-	11.62	-
17 Jan 22	12:13	-	38.38	-	11.65	-	17 Jan 22	12:36	32.06	-	11.62	-	17 Jan 22	12:59	32.06	-	11.62	-	17 Jan 22	13:22	32.06	-	11.62	-
17 Jan 22	12:14	-	38.54	-	11.64	-	17 Jan 22	12:38	32.27	-	11.62	-	17 Jan 22	13:00	32.27	-	11.62	-	17 Jan 22	13:23	32.27	-	11.62	-
17 Jan 22	12:15	-	38.66	-	11.64	-	17 Jan 22	12:39	32.27	-	11.62	-	17 Jan 22	13:01	32.43	-	11.64	-	17 Jan 22	13:24	32.43	-	11.64	-
17 Jan 22	12:16	-	38.37	-	11.61	-	17 Jan 22	12:39	32.47	-	11.64	-	17 Jan 22	13:02	32.47	-	11.64	-	17 Jan 22	13:25	32.47	-	11.64	-
17 Jan 22	12:18	-	38.20	-	11.65	-	17 Jan 22	12:39	32.18	-	11.64	-	17 Jan 22	13:03	32.18	-	11.64	-	17 Jan 22	13:26	32.18	-	11.64	-
17 Jan 22	12:19	-	38.16	-	11.65	-	17 Jan 22	12:40	32.18	-	11.64	-	17 Jan 22	13:04	32.18	-	11.64	-	17 Jan 22	13:27	32.18	-	11.64	-
17 Jan 22	12:20	-	38.28	-	11.64	-	17 Jan 22	12:41	32.18	-	11.64	-	17 Jan 22	13:05	32.18	-	11.64	-	17 Jan 22	13:28	32.18	-	11.64	-
17 Jan 22	12:21	-	38.26	-	11.63	-	17 Jan 22	12:42	32.18	-	11.63	-	17 Jan 22	13:06	32.18	-	11.63	-	17 Jan 22	13:29	32.18	-	11.63	-
17 Jan 22	12:22	-	38.32	-	11.63	-	17 Jan 22	12:43	32.18	-	11.63	-	17 Jan 22	13:07	32.18	-	11.63	-	17 Jan 22	13:30	32.18	-	11.63	-
17 Jan 22	12:23	-	38.18	-	11.63	-	17 Jan 22	12:44	32.17	-	11.64	-	17 Jan 22	13:08	32.17	-	11.64	-	17 Jan 22	13:31	32.17	-	11.64	-
17 Jan 22	12:24	-	38.11	-	11.64	-	17 Jan 22	12:45	32.06	-	11.63	-	17 Jan 22	13:09	32.06	-	11.63	-	17 Jan 22	13:32	32.06	-	11.63	-
17 Jan 22	12:25	-	38.34	-	11.63	-	17 Jan 22	12:46	32.06	-	11.62	-	17 Jan 22	13:10	32.06	-	11.62	-	17 Jan 22	13:33	32.06	-	11.62	-
17 Jan 22	12:26	-	38.41	-	11.62	-	17 Jan 22	12:47	32.06	-	11.62	-	17 Jan 22	13:11	32.06	-	11.62	-	17 Jan 22	13:34	32.06	-	11.62	-
17 Jan 22	12:27	-	38.32	-	11.64	-	17 Jan 22	12:49	32.06	-	11.63	-	17 Jan 22	13:12	32.06	-	11.63	-	17 Jan 22	13:35	32.06	-	11.63	-
17 Jan 22	12:28	-	38.36	-	11.64	-	17 Jan 22	12:49	32.06	-	11.63	-	17 Jan 22	13:13	32.06	-	11.63	-	17 Jan 22	13:36	32.06	-	11.63	-
17 Jan 22	12:29	-	38.86	-	11.65	-	17 Jan 22	12:50	32.06	-	11.63	-	17 Jan 22	13:15	32.06	-	11.63	-	17 Jan 22	13:38	32.06	-	11.63	-
17 Jan 22	12:30	-	39.90	-	11.65	-	17 Jan 22	12:51	31.96	-	11.65	-	17 Jan 22	13:16	31.96	-	11.65	-	17 Jan 22	13:39	31.96	-	11.65	-
17 Jan 22	12:31	-	39.86	-	11.64	-	17 Jan 22	12:52	31.96	-	11.65	-	17 Jan 22	13:18	31.96	-	11.64	-	17 Jan 22	13:40	31.96	-	11.64	-
17 Jan 22	12:32	-	39.64	-	11.63	-	17 Jan 22	12:53	32.01	-	11.65	-	17 Jan 22	13:20	32.01	-	11.65	-	17 Jan 22	13:41	32.01	-	11.65	-
Max			57.64	-	11.65	-	Max		32.47	-	11.65	-	Max		32.47	-	11.65	-	Max		32.47	-	11.65	-
Avg			39.70	-	11.64	-	Avg		32.14	-	11.63	-	Avg		32.14	-	11.63	-	Avg		32.14	-	11.63	-

Run No. 5							Time Base: 21 min							Run No. 6							Time Base: 21 min						
Date	Time	802	805	NDs	C02	C03	Date	Time	802	805	NDs	C02	C03	Date	Time	802	805	NDs	C02	C03							
17-Jan-22	12:54		37.96		11.84		17-Jan-22	13:18			22.28		11.84	17-Jan-22	13:18			22.28		11.84							
17-Jan-22	12:56		32.33		11.82	-	17-Jan-22	13:16			22.37		11.82	17-Jan-22	13:16			22.37		11.82							
17-Jan-22	12:56		31.53		11.83	-	17-Jan-22	13:17			21.60		11.83	17-Jan-22	13:17			21.60		11.83							
17-Jan-22	12:57		30.88		11.83	-	17-Jan-22	13:18			22.82		11.85	17-Jan-22	13:18			22.82		11.85							
17-Jan-22	12:59		32.31		11.84	-	17-Jan-22	13:19			21.12		11.84	17-Jan-22	13:19			21.12		11.84							
17-Jan-22	13:00		32.33		11.85	-	17-Jan-22	13:20			21.60		11.85	17-Jan-22	13:20			21.60		11.85							
17-Jan-22	13:08		30.08		11.86	-	17-Jan-22	13:21			21.18		11.86	17-Jan-22	13:21			21.18		11.86							
17-Jan-22	13:01		30.36		11.88	-	17-Jan-22	13:22			22.31		11.88	17-Jan-22	13:22			22.31		11.88							
17-Jan-22	13:02		31.81		11.92	-	17-Jan-22	13:23			21.48		11.88	17-Jan-22	13:23			21.48		11.88							
17-Jan-22	13:03		32.32		11.82	-	17-Jan-22	13:24			22.57		11.85	17-Jan-22	13:24			22.57		11.85							
17-Jan-22	13:04		30.40			-	17-Jan-22	13:25			21.71		11.84	17-Jan-22	13:25			21.71		11.84							
17-Jan-22	13:05		32.34		11.83	-	17-Jan-22	13:26			22.36		11.83	17-Jan-22	13:26			22.36		11.83							
17-Jan-22	13:06		30.08		11.84	-	17-Jan-22	13:27			22.67		11.83	17-Jan-22	13:27			22.67		11.83							
17-Jan-22	13:07		30.36		11.85	-	17-Jan-22	13:28			21.83		11.83	17-Jan-22	13:28			21.83		11.83							
17-Jan-22	13:08		30.08		11.82	-	17-Jan-22	13:29			22.79		11.83	17-Jan-22	13:29			22.79		11.83							
17-Jan-22	13:09		30.33		11.83	-	17-Jan-22	13:30			22.87		11.84	17-Jan-22	13:30			22.87		11.84							
17-Jan-22	13:10		31.36		11.91	-	17-Jan-22	13:31			21.82		11.82	17-Jan-22	13:31			21.82		11.82							
17-Jan-22	13:11		30.28		11.83	-	17-Jan-22	13:32			21.84		11.80	17-Jan-22	13:32			21.84		11.80							
17-Jan-22	13:12		32.22			-	17-Jan-22	13:33			22.33		11.82	17-Jan-22	13:33			22.33		11.82							
17-Jan-22	13:13		32.23		11.84	-	17-Jan-22	13:34			21.81		11.81	17-Jan-22	13:34			21.81		11.81							
17-Jan-22	13:14		32.28		11.84	-	17-Jan-22	13:35			21.82		11.83	17-Jan-22	13:35			21.82		11.83							
Max			32.36		11.85		Max				22.22		11.86							11.86							



### Reference Method Data

Client Name Nexif Ratch Energy Rayong Co., Ltd.  
Plant Name \_\_\_\_\_

Date	17 Jun 22
Location	HRSQ # 2

Run No. 7						Time Base: 21 min						Run No. 8						Time Base: 21 min					
Date	Time	B02	N04	CO	CO2	Date	Time	B02	N04	CO	CO2	Date	Time	B02	N04	CO	CO2	Date	Time	B02	N04	CO	CO2
		ppm	ppm	ppm	%Vol			ppm	ppm	ppm	%Vol			ppm	ppm	ppm	%Vol			ppm	ppm	ppm	%Vol
17 Jan 22	13:36		39.08	11.86		17 Jan 22	13:57		39.92	11.83		17 Jan 22	13:36		39.92	11.83		17 Jan 22	13:36		39.92	11.83	
17 Jan 22	13:37		39.17	11.84		17 Jan 22	13:58	-		39.88	11.82		17 Jan 22	13:37		39.88	11.82		17 Jan 22	13:37		39.88	11.82
17 Jan 22	13:38		39.36	11.84		17 Jan 22	13:59		39.86	11.84		17 Jan 22	13:38		39.86	11.84		17 Jan 22	13:38		39.86	11.84	
17 Jan 22	13:39		39.40	11.84		17 Jan 22	14:00		39.87	11.82		17 Jan 22	13:39		39.87	11.82		17 Jan 22	13:39		39.87	11.82	
17 Jan 22	13:40		39.51	11.84		17 Jan 22	14:01		39.86	11.85		17 Jan 22	13:40		39.86	11.85		17 Jan 22	13:40		39.86	11.85	
17 Jan 22	13:41		39.64	11.85		17 Jan 22	14:02		39.85	11.85		17 Jan 22	13:41		39.85	11.85		17 Jan 22	13:41		39.85	11.85	
17 Jan 22	13:42		39.56	11.83		17 Jan 22	14:03		39.77	11.83		17 Jan 22	13:42		39.77	11.83		17 Jan 22	13:42		39.77	11.83	
17 Jan 22	13:43		39.61	11.81		17 Jan 22	14:04		39.82	11.82		17 Jan 22	13:43		39.82	11.82		17 Jan 22	13:43		39.82	11.82	
17 Jan 22	13:44		39.75	11.81		17 Jan 22	14:05		39.87	11.83		17 Jan 22	13:44		39.87	11.83		17 Jan 22	13:44		39.87	11.83	
17 Jan 22	13:45		39.53	11.83		17 Jan 22	14:06		39.81	11.83		17 Jan 22	13:45		39.81	11.83		17 Jan 22	13:45		39.81	11.83	
17 Jan 22	13:46		39.47	11.84		17 Jan 22	14:07		39.87	11.87		17 Jan 22	13:46		39.87	11.87		17 Jan 22	13:46		39.87	11.87	
17 Jan 22	13:47		39.38	11.84		17 Jan 22	14:08		39.78	11.83		17 Jan 22	13:47		39.78	11.83		17 Jan 22	13:47		39.78	11.83	
17 Jan 22	13:48		39.24	11.87		17 Jan 22	14:09		39.46	11.82		17 Jan 22	13:48		39.46	11.82		17 Jan 22	13:48		39.46	11.82	
17 Jan 22	13:49		39.39	11.83		17 Jan 22	14:10		39.47	11.87		17 Jan 22	13:49		39.47	11.87		17 Jan 22	13:49		39.47	11.87	
17 Jan 22	13:50		39.40	11.83		17 Jan 22	14:11		39.38	11.82		17 Jan 22	13:50		39.38	11.82		17 Jan 22	13:50		39.38	11.82	
17 Jan 22	13:51		34.91	11.83		17 Jan 22	14:12		39.72	11.84		17 Jan 22	13:51		39.72	11.84		17 Jan 22	13:51		39.72	11.84	
17 Jan 22	13:52		34.94	11.82		17 Jan 22	14:13		39.80	11.86		17 Jan 22	13:52		39.80	11.86		17 Jan 22	13:52		39.80	11.86	
17 Jan 22	13:53		39.94	11.85		17 Jan 22	14:14		39.72	11.84		17 Jan 22	13:53		39.72	11.84		17 Jan 22	13:53		39.72	11.84	
17 Jan 22	13:54		39.96	11.86		17 Jan 22	14:15		39.73	11.85		17 Jan 22	13:54		39.73	11.85		17 Jan 22	13:54		39.73	11.85	
17 Jan 22	13:55		39.94	11.84		17 Jan 22	14:16		39.71	11.82		17 Jan 22	13:55		39.71	11.82		17 Jan 22	13:55		39.71	11.82	
17 Jan 22	13:56		39.81	11.87		17 Jan 22	14:17		39.72	11.81		17 Jan 22	13:56		39.72	11.81		17 Jan 22	13:56		39.72	11.81	
Max			34.91	11.87		Max			34.97	11.82		Max			34.97	11.82		Max			34.97	11.82	
			39.96	11.86					39.80	11.86					39.80	11.86					39.80	11.86	

Run No. 8							Time Base 21 min							Run No. 10							Time Base 21 min									
Date	Time	S02	NH <sub>3</sub>	CO	Q2	CO2	Date	Time	S02	NH <sub>3</sub>	CO	Q2	CO2	Date	Time	S02	NH <sub>3</sub>	CO	Q2	CO2	Date	Time	S02	NH <sub>3</sub>	CO	Q2	CO2			
		ppm	ppm	V-%	V-%	V-%			ppm	ppm	V-%	V-%	V-%			ppm	ppm	V-%	V-%	V-%			ppm	ppm	V-%	V-%	V-%			
17 Jan 22	14:18		23.30	-	-	11.61	-	17 Jan 22	14:38		32.75	-	-	11.60	-	17 Jan 22	14:38		32.75	-	-	11.60	-	17 Jan 22	14:38		32.75	-	-	11.60
17 Jan 22	14:19		23.82	-	-	11.62	-	17 Jan 22	14:40		32.75	-	-	11.58	-	17 Jan 22	14:40		32.75	-	-	11.58	-	17 Jan 22	14:40		32.75	-	-	11.58
17 Jan 22	14:20		23.46	-	-	11.61	-	17 Jan 22	14:41		33.23	-	-	11.57	-	17 Jan 22	14:41		33.23	-	-	11.57	-	17 Jan 22	14:41		33.23	-	-	11.57
17 Jan 22	14:21		23.46	-	-	11.58	-	17 Jan 22	14:42		33.27	-	-	11.57	-	17 Jan 22	14:42		33.27	-	-	11.57	-	17 Jan 22	14:42		33.27	-	-	11.57
17 Jan 22	14:22		23.84	-	-	11.57	-	17 Jan 22	14:43		33.27	-	-	11.57	-	17 Jan 22	14:43		33.27	-	-	11.57	-	17 Jan 22	14:43		33.27	-	-	11.57
17 Jan 22	14:23		23.42	-	-	11.61	-	17 Jan 22	14:44		32.90	-	-	11.60	-	17 Jan 22	14:44		32.90	-	-	11.60	-	17 Jan 22	14:44		32.90	-	-	11.60
17 Jan 22	14:24		23.27	-	-	11.60	-	17 Jan 22	14:45		32.75	-	-	11.60	-	17 Jan 22	14:45		32.75	-	-	11.60	-	17 Jan 22	14:45		32.75	-	-	11.60
17 Jan 22	14:25		23.38	-	-	11.61	-	17 Jan 22	14:46		32.86	-	-	11.60	-	17 Jan 22	14:46		32.86	-	-	11.60	-	17 Jan 22	14:46		32.86	-	-	11.60
17 Jan 22	14:26		23.38	-	-	11.61	-	17 Jan 22	14:47		32.86	-	-	11.58	-	17 Jan 22	14:47		32.86	-	-	11.58	-	17 Jan 22	14:47		32.86	-	-	11.58
17 Jan 22	14:27		23.38	-	-	11.60	-	17 Jan 22	14:48		32.94	-	-	11.58	-	17 Jan 22	14:48		32.94	-	-	11.58	-	17 Jan 22	14:48		32.94	-	-	11.58
17 Jan 22	14:28		23.33	-	-	11.62	-	17 Jan 22	14:49		32.86	-	-	11.58	-	17 Jan 22	14:49		32.86	-	-	11.58	-	17 Jan 22	14:49		32.86	-	-	11.58
17 Jan 22	14:29		23.30	-	-	11.61	-	17 Jan 22	14:50		32.90	-	-	11.57	-	17 Jan 22	14:50		32.90	-	-	11.57	-	17 Jan 22	14:50		32.90	-	-	11.57
17 Jan 22	14:30		23.30	-	-	11.58	-	17 Jan 22	14:51		32.86	-	-	11.58	-	17 Jan 22	14:51		32.86	-	-	11.58	-	17 Jan 22	14:51		32.86	-	-	11.58
17 Jan 22	14:31		23.17	-	-	11.62	-	17 Jan 22	14:52		32.86	-	-	11.58	-	17 Jan 22	14:52		32.86	-	-	11.58	-	17 Jan 22	14:52		32.86	-	-	11.58
17 Jan 22	14:32		23.33	-	-	11.58	-	17 Jan 22	14:53		32.90	-	-	11.57	-	17 Jan 22	14:53		32.90	-	-	11.57	-	17 Jan 22	14:53		32.90	-	-	11.57
17 Jan 22	14:33		23.33	-	-	11.58	-	17 Jan 22	14:54		32.86	-	-	11.58	-	17 Jan 22	14:54		32.86	-	-	11.58	-	17 Jan 22	14:54		32.86	-	-	11.58
17 Jan 22	14:34		23.30	-	-	11.60	-	17 Jan 22	14:55		32.90	-	-	11.57	-	17 Jan 22	14:55		32.90	-	-	11.57	-	17 Jan 22	14:55		32.90	-	-	11.57
17 Jan 22	14:35		23.30	-	-	11.60	-	17 Jan 22	14:56		32.90	-	-	11.58	-	17 Jan 22	14:56		32.90	-	-	11.58	-	17 Jan 22	14:56		32.90	-	-	11.58
17 Jan 22	14:36		23.30	-	-	11.61	-	17 Jan 22	14:57		32.90	-	-	11.58	-	17 Jan 22	14:57		32.90	-	-	11.58	-	17 Jan 22	14:57		32.90	-	-	11.58
17 Jan 22	14:37		23.82	-	-	11.60	-	17 Jan 22	14:58		32.86	-	-	11.60	-	17 Jan 22	14:58		32.86	-	-	11.60	-	17 Jan 22	14:58		32.86	-	-	11.60
17 Jan 22	14:38		23.86	-	-	11.62	-	17 Jan 22	14:59		32.78	-	-	11.62	-	17 Jan 22	14:59		32.78	-	-	11.62	-	17 Jan 22	14:59		32.78	-	-	11.62
Max			32.86	-	-	11.61	-	Max			33.27	-	-	11.62	-	Max			33.27	-	-	11.62	-	Max			33.27	-	-	11.62
Avg			23.31	-	-	11.60	-	Avg			32.86	-	-	11.58	-	Avg			32.86	-	-	11.58	-	Avg			32.86	-	-	11.58

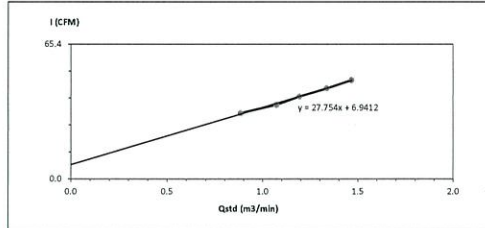
Run No. 11							Run No. 12						
Time Base: 21 min							Time Base: 21 min						
Date	Time	B02	B05	GO	GO2	GO3	Date	Time	B02	B05	GO	GO2	GO3
		sec	sec	sec	sec	sec			sec	sec	sec	sec	sec
17 Jun 22	15:00		22.76		11.88		17 Jun 22	15:01		20.08		11.88	
17 Jun 22	15:01		22.66		11.61		17 Jun 22	15:02		20.39		11.88	
17 Jun 22	15:02		22.62		11.61		17 Jun 22	15:03		20.76		11.88	
17 Jun 22	15:03		23.17		11.88		17 Jun 22	15:04		22.76		11.88	
17 Jun 22	15:04		22.26		11.88		17 Jun 22	15:05		22.76		11.87	
17 Jun 22	15:05		21.88		11.88		17 Jun 22	15:06		21.88		11.87	
17 Jun 22	15:06		22.66		11.60		17 Jun 22	15:07		22.76		11.88	
17 Jun 22	15:07		22.66		11.88		17 Jun 22	15:08		22.76		11.88	
17 Jun 22	15:08		21.88		11.88		17 Jun 22	15:09		22.08		11.87	
17 Jun 22	15:09		21.57		11.88		17 Jun 22	15:10		20.17		11.87	
17 Jun 22	15:10		20.26		11.87		17 Jun 22	15:11		20.17		11.88	
17 Jun 22	15:11		20.18		11.88		17 Jun 22	15:12		20.18		11.88	
17 Jun 22	15:12		22.88		11.88		17 Jun 22	15:13		20.64		11.88	
17 Jun 22	15:13		22.88		11.88		17 Jun 22	15:14		20.64		11.88	
17 Jun 22	15:14		20.88		11.88		17 Jun 22	15:15		20.38		11.87	
17 Jun 22	15:15		20.88		11.88		17 Jun 22	15:16		20.37		11.88	
17 Jun 22	15:16		21.87		11.87		17 Jun 22	15:17		20.38		11.88	
17 Jun 22	15:17		21.87		11.87		17 Jun 22	15:18		20.61		11.87	
17 Jun 22	15:18		21.87		11.87		17 Jun 22	15:19		20.32		11.88	
17 Jun 22	15:19		21.88		11.87		17 Jun 22	15:20		20.12		11.88	
17 Jun 22	15:20		21.88		11.87		17 Jun 22	15:21		20.08		11.88	
Max			23.28		11.61		Max			20.61		11.60	



