

ภาคผนวก ง

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ใบรับรองการสอบเทียบเครื่องมือ

High Volume Air Sampler Calibration Worksheet

Project Site: WML Surface Industrial Land Co., Ltd.  
Calibrator Location: WML Surface Industrial Land Co., Ltd.  
Calibration Date: 11-Oct-23  
Calibration Sheet No.: C-111021-BKK-F30364  
Calibrator ID: BKK-F30325  
Calibrator Model: TE-5020A  
Calibrator S/N: 2305  
Barometric Pressure (mm Hg): 757  
Temperature (°C): 32  
High Volume ID: BKK-F30364  
High Volume Model: TE-5020A  
High Volume S/N: 4376  
Calibrator Slope: 1.0029  
Calibrator Intercept: -0.0224  
Linear Regression:  $y = 50.646x - 12.881$

Test No. Delta H<sub>2</sub>O (mm) Q<sub>air</sub> (m³/min) F-Chart (CFM) Slope Intercept Correlation Coefficient

1 3.2 1.0781 60 50.646 -12.881 0.9999

2 4.0 1.3195 80 50.646 -12.881 0.9999

3 4.3 1.2432 50 50.646 -12.881 0.9999

4 5.1 1.3729 50 50.646 -12.881 0.9999

5 5.0 1.4418 60 50.646 -12.881 0.9999

Calibrated by: [Signature] Approved by: [Signature]

(Mr. Theerachai Subhan) (Mr. Noppang Intanang) Field Scientist(2) Senior Field Coordinator Scientist(1)

FORM NO. F-06-071 REVISION NO.: 0008 DATE: 14/03/16

High Volume Air Sampler Calibration Worksheet

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Calibrator S/N: 2305  
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Temperature (°C): 32  
High Volume ID: BKK-F30364  
High Volume Model: TE-5020A  
High Volume S/N: 4376  
Calibrator Slope: 1.0029  
Calibrator Intercept: -0.0224  
Linear Regression:  $y = 49.218x - 9.3461$

Test No. Delta H<sub>2</sub>O (mm) Q<sub>air</sub> (m³/min) F-Chart (CFM) Slope Intercept Correlation Coefficient

1 3.2 1.0781 60 49.218 -9.3461 0.9999

2 4.0 1.3195 80 49.218 -9.3461 0.9999

3 4.3 1.2432 50 49.218 -9.3461 0.9999

4 5.1 1.3729 50 49.218 -9.3461 0.9999

5 5.0 1.4418 60 49.218 -9.3461 0.9999

Calibrated by: [Signature] Approved by: [Signature]

(Mr. Theerachai Subhan) (Mr. Noppang Intanang) Field Scientist(2) Senior Field Coordinator Scientist(1)

FORM NO. F-06-071 REVISION NO.: 0008 DATE: 14/03/16

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Calibrator ID: BKK-F30325  
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Calibrator S/N: 2305  
Barometric Pressure (mm Hg): 757  
Temperature (°C): 32  
High Volume ID: BKK-F30364  
High Volume Model: TE-5020A  
High Volume S/N: 4376  
Calibrator Slope: 1.0029  
Calibrator Intercept: -0.0224  
Linear Regression:  $y = 45.185x - 9.3461$

Test No. Delta H<sub>2</sub>O (mm) Q<sub>air</sub> (m³/min) F-Chart (CFM) Slope Intercept Correlation Coefficient

1 3.2 1.0781 60 45.185 -9.3461 0.9999

2 4.0 1.3195 80 45.185 -9.3461 0.9999

3 4.3 1.2432 50 45.185 -9.3461 0.9999

4 5.1 1.3729 50 45.185 -9.3461 0.9999

5 5.0 1.4418 60 45.185 -9.3461 0.9999

Calibrated by: [Signature] Approved by: [Signature]

(Mr. Theerachai Subhan) (Mr. Noppang Intanang) Field Scientist(2) Senior Field Coordinator Scientist(1)

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3 4.3 1.2432 50 49.218 -9.3461 0.9999

4 5.1 1.3729 50 49.218 -9.3461 0.9999

5 5.0 1.4418 60 49.218 -9.3461 0.9999

Calibrated by: [Signature] Approved by: [Signature]

(Mr. Theerachai Subhan) (Mr. Noppang Intanang) Field Scientist(2) Senior Field Coordinator Scientist(1)

FORM NO. F-06-071 REVISION NO.: 0008 DATE: 14/03/16

Sartorius (Thailand) Co., Ltd.

Certificate of Calibration

Model Number: XP105DU  
Description: Sartorius Balance  
Serial Number: 1123001884  
ID No: BKK\_EN0004  
Manufacturer: Mettler Toledo  
Customer Name: ALS Laboratory Group (Thailand) Co., Ltd.  
Calibrated Place: Balance Room  
Calibrated By: Mr. Chonchai Intham  
Calibration Date: Wednesday, February 08, 2023  
Calibration Procedure No.: This calibration was conducted by using in-house calibration procedure number (W-003) Based on UKAS Lab 14: 2019  
Ambient Conditions: Temperature: 21.0 °C ± 3.0 °C Humidity: 65.0 % RH ± 5.0 % RH