### High Volume Air Sampler Calibration Worksheet

Project Site : Nexif Ratch Energy Rayong Co., Ltd. Barometric Pressure (mm Hg) : 757  
 Calibrate Location : A1 : หมู่ 10 บ้านนาบ่อ Temperature (°C) : 32  
 Calibrate Date : 15-Jun-02 High Volume ID : RYG-FS0192  
 Calibration Sheet No. : C-150602-RYG-FS0192 High Volume Model : TE-5009X  
 Calibrator ID : RYG-FS0206 High Volume S/N : 5331  
 Calibrator Model : TE-5028A Calibrator Slope : 1.4867  
 Calibrator S/N : 1543 Calibrator Intercept : -0.0445

Test No.	Delta H <sub>2</sub> O (Inch)	Q <sub>std</sub> (m <sup>3</sup> /min)	I : Chart (CFM)	Linear Regression
1	1.6	0.8838	32	Slope: 27.7537 Intercept: 6.9412 Correlation Coefficient: 0.9972
2	2.4	1.0725	36	
3	3.0	1.1938	40	
4	3.8	1.3380	44	
5	4.6	1.4677	48	



Calibrated by Surasak S.  
 (Mr. Surasak Sachin)  
 Field Scientist(2)

Approved by [Signature]  
 (Mr. Noppong Juntarupan)  
 Enviro Field Coordinator Scientist (3)

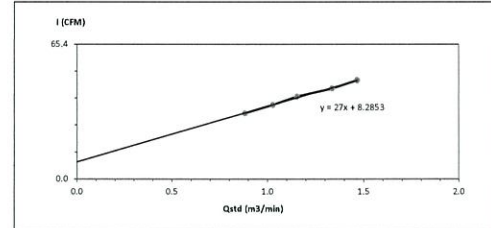
FORM NO. F 06-074 REVISION NO. : ISSUE DATE: 14/03/16



### High Volume Air Sampler Calibration Worksheet

Project Site : Nexif Ratch Energy Rayong Co., Ltd. Barometric Pressure (mm Hg) : 757  
 Calibrate Location : A2 : สะตือ Temperature (°C) : 32  
 Calibrate Date : 15-Jun-02 High Volume ID : RYG-FS0294  
 Calibration Sheet No. : C-150602-RYG-FS0294 High Volume Model : TE-5009X  
 Calibrator ID : RYG-FS0206 High Volume S/N : 5501  
 Calibrator Model : TE-5028A Calibrator Slope : 1.4867  
 Calibrator S/N : 1543 Calibrator Intercept : -0.0445

Test No.	Delta H <sub>2</sub> O (Inch)	Q <sub>std</sub> (m <sup>3</sup> /min)	I : Chart (CFM)	Linear Regression
1	1.6	0.8838	32	Slope: 27.0004 Intercept: 8.2853 Correlation Coefficient: 0.9905
2	2.2	1.0207	36	
3	2.8	1.1548	40	
4	3.8	1.3380	44	
5	4.6	1.4677	48	



Calibrated by Surasak S.  
 (Mr. Surasak Sachin)  
 Field Scientist(2)

Approved by [Signature]  
 (Mr. Noppong Juntarupan)  
 Enviro Field Coordinator Scientist (3)

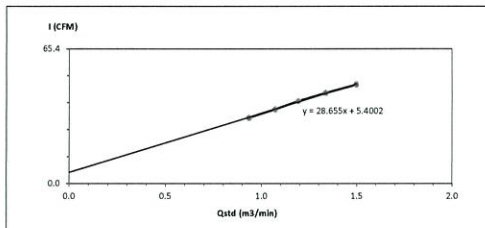
FORM NO. F 06-074 REVISION NO. : ISSUE DATE: 14/03/16



### High Volume Air Sampler Calibration Worksheet

Project Site : Nexif Ratch Energy Rayong Co., Ltd. Barometric Pressure (mm Hg) : 757  
 Calibrate Location : A3 : บ้านนาบ่อ Temperature (°C) : 32  
 Calibrate Date : 15-Jun-02 High Volume ID : RYG-FS0183  
 Calibration Sheet No. : C-150602-RYG-FS0183 High Volume Model : TE-5009X  
 Calibrator ID : RYG-FS0206 High Volume S/N : 4791  
 Calibrator Model : TE-5028A Calibrator Slope : 1.4867  
 Calibrator S/N : 1543 Calibrator Intercept : -0.0445

Test No.	Delta H <sub>2</sub> O (Inch)	Q <sub>std</sub> (m <sup>3</sup> /min)	I : Chart (CFM)	Linear Regression
1	1.8	0.9347	32	Slope: 28.6552 Intercept: 5.4002 Correlation Coefficient: 0.9988
2	2.4	1.0725	36	
3	3.0	1.1938	40	
4	3.8	1.3380	44	
5	4.8	1.4983	48	



Calibrated by Surasak S.  
 (Mr. Surasak Sachin)  
 Field Scientist(2)

Approved by [Signature]  
 (Mr. Noppong Juntarupan)  
 Enviro Field Coordinator Scientist (3)

FORM NO. F 06-074 REVISION NO. : ISSUE DATE: 14/03/16



**PENTA**  
CALIBRATION

RYG\_EN0001  
**PENTA CALIBRATION CO., LTD.**  
 66/124 The Connect 33 Village Kanchanaphisek Road  
 Dokmai Praweet Bangkok 10250  
 Tel: +66 (0) 2069-9773  
 www.pentalcal.com

## Certificate of Calibration

Represent to Certificate of Calibration : PTC/07/22102

Certificate No.: PTC/07/22102 Page: 1 of 2  
 Equipment: Digital Balance Condition: Normal  
 Manufacturer: Sartorius Serial No: 25409664  
 Model: LA130S-F ID No: RYG\_EN0001  
 Type of Balance: Single interval

Customer: ALS Laboratory Group (Thailand) Co., Ltd.  
 616/10 Moo 5 T.Maenamkoo, A.Pluakdaeng,  
 Rayong 21140, Thailand

Environment Condition: Temperature 23.9 °C ± 0.3 °C  
 Humidity 58.1 %RH ± 4.4 %RH  
 Air density 1.17 kg/m<sup>3</sup>

Calibration Place: ALS Laboratory Group (Thailand) Co., Ltd.  
 616/10 Moo 5 T.Maenamkoo, A.Pluakdaeng,  
 Rayong 21140, Thailand

The Method used: In house method, PTC-WI-07, base on Euramet cg. 18

Traceability: This certificate is traceable to the SI Units through Thai Calibration Service Co., Ltd.  
 , NSC-ONSC Accreditation No.: Calibration 0189

Date Received: March 23, 2022

Calibration Date: March 23, 2022

Issued Date: March 25, 2022

Calibration By: Mr. Rungroje Metakul

REVIEW BY [Signature]  
 APPROVED BY [Signature]  
 NEXT CAL. DATE 25/03/23

**PENTA**  
CALIBRATION CO., LTD.

[Signature]  
 (Mr. Kriangsak Kalasri)  
 Reviewed by

Approved By: [Signature]  
 (Mr. Keattisak Kerdto)  
 Laboratory Manager

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognised national standard laboratories.  
 The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM). The effect that the results relate only to the item calibrated.  
 This calibration certificate shall not be reproduced except in full only, without written approval from penta calibration co., Ltd.





PENTA CALIBRATION CO., LTD.  
66/124 The Connect 33 Village Kanchanaphisek Road  
Dokmai Praveit Bangkok 10250  
Tel: +66 (0) 2088-9773  
www.pentalcal.com

Represent to Certificate of Calibration, PTC/07/22102

Certificate No.: PTC/07/22102

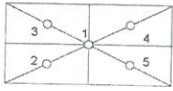
Page: 2 of 2

### Measurement Results:

Without Adjustment:

Function Calibration: Non Adjustment

Eccentric Error: Weight to be 1/3, 1/2 or of Maximum capacity



Eccentricity test 50 (g)				
Position (g)				
1	2	3	4	5
0.0000	0.0000	-0.0001	0.0000	0.0001
Maximum deviation: 0.0001				

Repeatability Test: Weight to be  $1/2 \leq L_1 \leq$  Maximum capacity

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

Nominal test value (g)	Standard Deviation
100	0.00009

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
0	0.00000	0.0000	0.0000	0.00026	2.87
0.01	0.01000	0.0100	0.0000	0.00026	2.65
0.05	0.05000	0.0500	0.0000	0.00026	2.65
0.1	0.10000	0.1000	0.0000	0.00026	2.65
0.5	0.50000	0.4999	0.0001	0.00026	2.65
1	1.00000	0.9999	0.0001	0.00026	2.65
2	2.00000	1.9999	0.0001	0.00026	2.65
5	5.00001	5.0000	0.0000	0.00026	2.65
10	10.00000	10.0001	-0.0001	0.00026	2.65
20	20.00003	20.0001	-0.0001	0.00026	2.52
100	100.00004	100.0001	-0.0001	0.00027	2.18

Note: Weight of adjust (g)

The End of Certificate

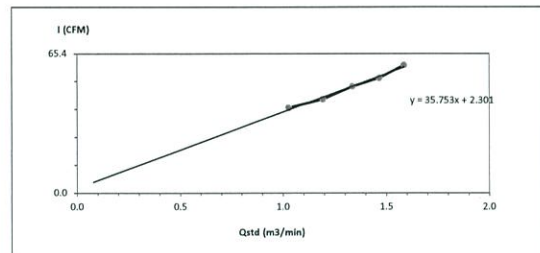
PTC FMC-07-07: 2 Feb 2019



### High Volume Air Sampler Calibration Worksheet

Project Site: Nexif Ratch Energy Rayong Co., Ltd. Barometric Pressure (mm Hg): 757  
Calibrate Location: A1: หมู่ 10 บ้านนาบอน Temperature (°C): 32  
Calibrate Date: 15-Jun-22 High Volume ID: RYG-FS0178  
CalibrationSheet No.: C-150622-RYG-FS0178 High Volume Model: TE-5170D  
Calibrator ID: RYG-FS0206 High Volume S/N: 4804  
Calibrator Model: TE-5028A Calibrator Slope: 1.4867  
Calibrator S/N: 1543 Calibrator Intercept: -0.0445

Test No.	Delta H <sub>2</sub> O (inch)	Q <sub>std</sub> (m <sup>3</sup> /min)	I: Chart (CFM)	Linear Regression	
1	2.2	1.0287	40	Slope: 35.7535 Intercept: 2.3010 Correlation Coefficient: 0.9932	
2	3.0	1.1938	44		
3	3.8	1.3380	50		
4	4.6	1.4677	54		
5	5.4	1.5864	60		



Calibrated by: Surasak S.  
(Mr. Surasak Sachin)  
Field Scientist(2)

Approved by: N. Noppong Juntarup  
(Mr. Noppong Juntarup)  
Enviro Field Coordinator Scientist (3)

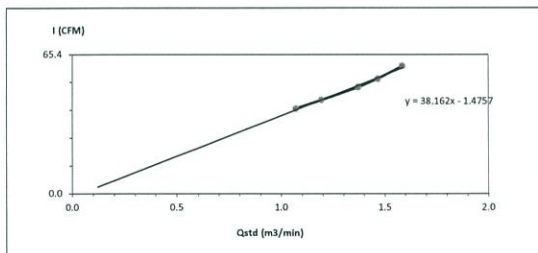
FORM NO.: F 06-073 REVISION NO.: ISSUE DATE: 14/03/16



### High Volume Air Sampler Calibration Worksheet

Project Site: Nexif Ratch Energy Rayong Co., Ltd. Barometric Pressure (mm Hg): 757  
Calibrate Location: A2: บ้านนาบอน Temperature (°C): 32  
Calibrate Date: 15-Jun-22 High Volume ID: RYG-FS0176  
CalibrationSheet No.: C-150622-RYG-FS0176 High Volume Model: TE-5170D  
Calibrator ID: RYG-FS0206 High Volume S/N: 4802  
Calibrator Model: TE-5028A Calibrator Slope: 1.4867  
Calibrator S/N: 1543 Calibrator Intercept: -0.0445

Test No.	Delta H <sub>2</sub> O (inch)	Q <sub>std</sub> (m <sup>3</sup> /min)	I: Chart (CFM)	Linear Regression	
1	2.4	1.0725	40	Slope: 38.1619 Intercept: -1.4757 Correlation Coefficient: 0.9956	
2	3.0	1.1938	44		
3	4.0	1.3716	50		
4	4.6	1.4677	54		
5	5.4	1.5864	60		



Calibrated by: Surasak S.  
(Mr. Surasak Sachin)  
Field Scientist(2)

Approved by: N. Noppong Juntarup  
(Mr. Noppong Juntarup)  
Enviro Field Coordinator Scientist (3)

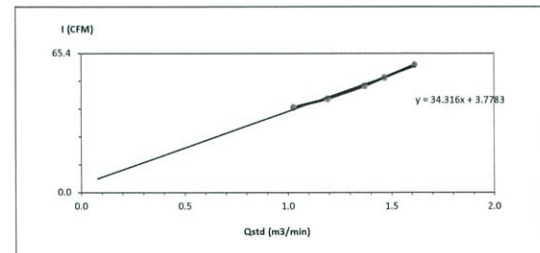
FORM NO.: F 06-073 REVISION NO.: ISSUE DATE: 14/03/16



### High Volume Air Sampler Calibration Worksheet

Project Site: Nexif Ratch Energy Rayong Co., Ltd. Barometric Pressure (mm Hg): 757  
Calibrate Location: A3: บ้านนาบอน Temperature (°C): 32  
Calibrate Date: 15-Jun-22 High Volume ID: RYG-FS0175  
CalibrationSheet No.: C-150622-RYG-FS0175 High Volume Model: TE-5170D  
Calibrator ID: RYG-FS0206 High Volume S/N: 4801  
Calibrator Model: TE-5028A Calibrator Slope: 1.4867  
Calibrator S/N: 1543 Calibrator Intercept: -0.0445

Test No.	Delta H <sub>2</sub> O (inch)	Q <sub>std</sub> (m <sup>3</sup> /min)	I: Chart (CFM)	Linear Regression	
1	2.2	1.0287	40	Slope: 34.3157 Intercept: 3.7783 Correlation Coefficient: 0.9944	
2	3.0	1.1938	44		
3	4.0	1.3716	50		
4	4.6	1.4677	54		
5	5.6	1.6147	60		



Calibrated by: Surasak S.  
(Mr. Surasak Sachin)  
Field Scientist(2)

Approved by: N. Noppong Juntarup  
(Mr. Noppong Juntarup)  
Enviro Field Coordinator Scientist (3)

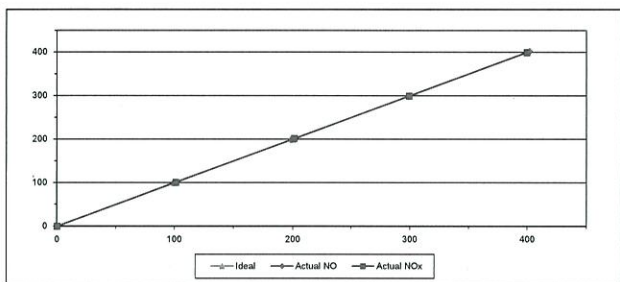
FORM NO.: F 06-073 REVISION NO.: ISSUE DATE: 14/03/16



## MULTIPOINT CALIBRATION REPORT

Calibration Date 4-Jan-22 Equipment Name NOx Analyzer  
 Manufacturer HORIBA Model APNA-370  
 Serial No. H73KYD1M Equipment ID BKK\_FS0797  
 Calibrator Manufacturer Teledyne API Model 700  
 Serial No. 947  
 Std. Gas Concentration (PPM) 51.33 Cylinder No. LL36633  
 Cylinder Pressure (psi) 1200 Certified By Airgas Inc.  
 Certified Date 18-Mar-14 Expired Date 18-Mar-22

CALIBRATION RESULTS							
Point	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			0.27



Calibrated By  
  
 (Mr. Jirawut Sakam)  
 Field Environmental Scientist (3)

Approved By  
  
 (Mr. Sarayuth Jitranont)  
 Assistant General Manager

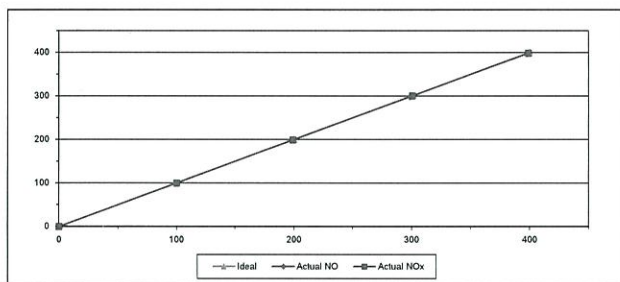
ALS Laboratory Group  
 FORM NO. F 06-056 REVISION NO. - ISSUE DATE: 02/04/12



## MULTIPOINT CALIBRATION REPORT

Calibration Date 4-Jan-22 Equipment Name NOx Analyzer  
 Manufacturer HORIBA Model APNA-370  
 Serial No. 7AV89544 Equipment ID RYG\_FS0272  
 Calibrator Manufacturer Teledyne API Model 700  
 Serial No. 947  
 Std. Gas Concentration (PPM) 51.33 Cylinder No. LL36633  
 Cylinder Pressure (psi) 1200 Certified By Airgas Inc.  
 Certified Date 18-Mar-14 Expired Date 18-Mar-22

CALIBRATION RESULTS							
Point	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.05	0.05	0.05	0.10	0.10	0.10
1	100.00	99.10	-0.90	-0.90	100.10	0.10	0.10
2	200.00	198.60	-1.40	-0.70	199.00	-1.00	-0.50
3	300.00	298.70	-1.30	-0.43	300.50	0.50	0.17
4	400.00	398.00	-2.00	-0.50	398.70	-1.30	-0.33
AVERAGE (%)				-0.50			-0.09



Calibrated By  
  
 (Mr. Jirawut Sakam)  
 Field Environmental Scientist (3)

Approved By  
  
 (Mr. Sarayuth Jitranont)  
 Assistant General Manager

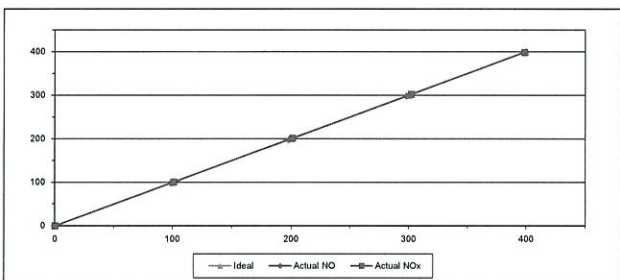
ALS Laboratory Group  
 FORM NO. F 06-056 REVISION NO. - ISSUE DATE: 02/04/12



## MULTIPOINT CALIBRATION REPORT

Calibration Date 4-Jan-22 Equipment Name NOx Analyzer  
 Manufacturer Teledyne API Model T200  
 Serial No. 2198 Equipment ID RYG\_FS0252  
 Calibrator Manufacturer Teledyne API Model 700  
 Serial No. 947  
 Std. Gas Concentration (PPM) 51.33 Cylinder No. LL36633  
 Cylinder Pressure (psi) 1200 Certified By Airgas Inc.  
 Certified Date 18-Mar-14 Expired Date 18-Mar-22

CALIBRATION RESULTS							
Point	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	98.80	-1.20	-1.20	101.00	1.00	1.00
2	200.00	198.00	-2.00	-1.00	201.30	1.30	0.65
3	300.00	298.10	-1.90	-0.63	302.30	2.30	0.77
4	400.00	398.20	-1.80	-0.45	398.80	-1.20	-0.30
AVERAGE (%)				-0.84			0.44



Calibrated By  
  
 (Mr. Jirawut Sakam)  
 Field Environmental Scientist (3)

Approved By  
  
 (Mr. Sarayuth Jitranont)  
 Assistant General Manager

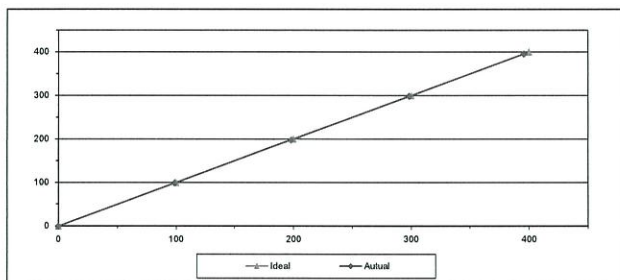
ALS Laboratory Group  
 FORM NO. F 06-056 REVISION NO. - ISSUE DATE: 02/04/12



## MULTIPOINT CALIBRATION REPORT

Calibration Date 4-Jan-22 Equipment Name SO2 Analyzer  
 Manufacturer HORIBA Model APSA-370  
 Serial No. G2CH436B Equipment ID BKK\_FS0798  
 Calibrator Manufacturer Teledyne API Model 700  
 Serial No. 947  
 Std. Gas Concentration (PPM) 50.87 Cylinder No. LL36633  
 Cylinder Pressure (psi) 1200 Certified By Airgas Inc.  
 Certified Date 18-Mar-14 Expired Date 18-Mar-22

Point	CALIBRATION RESULTS			
	Ideal	Actual	Error	%Error
ZERO	0.00	0.05	0.05	0.05
1	100.00	98.91	-1.09	-1.09
2	200.00	198.10	-1.90	-0.95
3	300.00	298.10	-1.90	-0.63
4	400.00	395.60	-4.40	-1.10
AVERAGE (%)				-0.74



Calibrated By  
  
 (Mr. Jirawut Sakam)  
 Field Environmental Scientist (3)

Approved By  
  
 (Mr. Sarayuth Jitranont)  
 Assistant General Manager

ALS Laboratory Group  
 FORM NO. F 06-056 REVISION NO. - ISSUE DATE: 02/04/12

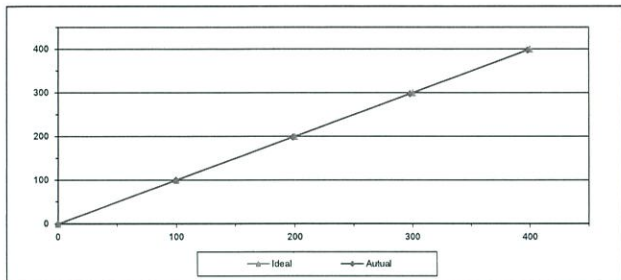




## MULTIPOINT CALIBRATION REPORT

Calibration Date: 4-Jan-22 Equipment Name: SO2 Analyzer  
 Manufacturer: HORIBA Model: APSA-370  
 Serial No.: 1082NYKM Equipment ID: RYG\_F80271  
 Calibrator Manufacturer: Teledyne API Model: 700  
 Serial No.: 947  
 Std. Gas Concentration (PPM): 50.87 Cylinder No.: LL38633  
 Cylinder Pressure (psi): 1200 Certified By: Algas Inc.  
 Certified Date: 18-Mar-14 Expired Date: 18-Mar-22

Point	CALIBRATION RESULTS			
	Ideal	Actual	Error	%Error
ZERO	0.00	0.10	0.10	0.10
1	100.00	99.50	-0.50	-0.50
2	200.00	198.20	-1.80	-0.90
3	300.00	297.60	-2.40	-0.80
4	400.00	398.00	-2.00	-0.50
AVERAGE (%)				-0.52



Calibrated By

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

Approved By

(Mr.Sarayuth Jittranont)  
Assistant General Manager

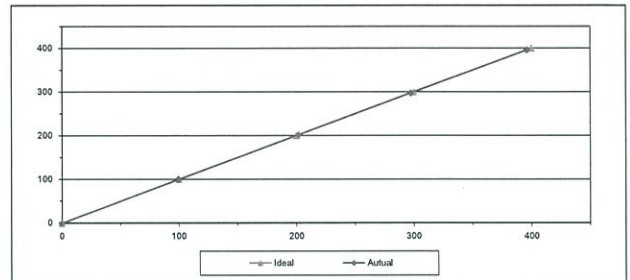
ALS Laboratory Group  
FORM NO. F-06-056 REVISION NO. - ISSUE DATE: 02/04/12



## MULTIPOINT CALIBRATION REPORT

Calibration Date: 4-Jan-22 Equipment Name: SO2 Analyzer  
 Manufacturer: Teledyne API Model: T100  
 Serial No.: 1773 Equipment ID: RYG\_F80251  
 Calibrator Manufacturer: Teledyne API Model: 700  
 Serial No.: 947  
 Std. Gas Concentration (PPM): 50.87 Cylinder No.: LL38633  
 Cylinder Pressure (psi): 1200 Certified By: Algas Inc.  
 Certified Date: 18-Mar-14 Expired Date: 18-Mar-22

Point	CALIBRATION RESULTS			
	Ideal	Actual	Error	%Error
ZERO	0.00	0.10	0.10	0.10
1	100.00	99.60	-0.40	-0.40
2	200.00	201.80	1.80	0.90
3	300.00	297.20	-2.80	-0.93
4	400.00	396.00	-4.00	-1.00
AVERAGE (%)				-0.27



Calibrated By

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

Approved By

(Mr.Sarayuth Jittranont)  
Assistant General Manager

ALS Laboratory Group  
FORM NO. F-06-056 REVISION NO. - ISSUE DATE: 02/04/12



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

## CERTIFICATE OF CALIBRATION

Certificate No: WS-01062021  
Page 1 of 2 pages

Measurement Item: Cup anemometer with data logger

Manufacturer: Data logger: Novayix  
 Cup anemometer: Novayix

Model/Type: Data logger: WS-250L  
 Cup anemometer: WS-02P

Serial Number: Data logger: A4481  
 Cup anemometer: -

ID No: Data logger: BRK\_F80141  
 Cup anemometer: -

Customer: ALS laboratory group (Thailand) co., Ltd.  
 104 Phatthanasarn Rd, Phatthanasarn Rd, Klongkum Suburb, Bangkok 10250  
 Thailand

Test Conditions: Wind tunnel: cross test section area: 900 cm<sup>2</sup>  
 Anemometer frontal area: 100 cm<sup>2</sup>  
 Diameter of mounting pipe: mm  
 Blockage ratio of test object: 0.111 [-]

Test Conditions: Air temperature: 23.7 ±0.6 °C  
 Air pressure: 1010.3 ±0.4 hPa  
 Relative air humidity: 53.7 ±3.5 %RH

Calibration Procedure: Calibration was carried out base on:  
 ISO 91400-12-1 (2011) 2006-Power Performance Measurements of Electricity Producing Wind  
 Turbines  
 MCA/SNCT Anemometer Calibration Procedure - Version 2: 2009

Traceability: This calibration documents the traceable to national standard which realize the unit of  
 measurements according to the international system of units (SI) through National Institute of  
 Metrology (NIMT)

Measurement Date: Jun 07, 2021  
 Issued Date: Jun 07, 2021

Calibrated by:  
☒ Mr. Soravil Thachad  
☐ Miss Orathai Wivattakay



Approved Signature: M. Farinya Bongsacharn  
 Technical Support  
 and Calibration Manager

THIS CERTIFICATE MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN  
 OBTAINED IN WRITING FROM THE LABORATORY.



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

Continuation of Certificate of Calibration Number

Certificate No: WS-01062021  
Page 2 of 2 pages

Result of calibration: ☒ Without adjustment ☐ With adjustment  
 Calibration in the range of 1 - 16 m/s at a calibration interval of 1 m/s.  
 The results of calibration and associated measurement uncertainties are reported in the table below:

V <sub>ref</sub> Reading m/s	V <sub>act</sub> Reading m/s	Error (m/s)	Uncertainty (%)
2.065	2.0	-0.1	2.6
4.124	4.0	-0.1	1.2
5.99	6.0	0.0	1.01
8.00	8.0	0.0	0.74
9.99	10.1	0.1	0.60
11.96	12.2	0.2	0.67
14.02	14.4	0.4	0.45
16.03	16.6	0.6	0.36
18.01	18.3	0.3	2.6
19.99	19.3	-0.6	0.41
20.99	21.2	0.2	0.53
9.01	9.3	0.3	1.2
7.05	7.0	-0.0	0.77
5.121	5.0	-0.1	0.88
3.048	3.0	0.0	1.8
1.088	1.0	-0.1	5.3

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%

## Appendix 1: Instrumentations

NO	Sensor	Manufacturer	Model/Type	Calibration Date	Certificate Report Number	Range
1	Plot static	TESTO INC.	0833145	July 16, 2020	MV-0035-20	5 - 30 m/s
2	Precision Differential Pressure Meter	Zorglab	DP42500	July 16, 2020	MV-0035-20	5 - 30 m/s
3	Air velocity transducer (hot wire)	TSP INC.	8455-12	July 20, 2020	MV-0035A-20	0 - 5 m/s
4	Temperature	Zorglab	DS9 TRP	March 30, 2021	D-027-04	0 - 70 °C
5	Relative humidity	Zorglab	DS9 TRP	March 30, 2021	RH-03032021	0 - 100 %RH
6	Atmospheric pressure	Zorglab	DS9 TRP	March 30, 2021	BP-01032021	500 - 1100 hPa
7	Wind tunnel	CSBOM	MP3300	-	-	0 - 50 Hz

\*\*\*End of certificate of calibration\*\*\*



# CERTIFICATE OF CALIBRATION

Certificate No: WD-01062021  
Page 1 of 2 pages

**Measurement Item** : Wind direction sensor with data logger.  
**Manufacturer** : Data logger: Novallux.  
: Wind direction sensor: Novallux.  
**Model/Type** : Data logger: WS-25DL.  
: Wind direction sensor: WS-02P.  
**Serial Number** : Data logger: A4481.  
: Wind direction sensor: -  
**ID No** : Data logger: BKH\_P50141.  
: Cup anemometer: -  
**Customer** : ALS laboratory group (Thailand) Co., Ltd.  
104 Phatthanakan 40, Phatthanakan Rd, Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.

**Environmental Condition:**  
The measurement was carried out in an ambient temperature of (23±3)°C, and relative humidity of (40-100%.

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

Note: The UUC 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: KW563/0044.

**Measurement Date** : Jun 07, 2021.  
**Issued Date** : Jun 07, 2021.

**Performed by**  
☒ Mr. Sorawit Thachalad  
☐ Miss Orathai Wiatwattaya



**Approved Signatory:**  
Mr. Parinya Booncharoen,  
Technical Support  
and Calibration Manager

THIS CERTIFICATE REPORT MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY.

Continuation of Certificate of Calibration Number

Certificate No: WD-01062021  
Pages 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 table below:

NO	Turning Direction	Nominal Angle (°)	Standard Reading (°)	UUC* Reading (°)	Error (°)	Uncertainty ±(°)
1	Clockwise	0/360	0	0	0	3.0
2		45	45	42	-3	3.0
3		90	90	90	0	3.0
4		135	135	136	1	3.0
5		180	180	182	2	3.0
6		225	225	227	2	3.0
7		270	270	273	3	3.0
8		315	315	314	-1	3.0
9	Counter Clockwise	0/360	0	0	0	3.0
10		45	45	42	-3	3.0
11		90	90	90	0	3.0
12		135	135	136	1	3.0
13		180	180	182	2	3.0
14		225	225	227	2	3.0
15		270	270	273	3	3.0
16		315	315	314	-1	3.0

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 of Calibration\*\*\*



# SITHIPHORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

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



Cert. No. : ACC22001  
Pages : 1 of 3

## Calibration Certificate

**Equipment** : SOUND CALIBRATOR  
**Manufacturer** : RION  
**Model** : NC-75  
**Serial No.** : 35002736  
**ID No.** : - 8766466

**Condition As Found** : GOOD

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

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

**Received Date** : 05 JANUARY 2022  
**Calibration Date** : 10 JANUARY 2022  
**Date of Issue** : 13 JANUARY 2022

**Calibrated by** : Nathakorn Pisutpaisan

**Approved by** : T. Petchurai  
( Thanakul 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.

# SITHIPHORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

## Continuation of Calibration Certificate

Cert. No. : ACC22001  
Job No. : YC65AC0040  
Pages : 2 of 3

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

### Calibration Method :

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

### Condition of this result of calibration :

#### 1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33511B	MY52302742	EF-0011-21	10-Feb-22
Digital Multimeter	33461A	MY53220104	EEL-BP_05/0264	10-Feb-22
Digital Multimeter	33461A	MY53220076	EEL-BP_03/0264	08-Feb-22
Digital Multimeter	33461A	MY60024273	I-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-42KAI	34560495	AA-3003-21	16-Feb-22
Audio Analyzer	AVR-3360A	V744B6069	EF-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).

T. Petchurai



Continuation of Calibration Certificate

Cert. No. : ACC22001  
Job No. : VC65AC0040  
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	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	0.10	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

QF-TS12-04-04-020664

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



Cert. No. : ACL22031  
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24  
Serial No. : 01222716 / 143832 / 22763  
ID No. : RYG\_FS0020

Condition As Found : GOOD

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

Location : -  
Ambient Temperature : ( 23.0 ± 3 ) °C  
Pressure : ( 101.3 ± 3 ) kPa  
Relative Humidity : ( 50.0 ± 20 ) %  
Received Date : 05 JANUARY 2022  
Calibration Date : 10-12 JANUARY 2022  
Date of Issue : 13 JANUARY 2022

REVIEW BY	<i>Thakorn Pisutpaisan</i>
APPROVED BY	<i>T. Petchurai</i>
NEXT CAL DATE	10/1/23

Calibrated by : Nathakorn Pisutpaisan

Approved by :

*T. Petchurai*  
( Thanakul Petchurai )

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Continuation of Calibration Certificate

Cert. No. : ACL22031  
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 items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0012-21	10-Feb-22
Waveform Generator	33511B	MY52302742	EF-0011-21	10-Feb-22
Digital Multimeter	33461A	MY53220104	EEL-BP_05/0264	10-Feb-22
Digital Multimeter	33461A	MY53220076	EEL-BP_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).

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Continuation of Calibration Certificate

Cert. No. : ACL22031  
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				
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. : ACL22031  
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 )
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

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	0.7	0.7	0.7	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	-2.1	-2.0	-2.0	±5.0

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## Continuation of Calibration Certificate

Cert. No. : ACL22031  
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
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	0.1	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
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. : ACL22031  
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 )
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	38.9	-0.1	± 1.1
34.0	34.0	0.0	± 1.1
30.0	29.9	-0.1	± 1.1
29.0	28.9	-0.1	± 1.1
28.0	27.9	-0.1	± 1.1
27.0	26.9	-0.1	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.8	-0.2	± 1.1

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## Continuation of Calibration Certificate

Cert. No. : ACL22031  
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. Tone burst response

Time Weighting	Tone burst duration, Tb ( ms )	Cycle	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.1	0.1	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.1	0.1	±1.0

## 10. Peak C sound level

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value, Lcpeak ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Continuous	133.0	133.0	0.0	-
One	136.4	136.3	-0.1	±3.0

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

QF-TS12-04-04-020664



Continuation of Calibration Certificate

Cert. No. : ACL22031  
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		
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

QF-TS12-04-04-020664

451-451/1 Sirinthon Rd, Bangumru, Bangkok 10700 THAILAND.  
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Cert. No. : ACL22030  
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42/ Microphone UC-52 / Preamplifier NH-24  
Serial No.: 01122607 / 145554 / 34373  
ID No.: RYG\_FS0019

Condition As Found : GOOD

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

Location : -  
Ambient Temperature : ( 23.0 ± 3 ) °C  
Pressure : ( 101.3 ± 3 ) kPa  
Relative Humidity : ( 50.0 ± 20 ) %  
Received Date : 05 JANUARY 2022  
Calibration Date : 10-12 JANUARY 2022  
Date of Issue : 13 JANUARY 2022

REVIEW BY	<i>Nathakorn P.</i>
APPROVED BY	<i>T. Petchur</i>
NEXT CAL. DATE	10/1/23

Calibrated by : Nathakorn Pisutpaisan

Approved by :

*T. Petchur*  
( Thanakul Petchurai )

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Continuation of Calibration Certificate

Cert. No. : ACL22030  
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 items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0012-21	10-Feb-22
Waveform Generator	33511B	MY52302742	EF-0011-21	10-Feb-22
Digital Multimeter	33461A	MY53220104	EEL.BP. 05/0264	10-Feb-22
Digital Multimeter	33461A	MY53220076	EEL.BP. 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).

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22030  
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				
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. : ACL22030  
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 )
16.5

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

Frequency Weighting	Measured value ( dB )
A - weight	13.1
C - weight	19.4
Flat	24.8

## 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	0.5	0.6	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	-1.7	-1.7	-1.6	±5.0

QF-TS12-04-04-020664

T. Ratan

## Continuation of Calibration Certificate

Cert. No. : ACL22030  
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
63	-0.1	-0.1	-0.1	±2.0
125	-0.1	0.0	0.0	±1.5
250	0.0	0.0	0.0	±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

QF-TS12-04-04-020664

T. Ratan

## Continuation of Calibration Certificate

Cert. No. : ACL22030  
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 )
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	84.1	0.1	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.1	0.1	± 1.1
69.0	69.1	0.1	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.1	0.1	± 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	26.9	-0.1	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.9	-0.1	± 1.1

QF-TS12-04-04-020664

T. Ratan

## Continuation of Calibration Certificate

Cert. No. : ACL22030  
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. Tone burst response

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

## 10. Peak C sound level

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value, L <sub>peak</sub> ( 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	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

T. Ratan



Continuation of Calibration Certificate

Cert. No. : ACL22030  
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		
89.5	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

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



Cert. No. : ACC22013  
Pages : 1 of 3

Calibration Certificate

Equipment : SOUND CALIBRATOR  
Manufacturer : RION  
Model : NC-74  
Serial No. : 34178121  
ID No. : RYG\_FS0213

Condition As Found : GOOD

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

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

Received Date : 22 APRIL 2022  
Calibration Date : 26 APRIL 2022  
Date of Issue : 29 APRIL 2022



Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Petchurai  
( Thanakul Petchurai )

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Continuation of Calibration Certificate

Cert. No. : ACC22013  
Job No. : VC65AC0054  
Pages : 2 of 3

Calibration Procedure : CP-AC-03

Calibration Method :

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

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33511B	MY52302742	EF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL-BP_04/0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL-BP_03/0265	09-Feb-23
Digital Multimeter	33461A	MY60024273	EEL-BP_05/0265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KAI	34560495	AA-3005-22	22-Feb-23
Audio Analyzer	AVR-3360A	V744B6069	EF-0010-22	07-Feb-23

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

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

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

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACC22013  
Job No. : VC65AC0054  
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	94.11	0.11	0.14	0.40

2. Frequency

Specified Frequency (Hz)	Measured value (Hz)	Deviated value ( % )	Uncertainty ( % )	Tolerance limit ( % )
1000	1003.1	0.3	0.1	1.0

3. Total distortion

Measured value ( % )	Uncertainty ( % )	Tolerance limit ( % )
2.02	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

QF-TS12-04-04-020664

# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

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



Cert. No. : ACL22029  
Pages : 1 of 8

## Calibration Certificate

**Equipment :** SOUND LEVEL METER  
**Manufacturer :** RION  
**Model :** NL-42/ Microphone UC-52 / Preamplifier NH-24  
**Serial No.:** 00900074 / 188467 / 01736  
**ID No.:** RYG\_FS0495

**Condition As Found :** GOOD

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

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

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

**Calibrated by :** Nathakorn Pisutpaisan

**Approved by :**

( Thanakul 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.

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# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

## Continuation of Calibration Certificate

Cert. No. : ACL22029  
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 items were made by observation of each Instruments display and also with SLM's display.

### Condition of this result of calibration :

#### 1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0012-21	10-Feb-22
Waveform Generator	33511B	MY52302742	EF-0011-21	10-Feb-22
Digital Multimeter	33461A	MY53220104	EEL.BP. 05/0264	10-Feb-22
Digital Multimeter	33461A	MY53220076	EEL.BP. 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).

QF-TS12-04-04-020664

T. Petchurai

# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

## Continuation of Calibration Certificate

Cert. No. : ACL22029  
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				
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

T. Petchurai

# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

## Continuation of Calibration Certificate

Cert. No. : ACL22029  
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)
14.2

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

Frequency Weighting	Measured value (dB)
A - weight	10.8
C - weight	17.4
Flat	23.3

#### 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	0.2	0.2	0.2	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	-0.8	-0.7	-0.7	±5.0

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T. Petchurai



## Continuation of Calibration Certificate

Cert. No. : ACL22029  
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
63	-0.1	-0.2	0.0	±2.0
125	-0.1	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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T. Bha.

## Continuation of Calibration Certificate

Cert. No. : ACL22029  
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 )
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	84.1	0.1	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.1	0.1	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	29.9	-0.1	± 1.1
29.0	28.9	-0.1	± 1.1
28.0	28.0	0.0	± 1.1
27.0	27.0	0.0	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.9	-0.1	± 1.1

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T. Bha.

## Continuation of Calibration Certificate

Cert. No. : ACL22029  
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. Tone burst response

Time Weighting	Tone burst duration, Tb ( ms )	Cycle	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.1	0.1	±1.0

## 10. Peak C sound level

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

T. Bha.

## Continuation of Calibration Certificate

Cert. No. : ACL22029  
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		
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

QF-TS12-04-04-020664

T. Bha.

# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

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



Cert. No. : ACL22028  
Pages : 1 of 8

## Calibration Certificate

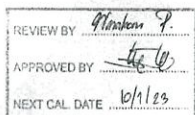
**Equipment :** SOUND LEVEL METER  
**Manufacturer :** RION  
**Model :** NL-42/ Microphone UC-52 / Preamplifier NH-24  
**Serial No.:** 00900073 / 188466 / 01735  
**ID No.:** RYG\_FS0494

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

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



**Calibrated by :** Nathakorn Pisutpaisan

**Approved by :**

*T. Petchur*  
( Thanakul Petchur )

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# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

## Continuation of Calibration Certificate

Cert. No. : ACL22028  
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 items were made by observation of each Instruments display and also with SLM's display.

### Condition of this result of calibration :

#### 1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0012-21	10-Feb-22
Waveform Generator	33511B	MY52302742	EF-0011-21	10-Feb-22
Digital Multimeter	33461A	MY53220104	EEL.BP. 05/0264	10-Feb-22
Digital Multimeter	33461A	MY53220076	EEL.BP. 03/0264	08-Feb-22
Digital Multimeter	34461A	MY60024273	1-15180725251-1	15-Sep-22
Programmable Attenuator	MA7-1070	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 :

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

QF-TS12-04-04-020664

T. Petchur

# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

## Continuation of Calibration Certificate

Cert. No. : ACL22028  
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				
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

T. Petchur

# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

## Continuation of Calibration Certificate

Cert. No. : ACL22028  
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)
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

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			Acceptance Limits
	Flat	C-weight	A-weight	
125	0.1	0.2	0.2	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	0.0	0.1	0.1	± 5.0

QF-TS12-04-04-020664

T. Petchur



## Continuation of Calibration Certificate

Cert. No. : ACL22028  
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
63	-0.1	-0.1	-0.1	±2.0
125	0.0	0.0	-0.1	±1.5
250	-0.1	-0.1	-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	0.0	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

QF-TS12-04-04-020664

## Continuation of Calibration Certificate

Cert. No. : ACL22028  
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 )
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
124.0	124.0	0.0	± 1.1
119.0	119.1	0.1	± 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	28.1	0.1	± 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

QF-TS12-04-04-020664

## Continuation of Calibration Certificate

Cert. No. : ACL22028  
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. 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	116.9	-0.1	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
	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	136.4	0.0	±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	-
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

## Continuation of Calibration Certificate

Cert. No. : ACL22028  
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		
89.5	89.7	0.2	±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

# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

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



Cert. No. : ACL22026  
Pages : 1 of 8

## Calibration Certificate

**Equipment :** SOUND LEVEL METER  
**Manufacturer :** RION  
**Model :** NL-42/ Microphone UC-52 / Preamplifier NH-24  
**Serial No.:** 00900071 / 188464 / 01733  
**ID No.:** RYG\_FS0492

**Condition As Found :** GOOD

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

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

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

**Calibrated by :** Nathakorn Pisutpaisan

**Approved by :**

( Thanakul Petchurai )

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

QF-TS12-04-04-020664

# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

## Continuation of Calibration Certificate

Cert. No. : ACL22026  
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 items were made by observation of each Instruments display and also with SLM's display.

### Condition of this result of calibration :

#### 1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0012-21	10-Feb-22
Waveform Generator	33511B	MY52302742	EF-0011-21	10-Feb-22
Digital Multimeter	33461A	MY53220104	EEL.BP. 05/0264	10-Feb-22
Digital Multimeter	33461A	MY53220076	EEL.BP. 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).

QF-TS12-04-04-020664

# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

## Continuation of Calibration Certificate

Cert. No. : ACL22026  
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				
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

# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

## Continuation of Calibration Certificate

Cert. No. : ACL22026  
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)
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	23.6

#### 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	0.2	0.2	0.2	± 1.5
1000	-0.1	-0.1	-0.1	± 1.0
8000	0.2	0.3	0.3	±5.0

QF-TS12-04-04-020664



## Continuation of Calibration Certificate

Cert. No. : ACL22026  
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
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	0.1	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
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

QF-TS12-04-04-020664

T. Rth.

## Continuation of Calibration Certificate

Cert. No. : ACL22026  
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 )
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	38.9	-0.1	± 1.1
34.0	33.9	-0.1	± 1.1
30.0	29.9	-0.1	± 1.1
29.0	28.9	-0.1	± 1.1
28.0	27.9	-0.1	± 1.1
27.0	26.8	-0.2	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.9	-0.1	± 1.1

QF-TS12-04-04-020664

T. Rth.

## Continuation of Calibration Certificate

Cert. No. : ACL22026  
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. Tone burst response

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

## 10. Peak C sound level

Number of cycle in test signal	Anticipated Value ( dB )	Measured Value, L <sub>peak</sub> ( 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	133.1	0.1	-
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

QF-TS12-04-04-020664

T. Rth.

## Continuation of Calibration Certificate

Cert. No. : ACL22026  
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		
89.6	89.5	-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

T. Rth.

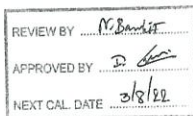


TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL. 0-2717-3000 FAX. 0-2719-9484

Cert.No.: 21TW20  
Page.: 1 of 2

## Certificate of Testing

Equipment : DO Meter  
Manufacturer : YSI  
Model : 5100  
Serial No. : 15L102139  
ID No. : RYG\_EN0140  
Received Date : 29 January 2021  
Test Date : 02 February 2021  
Reference : 2101-0817DSC-1  
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.  
Rayong Branch  
Eastern Seaboard Industrial Estate (Rayong)  
64/77 Moo 4,Building No.B1, Highway 331,  
Km91.5, T.Pluakdaeng, A.Pluakdaeng,  
Rayong 21140 Thailand  
Laboratory Condition : Temperature ( 25 ± 5 ) °C  
Humidity ( 50 ± 20 ) %  
Test Procedure : In - house method : CP-CH9  
by Comparison Technique with Azide Modification Method  
Calibrated by : Walalak Sirithuan  
Approved by :   
( / ) Malee Butkrues  
( ) Sathip Meangmai  
( ) Warakorn Lerngagrakul  
Issue Date : 3 February 2021



B 0252485



Cert.No.: 21TW20  
Page.: 2 of 2

Result : Dissolved Oxygen Meter Adjustment With Air 100 %  
Dissolved Oxygen Probe No.: 16C100647

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.02	8.02	0.0055

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 to use for advertising and referral purpose is prohibited. This report may not be reproduced other in full, without written approval of the laboratory

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TEL. 0-2717-3000 FAX. 0-2719-9484

Cert. No.: 21TM271  
Page.: 1 of 2

## Certificate of Calibration

Equipment : DO Meter with Sensor  
Manufacturer : YSI  
Model : 5100  
Serial No. : 15L102139  
ID No. : RYG\_EN0140  
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd. Rayong Branch  
Eastern Seaboard Industrial Estate (Rayong)  
64/77 Moo 4 Building No.B1, Highway 331 km. 91.5,  
T. Pluakdaeng, A. Pluakdaeng, Rayong 21140 Thailand  
Location : TPA On Site Calibration Laboratory  
Received Order : 29 January 2021  
Calibrated Date : 3 February 2021  
Ambient Temperature : ( 26 ± 10 ) °C  
Relative Humidity : ( 50 ± 30 ) %  
AC Line Voltage : ( 220 ± 22 ) V  
Calibrated by : Malee Butkrues  
Approved by :   
( ) Pornthippa Tameyakul  
( / ) Suwit Imjai  
Issue Date : 4 February 2021

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written  
Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

A 0024028



Equipment : DO Meter with Sensor  
Condition As-Received : Used Item  
Reference : 2101-0817DSC-2  
Procedure Used :-

Cert. No.: 21TM271  
Page.: 2 of 2

Calibration were conducted using in-house calibration procedure CP-OT01 according to comparison with Industrial Platinum Resistance Thermometer ( IPRT ) into Temperature Bath.

The temperature scale used was based on ITS-90.

### Condition of this result of calibration

- Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Digital Thermometer	1523	2188090	201389	20 Nov 2021
- This certificate is valid only to the item calibrated on date and place of calibration.
- This certification is traceable to the International System of Unit maintained at:-  
- National Institute of Metrology Thailand (NIMT)

Result of Calibration :- ( \* ) Without Adjustment

Function : Temperature measurement.

This instrument was connected with temperature sensor, S/N.: 16C100647

Calibration Point ( °C )	Immersion Depth ( mm )	Standard Temperature ( °C )	UUC* Reading ( °C )	Error ( °C )	Uncertainty ( ± °C )	Coverage Factor k
20.00	60	20.008	19.96	-0.048	0.15	2.00

UUC\* : Unit Under Calibration

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 1038626





TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
5344 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10230  
TEL: 0-2717-3000-27 FAX: 0-2719-9454



Cert. No.: 22TM317  
Page: 1 of 3

## Certificate of Calibration

Equipment : Low Temp. Incubator  
Manufacturer : Memmert  
Model : IPP750  
Serial No. : V818.0084  
ID No. : RYG\_EN0154  
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.  
(Rayong Branch)  
616/10 Moo 5 T.Maenam Khu,  
A.Pluakdaeng, Rayong 21140, Thailand  
Location : BOD Room  
Received Order : 22 April 2022  
Calibration Date : 22 April 2022  
Ambient Temperature :  $(26 \pm 10) ^\circ\text{C}$   
Relative Humidity :  $(50 \pm 30) \%$   
Calibrated by : Man Pattanapongpaiboon

Approved by :  
( ) Pornthippa Tameyakul  
( ) Malee Butkrues  
( ) Suwit Imjai

Issue Date : 3 May 2022  
The Uncertainties are for a confidence probability of approximately 95 %

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Approval of the head of Corporate Services 3: Equipment Calibration and Testing Services

A 0040735



Equipment : Low Temp. Incubator  
Condition As-Received : Used Item  
Reference : 2204-0146OC-1

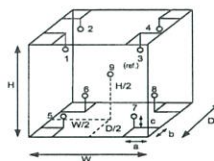
Cert. No.: 22TM317  
Page: 2 of 3

Procedure Used :-  
Calibration were conducted using calibration procedure CP-OT02 according to direct measurement  
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 MY44031769 21LM12 02 Sep 2022
2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This certification is traceable to the International System of Unit.

Result of Calibration :- ( ) Without Adjustment  
Function of UUC\* : Temperature Source  
Fresh air setting : Close



Probe Installation Details : Dimension of Chamber :  
a = 10 cm D = 0.60 m  
b = 1.0 cm W = 1.0 m  
c = 10 cm H = 1.2 m  
Capacity = 0.75 m<sup>3</sup>

Environment during calibration		
	Beginning	Finished
Temp. (°C)	25	25
REL.Humid. (%)	54	58
AC Supply ( Volt )	221	223

Position :	Ref. Std. ID No.:
1	9RTD-2/1
2	9RTD-2/2
3	9RTD-2/3
4	9RTD-2/4
5	9RTD-2/5
6	9RTD-2/6
7	9RTD-2/7
8	9RTD-2/8
9 (ref.)	9RTD-2/9

a 1106485



Equipment : Low Temp. Incubator  
Condition As-Received : Used Item  
Reference : 2204-0146OC-1  
Result of Calibration :- ( ) Without Adjustment  
Function of UUC\* : Temperature Source  
Fresh air setting : Close

Cert. No.: 22TM317  
Page: 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor k
20.0	20.0	20.0	0.022	0.20	0.22	0.30	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
20.0	1	2	3	4	5	6	7	8	9 (ref.)
20.0	20.209	20.174	20.199	20.110	20.075	20.062	20.027	20.069	20.030

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 %

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a 1106484



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66/124 The Connect 33 Village Kanchanaphisek Road  
Dokmai Praweit Bangkok 10250  
Tel : +66 (0) 2069-6773  
www.pentalab.com

## Certificate of Calibration

Represent to Certificate of Calibration PTC/07/22103

Certificate No. : PTC/07/22103 Page: 1 of 2  
Equipment: Digital Balance Condition: Normal  
Manufacturer: Sartorius Serial No: 26207038  
Model: MSE224S-100-DU ID No: RYG\_EN0002  
Type of Balance: Single interval

Customer: ALS Laboratory Group (Thailand) Co., Ltd.  
616/10 Moo 5 T.Maenamkoo, A.Pluakdaeng,  
Rayong 21140, Thailand

Environment Condition: Temperature 23.9 °C ± 0.3 °C  
Humidity 58.1 %RH ± 4.4 %RH  
Air density 1.17 kg/m<sup>3</sup>

Calibration Place: ALS Laboratory Group (Thailand) Co., Ltd.  
616/10 Moo 5 T.Maenamkoo, A.Pluakdaeng,  
Rayong 21140, Thailand

The Method used: In house method PTC-WI-07, base on Euramet cg. 18  
Traceability: This certificate is traceable to the SI Units through Thai Calibration Service Co., Ltd.  
NSC-ONSC Accreditation No : Calibration 0189

Date Received: March 23, 2022  
Calibration Date: March 23, 2022  
Issued Date: March 25, 2022  
Calibration By: Mr. Rungroj Metakul

( Mr. Kriangsak Kalasri )  
Reviewed by

Approved By :  
( Mr. Keattisak Kerdto )  
Laboratory Manager

This certificate is issued the units of measurement according to the International System of Units (SI) it provides traceability of measurement to international or national standard or other recognised national standard laboratories.

The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM). The effect that the results relate only to the items calibrated.

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PTC-FNC-01-02 2146-2020

Represent to Certificate of Calibration, PTC/07/22103

Certificate No.: PTC/07/22103

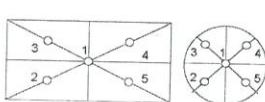
Page: 2 of 2

### Measurement Results:

Without Adjustment:

Function Calibration: Non Adjustment

Eccentric Error: Weight to be 1/3, 1/2 or of Maximum capacity



Eccentricity test 100 (g)				
Position (g)				
1	2	3	4	5
0.0000	0.0000	-0.0002	0.0002	0.0002
Maximum deviation: 0.0002				

Repeatability Test: Weight to be 1/2 ≤ L<sub>1</sub> ≤ Maximum capacity

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

Nominal test value (g)	Standard Deviation
200	0.00003

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
0	0.00000	0.0000	0.0000	0.000066	2.16
0.01	0.01000	0.0100	0.0000	0.00010	2.06
0.1	0.10000	0.1000	0.0000	0.00010	2.06
1	1.00000	1.0000	0.0000	0.00010	2.06
2	2.00000	1.9999	0.0001	0.00010	2.06
5	5.00001	5.0000	0.0000	0.00010	2.06
10	10.00000	10.0000	0.0000	0.00010	2.06
20	20.00003	19.9999	0.0001	0.00011	2.05
50	50.00004	49.9999	0.0001	0.00012	2.00
100	100.00004	100.0001	-0.0001	0.00017	2.00
200	200.00011	200.0000	0.0001	0.00027	2.00

Note: Weight of adjust (g)

The End of Certificate

PTC-FWC-01 (02/2016)



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)  
616/10 Moo 5 T. Maenam Khu,  
A. Pluakdaeng,  
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

( ) Pornhippa Tameyakul  
( ) Malee Butkruea  
( ) 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

Cert. No.: 21TM829  
Page: 2 of 3

### Procedure Used :-

Calibration were conducted using calibration procedure CP-OT02 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	MY57013823	21LM3	26 Feb 2022

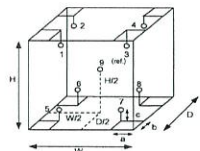
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

Result of Calibration :- ( ) Without Adjustment

Function of UUC\* : Temperature Source

Fresh air setting: Close



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 m<sup>3</sup>

Environment during calibration	
	Beginning
Temp. (°C)	29
REL Humid. (%)	56
AC Supply (Volt)	221

Position	Ref. Std. ID No.:
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

Mali

a 1054310



Equipment: Hot Air Oven  
Condition As-Received: Used Item  
Reference: 2105-0005OC-1

Cert. No.: 21TM829  
Page: 3 of 3

### 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)								
	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 %.

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Mali

a 1054309





TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
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TEL. 0-2717-3000-27 FAX. 0-2719-9484



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

## Certificate of Calibration

Equipment : Water Bath  
Manufacturer : Memmert  
Model : WNB22  
Serial No. : L513.0648  
ID No. : RYG\_EN0061  
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd. (Rayong Branch)  
616/10 Moo 5 T. Maenam Khu,  
A. Pluakdaeng,  
Rayong 21140 Thailand  
Wet 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 :   
( ) Pornthippa Tameyakul  
(x) Malee Butkruea  
( ) Suwit Imjai  
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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Approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

A 0028098



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

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

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

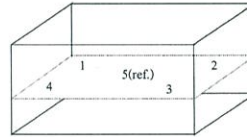
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

Result of Calibration :- ( \* ) Without Adjustment

Function of UUC\* : Temperature Source

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



Front

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

a 1054289



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

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

Calibration point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Average* Standard Reading ( °C )				
			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	0.22	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 %.

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a 1054288



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Cert.No.: 22CH405  
Page.: 1 of 3

## Certificate of Calibration

Equipment : pH Meter  
Manufacturer : Mettler Toledo  
Model : Seven Compact S220  
Serial No. : C104059460  
ID No. : RYG\_EN0183  
Condition As-Received : Used Item  
Received Date : 16 March 2022  
Calibration Date : 17 March 2022  
Reference : 2203-0611DSC-4  
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.  
Rayong Branch  
616/10 Moo 5 T. Maenam Khu,  
A. Pluakdaeng, Rayong 21140, Thailand

Ambient Temperature : (25 ± 2.5) °C  
Relative Humidity : (50 ± 15) %  
Calibration Procedure : In - house method :  
- CP-CH5 by direct measurement with standard voltage calibrator and direct measurement with certified reference material (CRM)  
- CP-CH8 by comparison with standard thermometer

Calibrated by : Warakorn Lemgagtrakul

Approved by :   
Approved Signatory

(x) Malee Butkruea  
( ) Saitip Meangmai  
( ) Warakorn Lemgagtrakul

Issue Date : 22 March 2022

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

A 0037307



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	54030049	130RC116	21E2682	25 Aug 2022
2) Ref. Standard Thermometer	4982054	110RC044	2111201	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 measurement results are traceable to SI through CPA chem Ltd., ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	788995	01 Jan 2024
pH 6.982	CPA chem	761017	02 Aug 2022
pH 10.015	CPA chem	766824	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 (4,7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement	Coverage factor
	pH	mV	mV	pH	( $\pm$ mV)	k
pH Meter S/N.: C104059460	4.000	177.48	177.4	4.000	0.058	2.00
	7.000	0.00	-0.1	7.000	0.058	2.00
	10.000	-177.48	-177.5	10.000	0.058	2.00

Malu

a 1100955



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

#### Calibration Results

##### Function : pH Measurement

##### Performing three buffers standard curve by using buffer nominal pH (4,7,10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement ( $\pm$ )	Coverage factor k
pH Electrode S/N.: 1453404	4.008	4.010	177.7	0.0046	2.00
	6.982	6.988	3.6	0.0084	2.00
	10.015	10.010	-172.9	0.0073	2.05

##### Function : Temperature Measurement

##### (\*) Without adjustment

This equipment was connected with Temperature Probe;

- Model :	InLab Expert Pro-ISM
- Serial No. :	1453404
- Dimension of probe :	
- Length :	120 mm.
- Diameter :	12 mm.
- Immersion Depth :	100 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement ( $\pm$ °C)	Coverage factor k
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, providing a level of confidence of approximately 95 %.

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Malu

a 1100954



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TEL: 0-2717-3000-24 FAX: 0-2719-9484



## Certificate of Calibration

Certificate No.: 22E986  
Page: 1 of 2

Equipment : pH Meter  
Manufacturer: Mettler Toledo  
Model : SevenCompact S220  
Serial No.: C104059460  
ID No.: RYG\_EN0183

Condition As-Received: Used Item  
Received Date: 16 March 2022  
Calibration Date: 21 March 2022

Reference: 2203-0811DSC  
Ambient Temperature: (23  $\pm$  2) °C  
Relative Humidity: (50  $\pm$  10) %  
Submitted by: ALS Laboratory Group (Thailand) Co., Ltd. Rayong Branch  
616/10 Moo 5 T. Maenam Khu. A. Pluakdeang, Rayong  
21140, Thailand

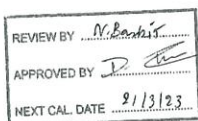
Procedure used: Calibration were conducted using in-house calibration Procedure CP-E17 According to direct measurement method with Multi-Product Calibrator.

#### Condition of this result of calibration

##### 1. Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Multi-Product Calibrator	5500A	6440007	21E1444	07 May 2022

2. This 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: Pongsagorn Boonyaporn  
Issue Date: 22 March 2022

Approved Signatory:   
[✓] Pongthipha Tameyakul  
[ ] Nuntawat Khamchai  
[ ] Pongthipha Tameyakul

B 0284414



Cert. No.: 22E986  
Page.: 2 of 2

#### Result of calibration :- (\*) Without adjustment ( ) After adjustment

Function:	DC voltage measurement	Range:	2000	mV
	Standard Value	UUC* Reading	Error	Uncertainty
	(mV)	(mV)	(mV)	( $\pm$ $\mu$ V)
	-200.0000	-200.0	0.0	72
	-150.0000	-150.0	0.0	69
	-100.0000	-100.0	0.0	65
	-50.0000	-50.0	0.0	62
	0.0000	0.0	0.0	58
	50.0000	50.0	0.0	62
	100.0000	100.0	0.0	65
	150.0000	150.0	0.0	69
	200.0000	200.0	0.0	72

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 %

\*UUC= Unit Under Calibration.

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a 1101070





TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
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TEL. 0-2717-3000-24 FAX: 0-2719-9484



## Certificate of Calibration

Certificate No.: 21T1200  
Page: 1 of 2

Equipment: Digital Thermometer With Sensor

Manufacturer: Testo

Model: 106

Serial No.: 31281494/504

ID No.: RYG\_FS0467

Condition As-Received: Used Item

Received Date: 02 July 2021

Calibration Date: 07 July 2021

Reference: 2107-0069OSC

Ambient Temperature: (25 ± 3) °C

Relative Humidity: (50 ± 20) %

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Corporate Services 3: Equipment Calibration and Testing Services.

Submitted by: ALS Laboratory Group (Thailand) Co., Ltd. Rayong Branch  
616/10 Moo 5 T.Maenam Khu, A.Pluakdaeng, Rayong  
21140, Thailand

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

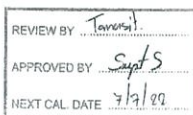
### Condition of this result of calibration

1. Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Digital Thermometer	1529-R	B19520	211680	26 Jun 2022
2) Platinum Resistance Thermometer	935-14-95	261569/1	211680	26 Jun 2022

2. The 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 maintained at:-  
National Institute of Metrology Thailand (NIMT)



Calibrated by: Yossapon Poljorn  
Issue Date: 09 July 2021

Approved Signatory:

- ☐ Phalinee Pratsapaipal  
☐ Chatchawan Khunpluek  
☒ Wanlop Larphum

0265214



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)
50	25.0029	24.9	-0.1029	0.12
50	30.0018	29.9	-0.1018	0.12
50	40.0035	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%.

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1063351

RYG\_EN0010



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, BANGKOK 10250  
TEL. 0-2717-3000-27 FAX: 0-2719-9484



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

## Certificate of Calibration

Equipment: Hot Air Oven

Manufacturer: Memmert

Model: UFE 500

Serial No.: G511.1572

ID No.: RYG\_EN0010

Submitted by: ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch)  
616/10 Moo 5 T. Maenam Khu, A. Pluakdaeng, 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

- ☐ Pornthippa Tameyakul  
☒ Malee Bulkruea  
☐ Suwit Imjai

Issue Date: 14 May 2021



The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written  
Approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

A 0028099



Equipment: Hot Air Oven  
Condition As-Received: Used Item  
Reference: 2105-0005OC-4

Cert. No.: 21TM827  
Page: 2 of 3

### Procedure Used :-

Calibration were conducted using calibration procedure CP-OT02 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	MY57013823	21LM3	26 Feb 2022

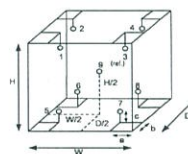
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

### Result of Calibration :-

Function of UUC\*: Temperature Source

Fresh air setting: Close



Probe Installation Details: Dimension of Chamber :  
a = 5.0 cm D = 0.40 m  
b = 5.0 cm W = 0.56 m  
c = 5.0 cm H = 0.48 m  
Capacity = 0.11 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	28	29
REL.Humid. (%)	59	56
AC Supply (Volt)	220	221

Ref. Std. ID No.: @ Calibration Point		
Position:	(104) °C	(180) °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

1054287



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

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

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	0.89	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 %.

-000-

1054286

SPC Calibration Center



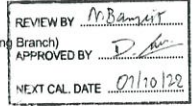
## Certificate of Calibration



Equipment: SPECTROPHOTOMETER  
Model: DR6000  
Serial No. (or ID.): 1627845 (RYG\_EN0037)  
Manufacturer: HACH  
Condition: In Condition

Certificate No.: C06210159  
Issued Date: 01 April 2021  
Job No.: KSPR2104738  
Page: 1 of 3

Customer: ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch)  
616/10 Moo 5 T.Maenam Khu,  
A.Pluakdaeng, Rayong 21140, Thailand.



Environment Condition: Temperature 25.1 °C ± 0.4 °C  
Humidity 48.8 %RH ± 3.7 %RH

Calibration Place: ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch) ( Wet Chemistry Lab )  
616/10 Moo 5 T.Maenam Khu,  
A.Pluakdaeng, Rayong 21140, Thailand.

Calibration By: Mr. Chattaphon Folthong

Calibration Date: 01 April 2021

The Method used: In house method, SPCC-WI-24, base on ASTM E 275-08 and ASTM E 387-04

Traceability: This certificate is traceable to the CRM maintained by National Institute of Standards and Technology (NIST) through Sarna Scientific Limited.

The standard for Wavelength Certificate No. 87146 and 87152

The standard for Photometric Certificate No. 87220 and 87139

The standard for Stray light Certificate No. 87163 and 87161

The standard for Spectral resolution Certificate No. 87173

(Mr. Chattaphon Folthong)

Person in charge



Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.

The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).

These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of SPC RT Co., Ltd.

SPC RT CO., LTD.  
1194 Soi Wapornasomsthi 57 Sukhumvit 101/1 Road Bangkok, Phrakongno Bangkok 10260 Thailand

SPC Calibration Center



Certificate No.: C06210159 Page 2 of 3

### Calibration Results: Without Adjustment

Wavelength Accuracy (nm), The spectral bandwidth of Std at 2 nm and UUC at 2 nm

Standard Wavelength	Unit Under Calibration	Correction	Uncertainty
418.61	418.4	0.21	0.13
536.66	536.7	-0.04	0.13
637.98	638.3	-0.32	0.14
748.48	748.7	-0.22	0.14
807.03	807.4	-0.37	0.14

Photometric Accuracy (Absorbance)

Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
420 nm	0.0000	0.000	0.0000	0.0045
	0.5890	0.590	-0.0010	0.0045
	0.7616	0.762	-0.0004	0.0045
	1.0263	1.027	-0.0007	0.0045
440 nm	0.0000	0.000	0.0000	0.0045
	0.5787	0.579	-0.0003	0.0045
	0.7442	0.744	0.0002	0.0045
	1.0039	1.004	-0.0001	0.0045
465 nm	0.0000	0.000	0.0000	0.0045
	0.5292	0.530	-0.0008	0.0045
	0.8865	0.887	-0.0005	0.0045
	0.9534	0.954	-0.0006	0.0045
546.1 nm	0.0000	0.000	0.0000	0.0045
	0.5468	0.546	0.0008	0.0045
	0.6957	0.695	0.0007	0.0045
	0.9991	0.998	0.0011	0.0045
590 nm	0.0000	0.000	0.0000	0.0045
	0.5851	0.584	0.0011	0.0045
	0.7238	0.723	0.0008	0.0045
	1.0957	1.094	0.0017	0.0045
635 nm	0.0000	0.000	0.0000	0.0045
	0.5692	0.568	0.0012	0.0045
	0.6914	0.691	0.0004	0.0045
	1.0881	1.087	0.0011	0.0045

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SPC Calibration Center



Certificate No.: C06210159 Page 3 of 3

### Calibration Results: Without Adjustment

Photometric Accuracy (Absorbance)

Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
235 nm	0.0000	0.000	0.0000	0.0080
	0.7307	0.730	0.0007	0.0080
257 nm	0.0000	0.000	0.0000	0.0080
	0.8516	0.850	0.0016	0.0080
313 nm	0.0000	0.000	0.0000	0.0080
	0.2836	0.285	-0.0014	0.0080
350 nm	0.0000	0.000	0.0000	0.0080
	0.6319	0.629	0.0029	0.0080

Stray light \*

Standard: cut-off	UUC: Wavelength (nm)	UUC: Transmission (%T)	Absorbance (A)
260.57 +/- 0.11 nm	260.6	1.5	1.824
392.03 +/- 0.11 nm	392.0	1.5	1.824

The stray light transmission reference is less than 1.0 T(%) and absorbance is greater than 2.0 (A)

Spectral Resolution \*

Nominal Concentration 0.02 % v/v	Peak	Trough	Ratio	SBW
Standard Wavelength ( nm )	268.72	266.76	1.39	2.00
UUC: Wavelength (nm)	268.2	266.1		
Std Absorbance ( A )	0.4616	0.2797		
Absorbance ( A )	0.416	0.300		

\* Calibration Marked \* Not TISI Accredited \* in this Certificate have been included for completeness.

The End of Certificate

SPC RT CO., LTD.  
1194 Soi Wapornasomsthi 57 Sukhumvit 101/1 Road Bangkok, Phrakongno Bangkok 10260 Thailand



## ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: KSPR2104738

ชนิดเครื่องมือ: SPECTROPHOTOMETER

รุ่น: DR6000

หมายเลขเครื่อง: 1627845

ตรวจสอบ (วัน)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
01 Apr 2021			01 Apr 2021		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		<i>General</i>			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. ความสมบูรณ์เครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสะอาด ( ช่องใส่ตัวอย่าง, ภายใน-นอกเครื่อง)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. สวิตช์ ปิด – เปิด เครื่อง (On-Off Switch)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. ปุ่มกด (Keypad)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. หน้าจอ (Display, Screen Contrast)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
		<i>Spectrophotometer</i>			
<input type="checkbox"/>	<input type="checkbox"/>	6. แรงดันไฟฟ้า (Battery Backup) >= 2.5 VDC	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	7. ตัวหมุนเลือกความยาวคลื่น (Wavelength Control)	<input type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. ความยาวคลื่น (Wavelength Check)	<input type="checkbox"/>	<input type="checkbox"/>	656.1=656.1 nm
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. แหล่งกำเนิดแสง (UV < 3,000 hour)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. แหล่งกำเนิดแสง (Visible < 5,000 hour)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	11. ช่องวัดหลายตัวอย่าง (Carousel Module)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
		<i>pH Meter and Conductivity Meter</i>			
<input type="checkbox"/>	<input type="checkbox"/>	12. อิเล็กโทรด ( Electrode and Connection Cable )	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	13. ระดับสารละลายใน Electrode (Level KCl )	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	14. ฝาปิดกันปลาย Electrode (Dust Protection Hood)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	15. ขาจับอิเล็กโทรด (Stand)	<input type="checkbox"/>	<input type="checkbox"/>	
		<i>Turbidimeter</i>			
<input type="checkbox"/>	<input type="checkbox"/>	16. ค่าความขุ่นที่ต่ำสุด (No Sample)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	17. ระดับการส่องสว่างของแสง (>= 2.5 ไม่นเกิน 3.0)	<input type="checkbox"/>	<input type="checkbox"/>	
		<i>Automatic titrator</i>			
<input type="checkbox"/>	<input type="checkbox"/>	18. สภาพ Piston Burettes	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	19. Function Rinsing and Dosing	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	20. ระบบท่อสายยางและอุปกรณ์ประกอบ	<input type="checkbox"/>	<input type="checkbox"/>	

เห็นด้วยและแนะนำ:

Mr. Chattraphon Foithong  
Service Engineer

3PC Calibration Center  
33/2 Moo 3, T. Banpa, A. Kaengkhoh, Saraburi 18110, Thailand.  
Tel: 08-0003 1134 Fax: 08-0003 1134 Email: 3pc@3pc.co.th



## Metrological Center

SCI ECO Services Company Limited

33/2 Moo 3, T. Banpa, A. Kaengkhoh, Saraburi 18110, Thailand.

Saraburi Tel: +66 3627 3096 Fax: +66 3627 3100

Bangkok Tel: +668 9205 6851, +669 8247 2360

Website: www.scieco.co.th E-Mail: calibrate@scg.co.th



Certificate No. T220384101 "Substitute for Calibration Certificate Number T220384" Page 1 of 4

## Certificate of Calibration

Equipment : Chamber ( Cold Room )

Manufacturer : MODULAR

Model : IREVOHCOO

Serial No. : C00351459

Customer Code : RYG\_EN0184

ID No. : T1939A5

Customer : ALS Laboratory Group (Thailand) Co.,Ltd. ( Rayong Branch)

616/10 Moo 5 T.Maenam Khu,

A.Plukaeng, Rayong 21140

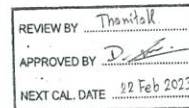
Customer Location : Laboratory

Date of Receipt : 18 February 2022

Calibrated By : Boonchai Suriyawong ( Site Calibration Manager )

Approved By :  / Sujjar Nakhakred (Site Calibration Manager)

Date of Issue : 18 MAR 2022



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

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

FM-L14 117-01-02-64

Metrological Center  
SCI ECO Services Company Limited

33/2 Moo 3, T. Banpa, A. Kaengkhoh, Saraburi 18110, Thailand.



Certificate No. T220384101

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## Calibration Report

Equipment : Chamber ( Cold Room )  
Date of Calibration : 22 February 2022  
Environment : Temperature : 23.2-24.3 °C  
Line Voltage : 221.8-227.2 V  
Relative Humidity : 55 - 65 %RH

## Condition of this results of calibration :

1. This equipment was calibrated by insert 16 standard thermocouples type T into its chamber, the other one standard thermocouples type T use for ambient temperature measurement. The calibration was done in according to WI-T20 ( based on ASTM E145-94 ( Reapproved 2001 ) 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	T150	T210743	21 April 2022

## 3. This certificate is traceable to :

National Institute of Metrology ( Thailand ) through Metrological Center ( NSC-TISI-TIS 17025 CALIBRATION 0244 ).

## 4. Condition of calibrated item : good

## Equipment Description :

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

## 5. Adjustment :

( X ) without adjustment ( ) after adjustment

Approved By: 

FM-L15 117-15-05-63

Metrological Center  
SCI ECO Services Company Limited

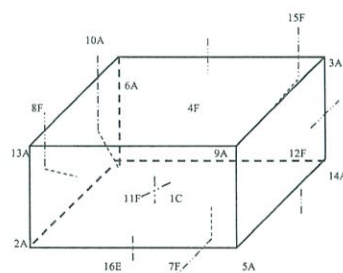
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Certificate No. T220384101

Page 3 of 4

## Calibration Report



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

1C = TN141	12F = TN152
2A = TN142	13A = TN153
3A = TN143	14A = TN154
4F = TN144	15F = TN155
5A = TN145	16E = TN156
6A = TN146	
7F = TN147	
8F = TN148	
9A = TN149	
10A = TN150	
11F = TN151	

Approved By: 

FM-L15 117-15-05-63



Certificate No. T220384101

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## Calibration Report

### Measurement Results

Calibration Point	Average Standard Reading at each position (°C)									
	TN141	TN142	TN143	TN144	TN145	TN146	TN147	TN148	TN149	TN150
3.0	2.80	2.96	2.98	2.97	3.16	3.29	2.95	3.14	3.10	3.45
	TN151	TN152	TN153	TN154	TN155	TN156				
	3.04	3.19	3.03	3.34	3.21	3.11				

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

\* The Accrued 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 which for a t-distribution, providing a level of confidence of approximately 95 %.

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

FM-L15 117-15-05-63

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Agilent CrossLab Compliance Services

## Certificate of System Qualification

GC-OQ + GCMS-OQ

System ID: GM-7  
Organization Name: ALS Laboratory Group (Thailand) Co., Ltd.  
Organization Location: 104 Pathanakam 40, Pathanakam rd., Khwang Suan Luang, Khet Suan Luang, Bangkok 10250

Date: December 24, 2020 2:51:10 PM  
EQP Name: AgilentRecommended, AgilentRecommended  
EQP Revision: GC.02.50, GCMS.02.50  
Overall Qualification Status: Pass

REVIEW BY	W. S. Sak
APPROVED BY	K. A. AL
NEXT CAL DATE	2.6.106.197

### 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 Accuracy

Name: 7890  
Front SSL

Setpoint Status: Pass

Inlet Pressure: Setpoint 25.0 psi Actual 25.3 psi  
Accuracy: 0.3 psi  
Agilent Recommended: <= 1.2 psi

### Overall Inlet Pressure Accuracy Test Status

Pass

### GC Oven Temperature Accuracy

Name: 7890

Date: December 24, 2020 2:51:10 PM  
System ID: GM-7

Page 1 / 13

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Agilent CrossLab Compliance Services

Setpoint Status: Pass  
Zone: Oven  
Setpoint/Actual  
Temperature: 230.0 230.6 °C  
Accuracy: 0.6 °C  
Agilent Recommended: >= -1.0 % setpoint in K (-5.0 °C)  
<= 1.0 % setpoint in K (5.0 °C)

Data for this setpoint was entered manually.

Reason: Data logging currently not available.

Setpoint Status: Pass  
Zone: Oven  
Setpoint/Actual  
Temperature: 100.0 100.9 °C  
Accuracy: 0.9 °C  
Agilent Recommended: >= -1.0 % setpoint in K (-3.7 °C)  
<= 1.0 % 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  
Setpoint/Average  
Temperature: 100.0 100.9 °C  
Stability: 0.0 °C  
Agilent Recommended: <= 0.5

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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Agilent CrossLab Compliance Services

### 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: 1050 m/z  
Drift After Five Minutes: 15 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:	>= 1200			
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	7890
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

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## Details

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Logged On User Name:	supasak.nimsongtham@agilent.com
Signature Creation Date:	December 24, 2020
Reason for Signature:	Executed protocol and published this original version of document

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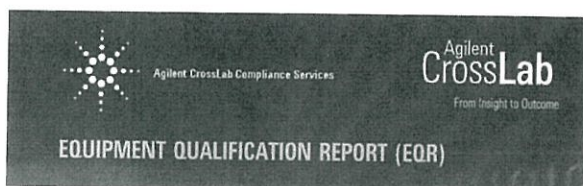
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Date: December 24, 2020 2:51:10 PM  
System ID: GM-7

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## Agilent CrossLab Compliance

Qualification Type: ICPMS-OQ

System ID: JP15471169

EQP Name: AgilentRecommended

EQP Revision: ICPMS.02.50

EQP Publish Date: March 2020

Date: September 30, 2021 4:07:18 PM

Report Type: Report

Org. Name: ALS Laboratory Group (Thailand) Co., Ltd.

Org. Location: 104 Phattanakarn 40, Suan Luang, Bangkok 10250.

REVIEW BY *Sophan H.*

APPROVED BY *Savitree N.*

NEXT CAL. DATE *29 March 2023*

Date: September 30, 2021 4:07:18 PM  
System ID: JP15471169

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Date: September 30, 2021 4:07:18 PM  
System ID: JP15471169

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## Test Summary

## Purpose

This section includes a status for each scheduled test and the overall qualification. For each test that is run, (1) the status is automatically determined based on pre-defined limits, and (2) the total number of times the test was run is displayed. For detailed results and specifications for a test, refer to the test results in this EQR.

Details	Status	Runs
Test		
Autosampler Check : SP54	Pass	1
Integrated Sample Introduction System (ISIS) Check : ISIS3	Pass	1
Autotune : G8403A	Pass	1
Background (No Gas Mode) : G8403A	Pass	1
Background (Gas Modes) : G8403A	Pass	1
20-Minute Stability (No Gas Mode) : G8403A	Pass	1
Overall Qualification Status		
Pass		

Date: September 30, 2021 4:07:18 PM  
System ID: JP15471169

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## Service Details

## Purpose

This section includes local contact and delivery details for this service.

## General Details

Service Order No./Request: 6004837154

EQP Name: AgilentRecommended

EQP Revision: ICPMS.02.50

Report Type: Report

## Organization Details

Name: ALS Laboratory Group (Thailand) Co., Ltd.

Location: 104 Phattanakarn 40, Suan Luang, Bangkok 10250.

## Local Contact Details

Name: Chatchanai Komarakul

Job Title: Manager

Qualification Location: Laboratory

## Operator Details

Name: Panthep Kurasathain

Job Title: Field Service Engineer.

## Data Acquisition Details

Acquisition Software Name: MassHunter

Acquisition Software Revision: C.01.04

## Customer Data System (CDS):

IcpMn: MassHunter

Date: September 30, 2021 4:07:18 PM  
System ID: JP15471169

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Instrument Details

Purpose  
This section describes the as found system configuration.

Details

ICP-MS 1	
Manufacturer	Agilent Technologies
Name	7800
Model Number	GB403A
Installed Options	#100H: Standard Package with Hydrogen option
Detector Type	SQ
Nebulizer	Mira Mist (G3161)
Spray Chamber	Quartz
Torch	Quartz
Sampling Cone	Ni
Skimmer Cone	Ni
Serial Number	JP15471169
Firmware Revision	C.01.04

ISIS 1	
Manufacturer	Agilent Technologies
Name	ISIS3
Model Number	G8411A
Type	Peristaltic pump system
Serial Number	JP15510227

Autosampler 1	
Manufacturer	Agilent Technologies
Name	SPS4
Model Number	G8410A
Serial Number	AU15430722

Chiller 1	
Manufacturer	Agilent Technologies
Name	Chiller
Model Number	G3292A
Serial Number	3U1510713

Calculation Formulas

Purpose  
This section includes calculation formulas for all available tests. Depending upon which tests are scheduled, all or some apply to your qualification.

For a description of calculations for ICP-MS tests performed by the MassHunter software, refer to the MassHunter application and documentation.

Protocol Details

Purpose  
This section lists the revisions for all test units used in this report. For complete test-specific and high-level change details, refer to the Revision History document.

Test Revision	Test
ICPMS.02.50	20-Minute Stability (No Gas Mode)
ICPMS.02.50	Autosampler Check
ICPMS.02.50	Autotune
ICPMS.02.50	Background (Gas Modes)
ICPMS.02.50	Background (No Gas Mode)
ICPMS.02.50	Integrated Sample Introduction System (ISIS) Check

## Autosampler Check

### Purpose

This test demonstrates that the autosampler module is correctly installed and connected. It does not test module performance.

### Setpoint

### Results

Criteria	Observed Result	Expected Result	Status
After the self test, is probe in the home position?	Yes	Yes	Pass
As commanded, is the probe positioned at vial 2?	Yes	Yes	Pass

Setpoint Status:

Pass

Runs: 1

### Overall Autosampler Check Test Status

Pass

Date: September 30, 2021 4:07:18 PM  
System ID: JP15471169

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## Integrated Sample Introduction System (ISIS) Check

### Purpose

This test demonstrates that the ISIS module is correctly installed and connected. It does not test module performance.

### Setpoint

### Results

Criteria	Observed Result	Expected Result	Status
As commanded, does the pump rotate?	Yes	Yes	Pass
As commanded, do the valves load and inject?	Yes	Yes	Pass

Setpoint Status:

Pass

Runs: 1

### Overall Integrated Sample Introduction System (ISIS) Check Test Status

Pass

Date: September 30, 2021 4:07:18 PM  
System ID: JP15471169

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## Autotune

### Purpose

This test uses traceable checkout standards to run a software-executed autotune in all modes. The tune report provides values for peak width, mass axis, sensitivity, oxide species, and doubly-charged species tests.

### Setpoint

### Results

#### Peakwidth Mass 7

Agilent Recommended:

0.719	AMU
>= 0.65	
<= 0.80	

Status:

Pass

#### Peakwidth Mass 89

Agilent Recommended:

0.750	AMU
>= 0.65	
<= 0.80	

Status:

Pass

#### Peakwidth Mass 205

Agilent Recommended:

0.713	AMU
>= 0.65	
<= 0.80	

Status:

Pass

#### Mass Axis 7

Agilent Recommended:

7.05	AMU
>= 6.9	
<= 7.1	

Status:

Pass

#### Mass Axis 89

Agilent Recommended:

88.95	AMU
>= 88.9	
<= 89.1	

Status:

Pass

#### Mass Axis 205

Agilent Recommended:

205.00	AMU
>= 204.9	
<= 205.1	

Status:

Pass

Date: September 30, 2021 4:07:18 PM  
System ID: JP15471169

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### Mass 7 Sensitivity No Gas

Agilent Recommended:

94.28	Mcps/ppm
>= 25.5	

Status:

Pass

### Mass 89 Sensitivity No Gas

Agilent Recommended:

307.15	Mcps/ppm
>= 127.5	

Status:

Pass

### Mass 205 Sensitivity No Gas

Agilent Recommended:

203.77	Mcps/ppm
>= 76.5	

Status:

Pass

### Mass 50 Sensitivity He

Agilent Recommended:

26.38	Mcps/ppm
>= 23.8	

Status:

Pass

### Mass 89 Sensitivity H2

Agilent Recommended:

129.27	Mcps/ppm
>= 68	

Status:

Pass

### Oxide Ratio 156/140

Agilent Recommended:

1.047	%
<= 1.38	

Status:

Pass

### Doubly Charged Species Ratio 70/140

Agilent Recommended:

1.482	%
<= 2.3	

Status:

Pass

Setpoint Status:

Pass

Runs: 1

### Overall Autotune Test Status

Pass

Date: September 30, 2021 4:07:18 PM  
System ID: JP15471169

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## Background (No Gas Mode)

### Purpose

This test examines the background of the ICP-MS in no gas mode by monitoring ions during a blank run.

### Setpoint

#### Conditions

Masses: 7 AMU  
89 AMU  
205 AMU

#### Measurements and Results

Masses (AMU): 7, 89, 205  
Measured Value: 3.200, 3.300, 9.600 cps  
Agilent Recommended: <= 6.9, <= 4.6, <= 11.5  
Status: Pass, Pass, Pass

Setpoint Status: Pass Runs: 1

#### Overall Background (No Gas Mode) Test Status

Pass

Date: September 30, 2021 4:07:16 PM  
System ID: JP15471169

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## Background (Gas Mode)

### Purpose

This test examines the background of the ICP-MS in the various gas modes by monitoring ions during a blank run.

Setpoint Gas Mode: Helium

#### Conditions

Mass: 78 AMU  
Integration Time: 1.0 sec  
Cycles: 20

#### Measurements and Results

Mass (AMU): 78  
Measured Value: 42.8500 cps  
Agilent Recommended: <= 115  
Status: Pass

Setpoint Status: Pass Runs: 1

Setpoint Gas Mode: Hydrogen

#### Conditions

Mass: 78 AMU  
Integration Time: 1.0 sec  
Cycles: 20

#### Measurements and Results

Mass (AMU): 78  
Measured Value: 2.1500 cps  
Agilent Recommended: <= 4.6  
Status: Pass

Setpoint Status: Pass Runs: 1

#### Overall Background (Gas Mode) Test Status

Pass

Date: September 30, 2021 4:07:16 PM  
System ID: JP15471169

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## 20-Minute Stability (No Gas Mode)

### Purpose

This test monitors the abundance of ions present in the checkout standard over a 20-minute period to verify that the signal is stable. The %RSD of the abundance of given ions is calculated internally by the software and compared to the limit.

### Setpoint

#### Conditions

Mode: Spectrum  
Masses: 7, 9, 59, 89, 140, 205  
Integration Time: 9.99 sec  
Peak Pattern: 3 points/peak  
Repetitions: 20  
Sweeps/Replicates: 100

#### Measurements and Results

Masses (AMU): 7, 89, 205  
Stability RSD: 0.96400, 0.51495, 0.73011 %  
Agilent Recommended: <= 2.3, <= 2.3, <= 2.3  
Status: Pass, Pass, Pass

Setpoint Status: Pass Runs: 1

#### Overall 20-Minute Stability (No Gas Mode) Test Status

Pass

Date: September 30, 2021 4:07:16 PM  
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## Declaration of Change Control

This document is under change control. Revision history is maintained and printed on each document. Access to the master documents is limited to process owners. Documents receive periodic review and cannot be assigned an evergreen status. The qualification performed according to this document refers only to the hardware/software configuration in place at the time of the qualification. Agilent Technologies recommends that instrument configuration change management procedures be in place in order to maintain the validation process. Any changes to the analytical or computer hardware or software must be clearly specified. A change management system provides a means for determining the degree of requalification required according to the extent of the changes made. All details of the changes must be thoroughly recorded and documented, together with details of completed tests and their results. Note: Hardware/software configuration management is the customer's responsibility.

Date: September 30, 2021 4:07:16 PM  
System ID: JP15471169

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## Attachments

Training requirements note: The delivery engineer attaches an ACE technique-specific training certificate to the Equipment Qualification Report (EQR). Obtaining ACE technique-specific certification includes pre-requisite trainings for Data Integrity, General Compliance topics (GMP, GLP, ALCOA, etc.), instrument hardware and software components, and the ACE technique itself. The one certificate encompasses all pre-requisite trainings as documented in the Agilent Learning Management System called Success Factors.

Location	Category	Document Name	Page
EQR	General	Certificate of System Qualification	18
EQR	General	Operator's training certificate and qualifications	19
EQR	General	Certificate of Qualification for ACE	20
EQR	General	Certificate of Qualification for ACE	21
EQR	General	Tune reports	22
EQR	General	Test Report	25
EQR	General	Test Report	27
EQR	General	Test Report	29

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General

Document Name: Certificate of System Qualification

**Agilent Technologies**

### Agilent Compliance Engine Self Qualification

Date: September 16, 2021 4:59:15 PM  
Drive Serial #: ADA25C9 Platform Revision: ACE 3.11

Individual self-qualification reports for each specific technique installed are also available upon request. They provide additional details on the general report from the concise summary and are structured by the actual algorithms challenged during the process. There is not a one-to-one relationship between algorithms and OQ program tests because some algorithms are used by several tests and across multiple similar hardware components of the qualified systems.

Technique Type	Tests Completed	Result
Atomic Absorption	7	Conforms
Capillary Electrophoresis	10	Conforms
Dissolution	6	Conforms
Emission Spectroscopy	3	Conforms
Gas Chromatography - GCMS	17	Conforms
Gas Chromatography	29	Conforms
Gel Permeation Chromatography	9	Conforms
ICP-MS	8	Conforms
Infrared Spectroscopy	7	Conforms
Liquid Chromatography	17	Conforms
Liquid Chromatography - LCMS	8	Conforms
Micropurification	18	Conforms
Sample Preparation - Gas Chromatography	9	Conforms
Sample Preparation - Liquid Chromatography	8	Conforms
Supercritical Fluid Chromatography	15	Conforms
Software	6	Conforms
UV-Vis Spectrophotometer	13	Conforms

Overall Qualification Status  
Conforms

Date: September 30, 2021 4:07:18 PM  
System ID: JP15471169

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General

Document Name: Operator's training certificate and qualifications

**Agilent Technologies**

### Certificate of Completion

Learner Name: Parthap Kurathain

Title Of Course: AN-CE-ICPMS-2-038-A: Agilent 7900 ICPMS FSE update training

Completion Date: June 7, 2014

Certified By Company: Learning at Agilent

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Date: September 30, 2021 4:07:18 PM  
System ID: JP15471169

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General

Document Name: Certificate of Qualification for ACE

**Agilent Technologies**

### Certificate of Completion

Learner Name: Parthap Kurathain

Title Of Course: AN-CE-SS-II-036-A: ACE 3.X User Update Training

Completion Date: July 7, 2020

Certified By Company: Learning at Agilent

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Date: September 30, 2021 4:07:18 PM  
System ID: JP15471169

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## General

Document Name: Test Report

## Batch Summary Report

Batch Folder: C:\Batch\2021\09\14\05 He-3  
Analyte File: BG He-3 batch.bln  
Tune Step: #1 He

Run	Acq. Date/Time	Data File	Sample Name	Type	Level	Duration
1	2021-09-30 14:24:47	BG He-3.d	BG He-3	Sample		1.0000

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2021-09-30 14:28:39

Date: September 30, 2021 4:07:18 PM  
System ID: JP15471169

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Document Name: Test Report

## Batch Summary Report

Run	Acq. Date/Time	Data File	Sample Name	Type	Level	Duration
1	2021-09-30 14:24:47	BG He-3.d	BG He-3	Sample		1.0000

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2021-09-30 14:28:40

Date: September 30, 2021 4:07:18 PM  
System ID: JP15471169

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## General

Document Name: Test Report

## Batch Summary Report

Batch Folder: D:\Agilent\Software\QOC\30 Sep 2021\03 H2 new bl  
Analyte File: BG H2 new batch.bln  
Tune Step: #1 H2

Run	Acq. Date/Time	Data File	Sample Name	Type	Level	Duration
1	2021-09-30 15:08:58	BG H2.d	BG H2	Sample		1.0000

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2021-09-30 15:10:31

Date: September 30, 2021 4:07:18 PM  
System ID: JP15471169

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Document Name: Test Report

## Batch Summary Report

Run	Acq. Date/Time	Data File	Sample Name	Type	Level	Duration
1	2021-09-30 15:08:58	BG H2.d	BG H2	Sample		1.0000

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2021-09-30 15:10:31

Date: September 30, 2021 4:07:18 PM  
System ID: JP15471169

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## General

Document Name: Test Report

## Batch Summary Report

Batch Folder: D:\Agilent Service\003 30 Sep 2021\23 Min\34\

Analysis File: 20 Min\batch34

Tune Step: #1 No Gas

Seq	Acq. Date-Time	Data File	Sample Name	Type	Level	Religion
1	2021-09-30 15:17:04	20 Min\c	20 Min	Sample		130002

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2021-09-30 15:46:42

Date: September 30, 2021 4:07:18 PM  
System ID: JP15471169

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Document Name: Test Report

## Batch Summary Report

## Analyte Table

Sample Name	7 / No Gas 1	8 / No Gas 1	9 / No Gas 1	10 / No Gas 1	11 / No Gas 1	12 / No Gas 1
20 Min	0.0460	7.0066	0.0007	0.0105	0.0104	0.0011

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2021-09-30 15:46:43

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Logged On User Name: panthep\_kurasathin@agilent.com  
Signature Creation Date: September 30, 2021  
Reason for Signature: Executed protocol and published this original version of document

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Date: September 30, 2021 4:07:18 PM  
System ID: JP15471169

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User Name: panthep\_kurasathin  
Hostname: ASB000X315System ID: JP15471169  
Print Date: September 30, 2021 4:07:22 PM

## ALS Q0HW 7500 30Sep21 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
September 30, 2021 3:50:07 PM	Audit	Session Created	Session	None
September 30, 2021 3:50:07 PM	Start	Configuration	Session	None
September 30, 2021 3:50:07 PM	Audit	Enrollment	Licensing	User is FieldEngineer and does not require an unlock code
September 30, 2021 3:52:52 PM	Audit	Expt. loaded	Session	EQP details for primary technique (eqpM): File path: [Protocol\Padua\Optima\Config\uniflow\72.50\eqpM\02.50.eqp] EQP File Name: [eqpM\02.50.eqp] EQP Name: [AgilentRecommended]
September 30, 2021 3:52:54 PM	End	Configuration	Session	None
September 30, 2021 3:52:57 PM	Start	Qualification	Session	QG
September 30, 2021 3:52:57 PM	Start	Execution	Autosampler Check : SP54: Autosampler Check	None
September 30, 2021 3:53:03 PM	End	Execution	Autosampler Check : SP54: Autosampler Check	Run Count : 1
September 30, 2021 3:53:04 PM	Start	Execution	Integrated Sample Introduction System (ISIS) Check : ISIS3 Integrated Sample Introduction System (ISIS) Check	None
September 30, 2021 3:53:08 PM	End	Execution	Integrated Sample Introduction System (ISIS) Check : ISIS3 Integrated Sample Introduction System (ISIS) Check	Run Count : 1

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Date: September 30, 2021 4:07:18 PM  
System ID: JP15471169

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User Name: pantiap\_kuruzathin

Hostname: ASBKKW315

System ID: JP15471169

Print Date: September 30, 2021 4:07:22 PM

ALS OQHW 7960 30Sep21 Transaction log :

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
September 30, 2021 3:53:10 PM	Start	Execution	Autotune : G8403A; Autotune 1	None
September 30, 2021 3:55:08 PM	End	Execution	Autotune : G8403A; Autotune 1	Run Count : 1
September 30, 2021 3:55:12 PM	Start	Execution	Background (No Gas Mode) : G8403A; No Gas Mode Background 1	None
September 30, 2021 3:55:40 PM	End	Execution	Background (No Gas Mode) : G8403A; No Gas Mode Background 1	Run Count : 1
September 30, 2021 3:55:43 PM	Start	Execution	Background (Gas Modes) : G8403A; Gas Mode Background Helium	None
September 30, 2021 3:56:17 PM	End	Execution	Background (Gas Modes) : G8403A; Gas Mode Background Helium	Run Count : 1
September 30, 2021 3:56:19 PM	Start	Execution	Background (Gas Modes) : G8403A; Gas Mode Background Hydrogen	None
September 30, 2021 3:56:39 PM	End	Execution	Background (Gas Modes) : G8403A; Gas Mode Background Hydrogen	Run Count : 1
September 30, 2021 3:56:41 PM	Start	Execution	20-Minute Stability (No Gas Mode) : G8403A; 20-Minute Stability (No Gas Mode) 1	None
September 30, 2021 3:57:22 PM	End	Execution	20-Minute Stability (No Gas Mode) : G8403A; 20-Minute Stability (No Gas Mode) 1	Run Count : 1
September 30, 2021 3:57:24 PM	End	Qualification	Session	OQ
September 30, 2021 3:57:24 PM	Start	Reporting	Session	None

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Date: September 30, 2021 4:07:18 PM  
System ID: JP15471169

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User Name: pantiap\_kuruzathin

Hostname: ASBKKW315

System ID: JP15471169

Print Date: September 30, 2021 4:07:22 PM

ALS OQHW 7960 30Sep21 Transaction log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
September 30, 2021 4:03:07 PM	Audit	Reporting	Session	Report Generated : Certificate
September 30, 2021 4:03:17 PM	Audit	Reporting	Session	Report Generated : Report
September 30, 2021 4:03:59 PM	Start	Qualification	Session	OQ
September 30, 2021 4:04:08 PM	End	Qualification	Session	OQ
September 30, 2021 4:04:08 PM	Start	Reporting	Session	None
September 30, 2021 4:04:26 PM	Audit	Reporting	Session	Report Generated : Certificate
September 30, 2021 4:04:36 PM	Audit	Reporting	Session	Report Generated : Report

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**Metrological Center**  
SCI ECO Services Company Limited  
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Telephone : +66 2 586 5792-4 Fax : +66 2 586 5109  
Website : www.scieco.co.th E-Mail : calibrate@scg.co.th

Certificate No. T220730

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## Certificate of Calibration

Equipment : HEATING BLOCK  
Manufacturer : Environmental Express

Model : SC 196

Serial No. : 6974CECW3285

Customer Code : BKK\_EL0054

ID No. : TS306A3

Customer : ALS Laboratory Group (Thailand) Co.,Ltd.

104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,  
Khet Suan Luang, Bangkok 10250

Customer Location : Acid Digestion Lab

Date of Receipt : 30 March 2022

Calibrated By : Watcharapon Sangtong (Technician)

Approved By : / Sujjar Naknakred (Site Calibration Manager)

Date of Issue : 17 APR 2022

REVIEW BY	Tattapan C.
APPROVED BY	
NEXT CAL. DATE	7/10/23

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

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**Metrological Center**  
SCI ECO Services Company Limited  
33/2 Moo 3, T.Banpa, A.Kaengkhioi, Saraburi 18110  
Telephone : +66 2 586 5792-4 Fax : +66 2 586 5109  
Website : www.scieco.co.th E-Mail : calibrate@scg.co.th

Certificate No. T220730

Page 2 of 6

## Calibration Report

Equipment : HEATING BLOCK  
Date of Calibration : 7 April 2022  
Environment : Temperature : 21.8-23.1 °C  
Line Voltage : 221.6-226.3 V  
Relative Humidity : 55 - 65 %RH

## Condition of this results of calibration :

1. This equipment was calibrated by insert nine standard thermocouples type T into its chamber , the other one standard thermocouples type T use for ambient temperature measurement . The calibration was done in according to WI-T20.

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	TN221-TN230	T210008	08 June 2022
TC	TYPE T	TN231-TN240	T210008	08 June 2022
DATA LOGGER	34970A	T149	T210008	08 June 2022

## 3. This certificate is traceable to :

National Institute of Metrology ( Thailand ) through Metrological Center ( NSC-TISI-TIS 17025 CALIBRATION 0244 )

## 4. Condition of calibrated item : good

## Equipment Description :

Time Constant 2 Hour 25 Minute At 95 °C  
Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max  
☐ Close  
☒ Not Available

## 5. Adjustment :

( ) without adjustment ( X ) after adjustment

Approved By:

FM-L13 108-30-05-57

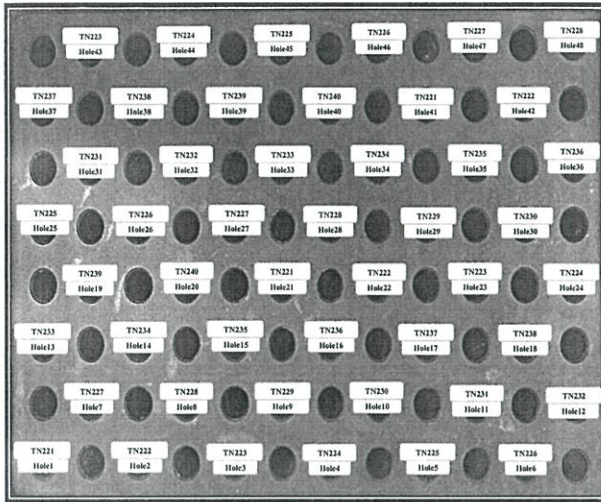




Certificate No. T220730

Page 3 of 6

### Calibration Report



FRONT CONTROL

Approved By.

FM-L13 108/30-05-57



Certificate No. T220730

Page 4 of 6

### Calibration Report

Measurement Results		Average Standard Reading at each position (°C)					
Calibration Point		TN221	TN222	TN223	TN224	TN225	TN226
R1 Hole1-Hole6	CAL POINT	Max	93.60	93.82	94.05	94.20	94.26
		Min	93.07	93.26	93.51	93.66	93.71
		Average	93.33	93.54	93.78	93.93	94.09
R2 Hole7-Hole12		TN227	TN228	TN229	TN230	TN231	TN232
	Max	94.59	94.79	94.63	94.55	94.82	95.00
	Min	94.05	94.25	94.08	93.97	94.26	94.44
R3 Hole13-Hole18		TN233	TN234	TN235	TN236	TN237	TN238
	Max	95.03	94.54	94.78	94.84	95.06	94.73
	Min	94.46	93.98	94.20	94.28	94.49	94.18
R4 Hole19-Hole24		TN239	TN240	TN221	TN222	TN223	TN224
	Max	94.89	94.82	95.73	95.85	95.73	96.10
	Min	94.33	94.26	95.51	95.62	95.51	95.85
R5 Hole25-Hole30		TN225	TN226	TN227	TN228	TN229	TN230
	Max	96.28	96.39	96.37	96.54	96.19	96.04
	Min	96.01	96.10	96.02	96.20	95.89	95.71
R6 Hole31-Hole36		TN231	TN232	TN233	TN234	TN235	TN236
	Max	96.84	96.97	97.03	96.48	96.33	95.76
	Min	96.53	96.65	96.71	96.08	95.98	95.43
R7 Hole37-Hole42		TN237	TN238	TN239	TN240	TN221	TN222
	Max	96.46	96.15	96.19	96.06	96.93	97.09
	Min	96.13	95.84	95.85	95.72	96.64	96.78
R8 Hole43-Hole48		TN223	TN224	TN225	TN226	TN227	TN228
	Max	96.91	96.58	96.13	96.19	96.34	96.19
	Min	96.55	96.21	95.80	95.87	96.03	95.88
	Average	96.73	96.40	95.96	96.03	96.18	96.03

Approved By.

FM-L13 108/30-05-57



Certificate No. T220730

Page 5 of 6

### Calibration Report

Measurement Results		Average Standard Reading at each position (°C)					
Calibration Point		TN221	TN222	TN223	TN224	TN225	TN226
R1 Hole1-Hole6	CAL POINT	Max	104.47	104.65	104.79	105.31	105.47
		Min	104.15	104.27	104.45	104.98	105.14
		Average	104.31	104.46	104.62	105.15	105.31
R2 Hole7-Hole12		TN227	TN228	TN229	TN230	TN231	TN232
	Max	105.55	105.73	105.65	105.84	105.97	106.07
	Min	105.28	105.43	105.35	105.52	105.68	105.83
R3 Hole13-Hole18		TN233	TN234	TN235	TN236	TN237	TN238
	Max	106.14	106.06	105.81	106.05	105.81	105.87
	Min	105.85	105.81	105.55	105.80	105.53	105.64
R4 Hole19-Hole24		TN239	TN240	TN221	TN222	TN223	TN224
	Max	105.86	105.60	104.44	104.51	104.28	104.78
	Min	105.61	105.37	104.27	104.35	104.12	104.61
R5 Hole25-Hole30		TN225	TN226	TN227	TN228	TN229	TN230
	Max	104.94	104.93	104.97	105.08	104.68	104.69
	Min	104.77	104.75	104.76	104.90	104.51	104.49
R6 Hole31-Hole36		TN231	TN232	TN233	TN234	TN235	TN236
	Max	105.44	105.45	105.61	104.95	104.84	104.42
	Min	105.27	105.27	105.44	104.76	104.66	104.25
R7 Hole37-Hole42		TN237	TN238	TN239	TN240	TN221	TN222
	Max	105.17	104.70	104.59	104.51	105.22	105.53
	Min	105.00	104.53	104.41	104.35	105.04	105.37
R8 Hole43-Hole48		TN223	TN224	TN225	TN226	TN227	TN228
	Max	105.61	105.45	105.10	104.77	104.87	105.02
	Min	105.44	105.28	104.92	104.60	104.70	104.85
	Average	105.53	105.37	105.01	104.69	104.79	104.93

Approved By.

FM-L13 108/30-05-57



Certificate No. T220730

Page 5 of 6

### Calibration Report

Measurement Results:

HEATING BLOCK			Temperature Distribution	
Setting (°C)	Reading (°C)		Stability (±°C)	Uncertainty (±°C)
	Min, Max	Average		
100.0	100.0, 100.4	100.1	0.29	0.83
105.0	105.0, 105.4	105.1	0.20	0.79

\* The quoted 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  $k$  which for a t-distribution, providing a level of confidence of approximately 95 %.

Approved By.

FM-L13 108/30-05-57



## Metrological Center

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoh, Saraburi 18110, Thailand.  
Saraburi Tel: +66 3627 3096 Fax: +66 3627 3100  
Bangkok Tel: +668 9205 6851, +669 8247 2360  
Website: www.scieco.co.th E-Mail: calibrate@scg.co.th



Certificate No. T211009

Page 1 of 4

### Certificate of Calibration

Equipment : Chamber (Cold Room)

Manufacturer : KOLDTECH

Model : KM 320

Serial No. : TBN-1012061/05

Customer Code : BKK\_EN0167

ID No. : T2463A3

Customer : ALS Laboratory Group (Thailand) Co.,Ltd.

104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,  
Khet Suan Luang, Bangkok 10250

Customer Location : Laboratory

Date of Receipt : 6 May 2021

Calibrated By : Watcharapon Songthong (Technician)

Approved By : Boonchai Suriyawong (Site Calibration Manager)

Date of Issue : 20 MAY 2021

REVIEW BY	<u>Sinuke P.</u>
APPROVED BY	<u>LAL AL</u>
NEXT CAL. DATE	<u>16/11/22</u>

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

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

FM-L14 11/7/01-02-64



## Metrological Center

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoh, Saraburi 18110, Thailand.



Certificate No. T211009

Page 2 of 4

### Calibration Report

Equipment : Chamber (Cold Room)

Date of Calibration : 18 May 2021

Environment : Temperature : 23.4-24.9 °C

Line Voltage : 221.4-230.2 V

Relative Humidity : 55 - 65 %RH

#### Condition of this results of calibration :

1. This equipment was calibrated by insert 16 standard thermocouples type T into its chamber, the other one standard thermocouples type T use for ambient temperature measurement. The calibration was done in according to WI-T20 (based on ASTM E145-94 (Reapproved 2001) 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	TN161-TN170	T210009	8 January 2022
TC	TYPE T	TN171-TN180	T210009	8 January 2022
DATA LOGGER	34970A	T149	T210009	8 January 2022

#### 3. This certificate is traceable to :

National Institute of Metrology ( Thailand ) through Metrological Center ( NSC-TISI-TIS 17025 CALIBRATION 0244 )

#### 4. Condition of calibrated item : good

##### Equipment Description :

Time Constant	1 Hour	Minute	At 3 °C
Fresh Air Damper	<input type="checkbox"/> Open	<input type="checkbox"/> Min	<input type="checkbox"/> Medium <input type="checkbox"/> Max
	<input type="checkbox"/> Close		
	<input checked="" type="checkbox"/> Not Available		

#### 5. Adjustment :

( X ) without adjustment

( ) after adjustment

Approved By: Boonchai

FM-L15 11/7/15-05-63



## Metrological Center

SCI ECO Services Company Limited

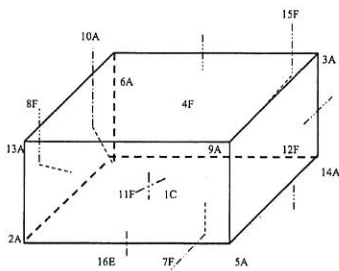
33/2 Moo 3, T.Banpa, A.Kaengkhoh, Saraburi 18110, Thailand.



Certificate No. T211009

Page 3 of 4

### Calibration Report



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

1C = TN161	12F = TN172
2A = TN162	13A = TN173
3A = TN163	14A = TN174
4F = TN164	15F = TN175
5A = TN165	16E = TN176
6A = TN166	
7F = TN167	
8F = TN168	
9A = TN169	
10A = TN170	
11F = TN171	

Approved By: Boonchai

FM-L15 11/7/15-05-63



## Metrological Center

SCI ECO Services Company Limited

33/2 Moo 3, T.Banpa, A.Kaengkhoh, Saraburi 18110, Thailand.



Certificate No. T211009

Page 4 of 4

### Calibration Report

#### Measurement Results

Calibration Point	Average Standard Reading at each position (°C)							
	TN161	TN162	TN163	TN164	TN165	TN166	TN167	TN168
3	3.23	3.38	3.23	3.41	3.36	3.52	3.51	3.11
	TN171	TN172	TN173	TN174	TN175	TN176		
	3.36	3.18	3.52	3.22	3.28	3.31		

Chamber (Cold Room)			Temperature Distribution			
Setting (°C)	Reading (°C)		Average (°C)	Stability (±°C)	Uniformity (°C)	Coverage Factor k
	Min	Max				
3.0	2.7, 3.4	3.0	3.34	1.00	1.10	1.46

\* The Accrued 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 which for a t-distribution, providing a level of confidence of approximately 95 %.

Approved By: Boonchai

FM-L15 11/7/15-05-63





TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)

CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES

534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL. 0-2717-3000-24 FAX. 0-2719-9484

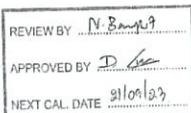


Cert.No.: 18CG4595  
Page.: 1 of 2

## Certificate of Calibration

Equipment : Burette  
Capacity : 50 mL  
Serial No. : -  
ID. No. : 243007  
Manufacturer : Witeg  
Made in : Germany  
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.  
Eastern Seaboard Industrial Estate (Rayong)  
64/77 Moo 4, Building No.B1, Highway 331, km 91.5  
T.Pluakdaeng, A.Pluakdaeng, Rayong 21140

Ambient Temperature : (22 ± 2.5) °C  
Relative Humidity : (50 ± 10) %  
Barometric Pressure : 757 mmHg  
Calibration Procedure : ASTM E 542 - 01  
Calibrated by : Natcha Chayingcheiw



Approved by :   
Approved Signatory

( ) Pornthippa Tameyakul  
( ) Malee Butkruea  
( ) Ponpan Palpim  
( ) Srisuda Khamtha

Issue Date : 27 September 2018

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

This certificate may not be reproduced other than in full, except with the prior written approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

A 0087224



Equipment : Burette  
Capacity : 50 mL  
Serial No. : -  
ID. No. : 243007  
Manufacturer : Witeg  
Received Date : 10 September 2018  
Condition As-Received : Used Item  
Calibration Date : 21 September 2018  
Reference : 1809-0411DPC

Cert.No.: 18CG4595  
Page.: 2 of 2

### Condition of this result of calibration

1. Reference Standard Instruments :

Instruments	Model	Serial No.	ID. No.	Certificate No.	Traceability	Due date
1) Balance	XP205DR	1126143764	140RC004	18MM1	NIMT	2 Jan 2019

This certification is traceable to SI Unit

2. This certificate was certified only for the measuring instrument we calibrated.  
3. This result of calibration was found accurate as shown on date and place of calibration only.  
4. True value is converted to true volume at the standard temperature of 20 °C

### Calibration result :

Nominal capacity ( mL )	Reading ( mL )	Uncertainty ( ± mL )	k Factor
50	49.9901	0.010	2.00

Remark mL = cm<sup>3</sup>

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%.

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a 0901034

RYG\_EN0029



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)

CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES

534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL. 0-2717-3000-27 FAX. 0-2719-9484



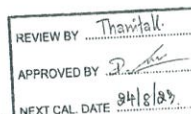
Cert.No.: 22CH283  
Page.: 1 of 2

## Certificate of Calibration

Equipment : Conductivity Meter  
Manufacturer : Mettler Toledo  
Model : S230  
Serial No. : B241407147  
ID No. : RYG\_EN0029  
Condition As-Received : Used Item  
Received Date : 22 February 2022  
Calibration Date : 23 February 2022  
Reference : 2202-0732DSC-1  
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd. (Rayong Branch)  
616/10 Moo 5 T.Maenam Khu, A.Pluakdaeng,  
Rayong 21140, Thailand

Ambient Temperature : (25 ± 2.5) °C  
Relative Humidity : (50 ± 15) %  
Calibration Procedure : In-house method :  
- CP-CH6 : based on direct measurement by  
using certified reference material (CRM)

Calibrated by : Walailak Sirithan



Approved by :   
Approved Signatory

( ) Malee Butkruea  
( ) Sathip Meangmai  
( ) Warakorn Lernagatrakul

Issue Date : 25 February 2022

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

This certificate may not be reproduced other than in full, except with the prior written approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

A 0038145



Cert.No.: 22CH283  
Page.: 2 of 2

### Condition of this result of calibration

1. Reference Standard Instrument :-

Instrument	Serial No.	ID No.	Certificate No.	Due date
1) Thermometer	9549224	130RC003	211451	15 Apr 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 :-  
- Conductivity calibration solution, CPA chem Ltd., The measurement results are traceable to SI through CPA chem Ltd., ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

Conductivity Solution	Manufacturer	Lot No.	Exp. date
84.000 µS/cm	CPA Chem	754034	28 June 2022
1413.0 µS/cm	CPA Chem	766815	04 Sep 2022
12.880 mS/cm	CPA Chem	761022	02 Aug 2022

- Control Conductivity calibration solution temperature by Water bath (25±0.1) °C  
3. This certificate is valid only to the item calibrated on date and place of calibration.

### Calibration results

Function : Conductivity Measurement

(\*) After Adjustment at 1413.0 µS/cm

Conductivity Electrode Serial No.: 5821441030

Standard Conductivity Solution	Before Adjustment UUC* Reading	After Adjustment UUC* Reading	Uncertainty of Measurement ( ± )	Coverage factor k
84.000 µS/cm	82.4 µS/cm	84.4 µS/cm	0.62 µS/cm	2.00
1413.0 µS/cm	1375 µS/cm	1413 µS/cm	9.2 µS/cm	2.00
12.880 mS/cm	12.54 mS/cm	12.81 mS/cm	0.086 mS/cm	2.00

Remark - UUC\* = Unit Under Calibration  
- Cell constant = 0.555236 cm<sup>-1</sup>

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%.

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a 1090534

ภาคผนวก จ

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สำเนาหนังสืออนุญาตขึ้นทะเบียน  
ห้องปฏิบัติการวิเคราะห์



ผู้อำนวยการกองวิจัยและเตือนภัยสัตว์พิษ  
 ผู้อำนวยการกองวิจัยและเตือนภัยสัตว์พิษ

๓๒) นายสมบุรณ์ บุตรจันทร์  
๓๓) นายวิรัตน์ โยธะนา  
๓๔) นายบุญเทศ ทรัพย์น  
๓๕) นายจิรวัฒน์ ชาวละอ  
๓๖) นายสมโภช วัฒนา  
๓๗) นายอิทธิ นามฤ  
๓๘) นายอัฐินันท์ ป่านประเสริฐ  
๓๙) นายอิศวรรร จ่อสาร  
๔๐) นายประเสริฐ ธรรมะชัย  
๔๑) นายบุญฤ จันทะนิยม  
๔๒) นายพิทักษ์ ทองอุณปิศา  
๔๓) นายภาณุเดช ทองน  
๔๔) นายอนุวัตร ม่วงเพ  
๔๕) นายเจตนากร ปิตะระ  
๔๖) นายบุญณะ สายวรรณ  
๔๗) นายพิชัย บุญชัย  
๔๘) นายภาณุพงศ์ ไชยวงศ์  
๔๙) นายสามารถ คู่มป  
๕๐) นายอัฐิชัย โกกริน  
๕๑) นายอัฐิชาติ ศรีประเสริฐ  
๕๒) นายชวัลชัย นาคพน  
๕๓) นายพรหมชัย สัท  
๕๔) ว่าที่ร้อยตรี สมเกียรติ แสน  
๕๕) นายสิทธิโชค ชาติ  
๕๖) นายอนามร อินสุ  
๕๗) นายสุวรรณชัย ชาติ  
๕๘) นางสาวพิมพ์ขวัญ มีนา  
๕๙) นางสาวเพ็ชรรัตน์ หิ  
๖๐) นางสาวกาญจนาพร  
๖๑) นายอภิชาติ หวั  
๖๒) นายเจริญ น  
๖๓) นายพิชิตชัย สุข  
๖๔) นายณรรพนธ์ หิ  
๖๕) นายศุภยพล ส  
๖๖) นายทักษิณัย สุ  
๖๗) นายเพชรพร น  
๖๘) นายอิทธิพล วัฒ  
๖๙) นายอรรถพร น

[illegible]

(นายศิริระ จันทร์เจ็ด)

นักวิทยาศาสตร์จำนวนมากที่เกษียณอายุราชการแล้ว  
ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน  
เพื่อพิจารณาการปนเปื้อนสิ่งแวดล้อมในเขตอุตสาหกรรม

๑๐๕) นายสมชาย...

- ๓๐๙) นายสนพชัย อุบลนิ่ม
- ๓๑๐) นายสุวิทย์ คุนยสุรัตน์
- ๓๑๑) นายพนทวิทย์ สาริน
- ๓๑๒) นายปิยะนัฐ พลมงคลศรี
- ๓๑๓) นายพชรศักดิ์ โสมะขันธ์
- ๓๑๔) นายพิพัฒน์ เก้าท่า
- ๓๑๕) นายมานพคุณท์ มานิชย์
- ๓๑๖) นายมงคล สลาพิทักษ์
- ๓๑๗) นายนิรันดร์ พูลศิริ
- ๓๑๘) นายสิริวันทน์ ทองชัย
- ๓๑๙) นายอนนชา พันสนธิ์
- ๓๒๐) นายอดิศักดิ์ เปรมทิพย์
- ๓๒๑) นายอนันต์ฐานะ วิรมล
- ๓๒๒) นายณัฐเศรษฐ์ เชิดเดชอง
- ๓๒๓) นายวราวุธ คุ้ม
- ๓๒๔) นายแสงตะวัน นาคะสิทธิ์
- ๓๒๕) นายยุทธพงศ์ วัฒนะ
- ๓๒๖) นายชัชฌาณัฐ โขยธนะจปี
- ๓๒๗) นายวิรุฑฐ ธีรธรรมาน
- ๓๒๘) นายนาทพงศ์ เมธีเกื้ออง
- ๓๒๙) นายกัณธิ์ สุทธะ
- ๓๓๐) นางสาวณัฐฎาภรณ์ วัชรพะวง
- ๓๓๑) นางสาวประทุมมาธิ์ บุตรพรหม
- ๓๓๒) นางสาวนิภาลัยย์ นามพรม
- ๓๓๓) นางสาวพัชรินทร์ นามสร้อย
- ๓๓๔) นายไพโรจน์ เปรมทิพย์
- ๓๓๕) นางสาวศุภมาดา ทองมาก
- ๓๓๖) นางสาวธลิตา จิตธรรมาวง
- ๓๓๗) นางสาวมาลีพร เล็กอุทัย
- ๓๓๘) นางสาวกัญญาพร คำเต็ม
- ๓๓๙) นางสาวสกุฎสินท์ กาญจน
- ๓๔๐) นางสาวกาญจนาภา ภาณุ
- ๓๔๑) นางสาวไพโรจน์ ศรีบุญ
- ๓๔๒) นางสาวทิพพริมา ศรีบุญญา
- ๓๔๓) นางสาวสาธิตา ปานทอง
- ๓๔๔) นางสาวอรวิภา หอมทอง
- ๓๔๕) นางสาวอรุณมา คำอ่อง

[illegible]

(นายศิริระ จันทร์เจ็ด

ผู้อำนวยการกองวิจัยและฝึกอบรมนิเทศวิทยา  
ผู้อำนวยการกองวิจัยและฝึกอบรมนิเทศวิทยา

๑๕๖) นางสาวชดาภรณ์...

- ๓๔๖) นางสาวสุคนธ์กร นิสกรบรา
- ๓๔๗) นางสาวสุภาวรินทร์ นามประเสริฐ
- ๓๔๘) นางสาวสุวิภากร เวียงคานา
- ๓๔๙) นางสาวสิริญาญ์พรีย์ ศรีจิตวิภา
- ๓๕๐) นางสาวสิริยาณี ศรีจันทร์
- ๓๕๑) นายสุกัญญาธิ์ เอี่ยมเทศ
- ๓๕๒) นายศิริวิรัตน์ พาพันธ์
- ๓๕๓) นางสาวศุภรดา นิ่มมูจร
- ๓๕๔) นางสาวศุภาพร คุณนภา
- ๓๕๕) นางสาวจิราจก พงศา
- ๓๕๖) นางสาวสราภรณ์ วัชร
- ๓๕๗) นางสาวอรภากร มีสุข
- ๓๕๘) นางสาวจิณิฉา ประทีปอสุภ
- ๓๕๙) นางสาวอัสรา ปริญญาธรรม
- ๓๖๐) นางสาววิรัชชา นาคพจน
- ๓๖๑) นางสาวกานทิยา ขจรพันธ์
- ๓๖๒) นางสาวนันทิยา ขจรพันธุ์

ทะเบียนเลขที่ 7-๖๐๘-๔-๑๓๕๗  
ทะเบียนเลขที่ 7-๖๐๘-๔-๑๓๕๖  
ทะเบียนเลขที่ 7-๖๐๘-๔-๑๓๕๕  
ทะเบียนเลขที่ 7-๖๐๘-๔-๑๓๕๔  
ทะเบียนเลขที่ 7-๖๐๘-๔-๑๓๕๓  
ทะเบียนเลขที่ 7-๖๐๘-๔-๑๓๕๒  
ทะเบียนเลขที่ 7-๖๐๘-๔-๑๓๕๑  
ทะเบียนเลขที่ 7-๖๐๘-๔-๑๓๕๐  
ทะเบียนเลขที่ 7-๖๐๘-๔-๑๓๔๙  
ทะเบียนเลขที่ 7-๖๐๘-๔-๑๓๔๘  
ทะเบียนเลขที่ 7-๖๐๘-๔-๑๓๔๗  
ทะเบียนเลขที่ 7-๖๐๘-๔-๑๓๔๖  
ทะเบียนเลขที่ 7-๖๐๘-๔-๑๓๔๕

১২৭২.

(นายศิระ จันทรเฑฐ)

เอกสารแนบท้ายหนังสือรับคำอายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน  
บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด  
ที่ อก ๐๓๑๐(๑)/ ๑๐๖๕ ลงวันที่ ๒๘ มกราคม

ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๓๖๑ รายการ

น้ำเสีย จำนวน 59 รายการ

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

(นางวิภาณูจน์ ฉัตรสกุลวิไล)

ผู้ชำนาญการกลุ่มมาตรฐานวิชาการ/ภาระหน้าที่ของสมาชิก  
และทะเบียนข้อมูลทั่วไป



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

วิมล  
(นางสาวกัญจน์ ชัยสกุลวิไล)  
ผู้อำนวยการศูนย์มาตรฐานวิธีการวิเคราะห์ทดสอบผลิตภัณฑ์  
กรมส่งเสริมการค้าระหว่างประเทศ

44 Methomyl...

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

น้ำดื่ม จำนวน 126 รายการ

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

วิมล  
(นางสาวกัญจน์ ชัยสกุลวิไล)  
ผู้อำนวยการศูนย์มาตรฐานวิธีการวิเคราะห์ทดสอบผลิตภัณฑ์  
กรมส่งเสริมการค้าระหว่างประเทศ

3 Aldrin...

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

วิมล  
(นางสาวกัญจน์ ชัยสกุลวิไล)  
ผู้อำนวยการศูนย์มาตรฐานวิธีการวิเคราะห์ทดสอบผลิตภัณฑ์  
กรมส่งเสริมการค้าระหว่างประเทศ

18 Bis(2-ethylhexyl)phthalate...


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

วิมล  
(นางสาวกัญจน์ ชัยสกุลวิไล)  
ผู้อำนวยการศูนย์มาตรฐานวิธีการวิเคราะห์ทดสอบผลิตภัณฑ์  
กรมส่งเสริมการค้าระหว่างประเทศ

34 Chromium (III)...



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

  
 (นางธิกาญจน์ นัตถกุลชัยโต)  
 ผู้อำนวยการศูนย์มาตรฐานวิธีการทางห้องปฏิบัติการ  
 กรมควบคุมมลพิษ


51 cis-1,2-Dichloroethylene...

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

  
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68 Fluorene...

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

  
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84 Methanol...


ลำดับที่	สารเคมี	วิธีวิเคราะห์
84	Methanol	1) Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup> 2) Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
85	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
86	Methyl Bromide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
87	Methylene Chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
88	2-Methylphenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
89	2-Methylnaphthalene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
90	Methyl tert-Butyl Ether	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
91	Naphthalene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
92	Nickel	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
93	Nitrobenzene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
94	N-Nitrosodiphenylamine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
95	N-Nitrosodi-n-Propylamine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
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 <sup>(4)</sup>

  
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97 Pentachlorophenol...



ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
97	Pentachlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
98	pH	Electrometric Method <sup>(4)</sup>
99	Phenanthrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
100	Phenol	1) Distillation, Direct Photometric Method <sup>(4)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
101	Pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
102	Selenium	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
103	Silver	1) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>(4)</sup>
104	Styrene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
105	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
106	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
107	Toluene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
108	Toxaphene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
109	TPH (C <sub>9</sub> -C <sub>6</sub> )	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(13,24)</sup>
110	TPH (C <sub>9</sub> -C <sub>16</sub> )	Solvent Extraction, Gas Chromatographic Method <sup>(9,21)</sup>
111	TPH (C <sub>16</sub> -C <sub>33</sub> )	Solvent Extraction, Gas Chromatographic Method <sup>(9,21)</sup>
112	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>
113	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>(4)</sup>


  
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114 1,1,2-Trichloroethane...

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


จากภาคเสีย (ป่องระเหย) จำนวน 16 รายการ

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

  
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3 Carbon Monoxide...


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

  
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สิ่งปฏิกูล...

สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน 35 รายการ

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

  
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6 Cadmium...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
6	Cadmium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1.6.15)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1.6.16)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7.15)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7.16)</sup>
7	Chlordane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1.9.25)</sup> 2) Soxhlet Extraction, Gas Chromatographic Method <sup>(10.22)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic Method <sup>(22.31)</sup>
8	Chromium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1.6.15)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1.6.16)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7.15)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7.16)</sup>
9	Chromium (III)	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method; Waste Extraction, Colorimetric Method; Calculation Method <sup>(1.6.15,17)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method; Waste Extraction, Colorimetric Method; Calculation Method <sup>(1.6.16,17)</sup> 3) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation Method <sup>(7.15,17)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation Method <sup>(7.16,17)</sup>
10	Chromium (VI)	1) Waste Extraction, Colorimetric Method <sup>(1.6.17)</sup> 2) Alkaline Digestion, Colorimetric Method <sup>(16.17)</sup>

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11 Cobalt...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
11	Cobalt	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1.6.15)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1.6.16)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7.15)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7.16)</sup>
12	Copper	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1.6.15)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1.6.16)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7.15)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7.16)</sup>
13	2,4-D	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1.9.25)</sup> 2) Soxhlet Extraction, Gas Chromatographic Method <sup>(10.22)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic Method <sup>(22.31)</sup>
14	DDD	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1.9.25)</sup> 2) Soxhlet Extraction, Gas Chromatographic Method <sup>(10.22)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic Method <sup>(22.31)</sup>
15	DOE	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1.9.25)</sup> 2) Soxhlet Extraction, Gas Chromatographic Method <sup>(10.22)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic Method <sup>(22.31)</sup>
16	DDT	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1.9.25)</sup>

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2) Soxhlet...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
17	Dieldrin	2) Soxhlet Extraction, Gas Chromatographic Method <sup>(10.22)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic Method <sup>(22.31)</sup>
18	Endrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1.9.25)</sup> 2) Soxhlet Extraction, Gas Chromatographic Method <sup>(10.22)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic Method <sup>(22.31)</sup>
19	Heptachlor	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1.9.25)</sup> 2) Soxhlet Extraction, Gas Chromatographic Method <sup>(10.22)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic Method <sup>(22.31)</sup>
20	Lead	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1.6.15)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1.6.16)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7.15)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7.16)</sup>
21	Lindane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1.9.25)</sup> 2) Soxhlet Extraction, Gas Chromatographic Method <sup>(10.22)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic Method <sup>(22.31)</sup>
22	Mercury	1) Waste Extraction, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>(1.6.18)</sup> 2) Waste Extraction...

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2) Waste Extraction...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
23	Methoxychlor	2) Waste Extraction, Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method <sup>(1.6.19)</sup> 3) Waste Extraction, Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method <sup>(1.6.20)</sup> 4) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>(18)</sup> 5) Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method <sup>(19)</sup> 6) Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method <sup>(20)</sup>
24	Mirex	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1.9.25)</sup> 2) Soxhlet Extraction, Gas Chromatographic Method <sup>(10.22)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic Method <sup>(22.31)</sup>
25	Molybdenum	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1.6.15)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1.6.16)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7.15)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7.16)</sup>
26	Nickel	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1.6.15)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1.6.16)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7.15)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7.16)</sup>

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
27 Polychlorinated...



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 <sup>(1,9,23)</sup> 2) Soxhlet Extraction, Gas Chromatographic Method <sup>(10,23)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic Method <sup>(22,31)</sup>

  
 28 Pentachlorophenol...  
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ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
28	Pentachlorophenol	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1,9,23)</sup> 2) Soxhlet Extraction, Gas Chromatographic Method <sup>(10,22)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic Method <sup>(22,31)</sup> Electrometric Method <sup>(29,30)</sup>
29	pH	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1,6,15)</sup>
30	Selenium	2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1,6,14)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7,15)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,14)</sup>
31	Silver	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1,6,15)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1,6,14)</sup>
32	Thallium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1,6,15)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1,6,14)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7,15)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,14)</sup>
33	Toxaphene	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1,9,23)</sup> 2) Soxhlet Extraction, Gas Chromatographic Method <sup>(10,22)</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic Method <sup>(22,31)</sup>
34	Vanadium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1,6,15)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1,6,14)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7,15)</sup>

  
 4) Digestion...  
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ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
35	Zinc	4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,14)</sup> 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1,6,15)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(1,6,14)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(7,15)</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,14)</sup>

พิมพ์ จำนวน 125 รายการ

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

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

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

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40 DDE...

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

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57 Dieldrin...

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

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71 Hexachlorobenzene...

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

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2) Thermal...



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

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- Aroclor 1242...

ลำดับที่	สารเคมี	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',3,4,4',5'-Heptachlorobiphenyl - 2,2',3,4,4',5,5'-Heptachlorobiphenyl - 2,2',3,4,4',5,5',6'-Heptachlorobiphenyl - 2,2',3,4,4',5,5',6'-Nonachlorobiphenyl - Pentachlorophenol	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(25,31)</sup> Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(25,31)</sup> Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(25,31)</sup> Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(25,31)</sup>
97	Phenanthrene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(25,31)</sup>
98	Phenol	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(25,31)</sup>
99	Pyrene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(25,31)</sup>
100		

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101 Selenium...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
101	Selenium	1) Digestion, Inductively Coupled Plasma Method <sup>(7,15)</sup> 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,14)</sup>
102	Silver	1) Digestion, Inductively Coupled Plasma Method <sup>(7,15)</sup> 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>(7,14)</sup>
103	Styrene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(14,24)</sup>
104	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(14,24)</sup>
105	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(14,24)</sup>
106	Toluene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(14,24)</sup>
107	Toxaphene	1) Soxhlet Extraction, Gas Chromatographic Method <sup>(10,22)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(25,31)</sup>
108	TPH (C <sub>5</sub> -C <sub>8</sub> )	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(14,24)</sup>
109	TPH (C <sub>8</sub> -C <sub>16</sub> )	1) Solvent Extraction, Gas Chromatographic Method <sup>(12,21)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic Method <sup>(25,31)</sup>
110	TPH (C <sub>16</sub> -C <sub>35</sub> )	1) Solvent Extraction, Gas Chromatographic Method <sup>(12,21)</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic Method <sup>(25,31)</sup>
111	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(14,24)</sup>
112	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(14,24)</sup>
113	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(14,24)</sup>
114	Trichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(14,24)</sup>
115	2,4,5-Trichlorophenol	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(25,31)</sup>

วิมล  
(นางวิมล ชัยกุลวิไล)  
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116 2,4,6-Trichlorophenol...

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

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
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ผู้อำนวยการศูนย์บริการวิชาการและทดสอบผลิตภัณฑ์

7. United States...




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กรมทรัพยากรทางทะเลและชายฝั่ง

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ผู้อำนวยการศูนย์อนุรักษ์ทรัพยากรทางทะเลและชายฝั่ง  
กรมทรัพยากรทางทะเลและชายฝั่ง

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบและประเมินผลปฏิบัติการ การวิจัยและพัฒนาระบบข้อมูลสารสนเทศ กรมทรัพยากรทางทะเลและชายฝั่ง



ที่ อก ๐๓๓๐(๓)/ ๒๕๖๐

กรมโรงงานอุตสาหกรรม  
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท  
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐๐

๒๕ มิถุนายน ๒๕๖๕

เรื่อง ขันทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท เอลเอส แลบริทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และขอขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ลงวันที่ ๒๔ เมษายน ๒๕๖๔

สิ่งที่ส่งมาด้วย เอกสารแบบฟอร์มขอขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน บริษัท เอลเอส แลบริทอรี กรุ๊ป (ประเทศไทย) จำกัด จำนวน ๒ แผ่น

ตามที่หนังสืออ้างถึง บริษัท เอลเอส แลบริทอรี กรุ๊ป (ประเทศไทย) จำกัด ขอขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน พร้อมรายชื่อผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ และรายการสารเคมีที่จะทำการวิเคราะห์ ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท เอลเอส แลบริทอรี กรุ๊ป (ประเทศไทย) จำกัด ขันทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน มีเลขทะเบียน ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๓๐ อนุมัติ ๕ ตำแหน่งแล้ว ๕ ตำแหน่งคงเหลือ ๒ ตำแหน่ง โดยเรียงลำดับดังนี้

- |  |                                   |
|--|-----------------------------------|
| ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์    |                                   |
| ๑) นายเดช ช้างชน                           | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๓๐ |
| ๒) นางวิลาวัลย์ บริรักษ์                   | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๓๑ |
| ๓) นายสุพจน์ สลามาณะ                       | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๓๒ |
| ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ |                                   |
| ๑) นางสาวณัฐพร บรรจงกิจ                    | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๓๓ |
| ๒) นางพนา สิตา                             | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๓๔ |
| ๓) นางสาวนิตา กุลสุริวงศ์                  | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๓๕ |
| ๔) นายพิทยา ทองแดง                         | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๓๖ |
| ๕) นางชลธิชา สุนภก                         | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๓๗ |
| ๖) ว่าที่ ร.ต.มณชัย ม่วงมา                 | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๓๘ |
| ๗) นายวรวิทย์ ทับพา                        | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๓๙ |
| ๘) นายศักดิ์รินทร์ จรัสกาย                 | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๔๐ |
| ๙) นายสุรศักดิ์ สาขิน                      | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๔๑ |
| ๑๐) นางสาวพรพรรณ ภาณุตานนท์                | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๔๒ |
| ๑๑) นายสุภากร ภาณุแก้ว                     | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๔๓ |
| ๑๒) นายสุพจน์ศิริวงศ์ โชติพิพัฒน์          | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๔๔ |

๑๓) นายวิมล...

- |                                  |                                   |
|----------------------------------|-----------------------------------|
| ๑๓) นายวิมล หันไชยเนาว์          | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๔๕ |
| ๑๔) นางสาวนาลิ เจริญตระกูล       | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๔๖ |
| ๑๕) นางสาวนิตา ผดุงจิตต์         | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๔๗ |
| ๑๖) นายธนสิทธิ์ วงศ์ไชย          | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๔๘ |
| ๑๗) นายชัยนุสรณ์ เลิศนันทกุลชัย  | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๔๙ |
| ๑๘) นายสิริจ่า เพ็ชรแสง          | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๕๐ |
| ๑๙) นายกันตพล มณีสัมพันธ์        | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๕๑ |
| ๒๐) นางสาวจันทิพย์ โกเมนชนะ      | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๕๒ |
| ๒๑) นายชวรินทร์ อธิกุลนาค        | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๕๓ |
| ๒๒) นายศุภณัฐ พิสิษฐ์พันธ์       | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๕๔ |
| ๒๓) นายศุภชัย วงศ์สุริยา         | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๕๕ |
| ๒๔) นายปฐมพงศ์ กรสวัช            | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๕๖ |
| ๒๕) นายโสภณ ดันไธ                | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๕๗ |
| ๒๖) นางสาวกิตติยา สันติยาภิรักษ์ | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๕๘ |
| ๒๗) นางสาวเจษฎาพร ศรีบุญเรือง    | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๕๙ |
| ๒๘) นางสาวมธุรินทร์ สิงห์        | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๖๐ |
| ๒๙) นางสาววิภาวดี ศิริมงคล       | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๖๑ |
| ๓๐) นายพิพัฒน์ นิพัทธ์เศรษฐ์     | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๖๒ |
| ๓๑) นายศิริวิทย์ เจริญ           | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๖๓ |
| ๓๒) นายปารเมศ สัตยาคุณ           | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๖๔ |
| ๓๓) นายณัฐภาพ ธรรมะโร            | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๖๕ |
| ๓๔) นางสาวกัญจรัตน์ โสจันทร์     | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๖๖ |
| ๓๕) นายพชรกร อินทรเสนา           | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๖๗ |
| ๓๖) นายพิวกร เชื้อมาก            | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๖๘ |
| ๓๗) นายอนุวัชร ทองเจริญศักดิ์    | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๖๙ |
| ๓๘) นายอภิชาติ วิลาศ             | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๗๐ |
| ๓๙) นายจรัสสะวี ศรีรักษา         | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๗๑ |
| ๔๐) นายประสาธมิตร เชื้อเพชร      | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๗๒ |
| ๔๑) นายภาณุวัฒน์ วัชร            | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๗๓ |
| ๔๒) นายสันติ ชัยชนะ              | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๗๔ |
| ๔๓) นายสิทธิชัย แก้วกัญ          | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๗๕ |
| ๔๔) นายทินกร กุลชาติ             | ทะเบียนเลขที่ ๖-๒๒๒๓-๑-๒๕๖๕๑๓๒๖๗๖ |

ค. ขอขานสารเคมีที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย จำนวน ๑๔ รายการ  
อากาศเสีย (ปล่อยระบาย) จำนวน ๗ รายการ และน้ำใต้ดิน จำนวน ๓ รายการ รวมทั้งสิ้นจำนวน ๒๔ รายการ  
ตามที่ส่งมาด้วย



หนังสือฉบับนี้มีอายุ ๓ ปี นับจากวันที่กรมโรงงานอุตสาหกรรมออกหนังสือ หากประสงค์จะต่ออายุหนังสือขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอต่อกรมโรงงานอุตสาหกรรมภายใน ๓๐ วัน ก่อนวันสิ้นอายุของหนังสือขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ซึ่งคำขอต่ออายุดังกล่าวขอรับได้ที่กรมโรงงานอุตสาหกรรม

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

  
(นางจินดา เศษะรินทร์)  
ผู้อำนวยการศูนย์และห้องปฏิบัติการวิเคราะห์เอกชน  
ปฎิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม  
๒๘ มิ.ย. ๒๕๖๕

กองวิจัยและเตือนภัยมลพิษโรงงาน  
ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก  
โทร. ๐ ๒๘๐๕ ๙๖๖๑-๓  
ไปรษณีย์อิเล็กทรอนิกส์ : eicw@edw.mail.go.th

เอกสารแนบท้ายหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน  
บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด เลขทะเบียน ว-๓๒๓  
ที่ อก ๐๓๑๐(๓)/ ๒๔๗๐ ลงวันที่ ๒๘ มิถุนายน ๒๕๖๕

ขอขยายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๒๔ รายการ  
น้ำเสีย จำนวน 14 รายการ

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

อากาศเสีย (ปล่อยระบาย) จำนวน 7 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Carbon Monoxide	1) Sampling Bag, Non-Dispersive Infrared Method <sup>(3)</sup> 2) Instrumental Analyzer Method <sup>(4)</sup>
2	Hydrogen Sulfide	Absorption Sampling, Iodometric Method <sup>(3)</sup>
3	Opacity	Ringelmann's Method <sup>(3,4)</sup>
4	Oxide of Nitrogen	1) Absorption Sampling, Phenoldisulfonic Acid Method <sup>(4)</sup> 2) Instrumental Analyzer Method <sup>(3)</sup>
5	Sulfur Dioxide	1) Absorption Sampling, Barium-Thorin Titrimetric Method <sup>(3)</sup> 2) Instrumental Analyzer Method <sup>(1,3)</sup>

  
(นางสาววิชุดา สัมฤทธิ์ผล)  
ผู้อำนวยการ

ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก

Sulfuric Acid...


ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
6	Sulfuric Acid	Isokinetic Sampling, Barium - Thorin Titrimetric Method <sup>(4)</sup>
7	Total Suspended Particulate	Isokinetic Sampling, Gravimetric Method <sup>(1)</sup>

น้ำใต้ดิน จำนวน 3 รายการ

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

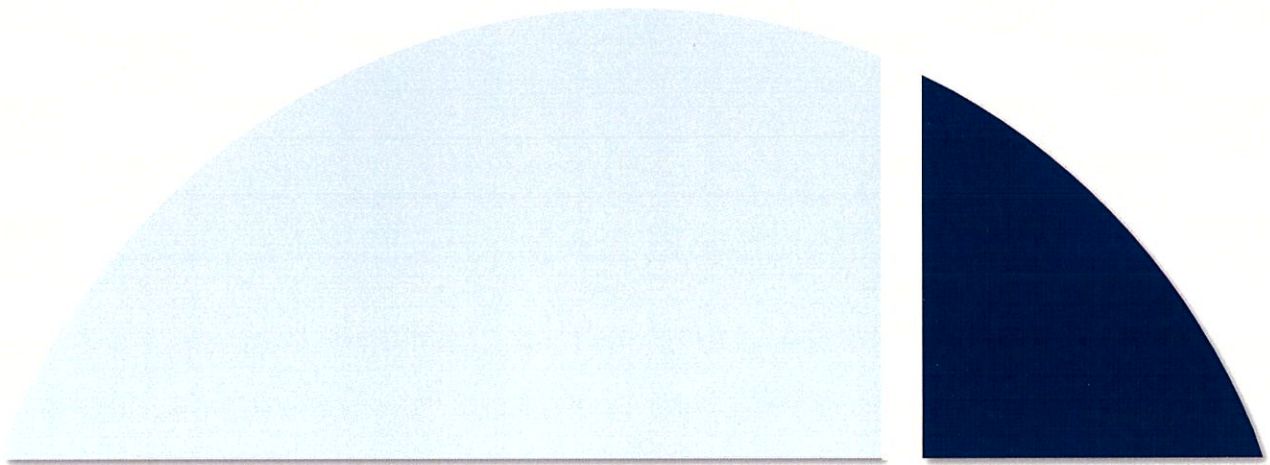
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(นางสาววิชุดา สัมฤทธิ์ผล)  
ผู้อำนวยการ

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ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก กองวิจัยและเตือนภัยมลพิษโรงงาน กรมโรงงานอุตสาหกรรม โทร ๐ ๒๘๐๕ ๙๖๖๑-๓



บริษัท เอแอลเอส แลборาทอรี กรุ๊ป (ประเทศไทย) จำกัด

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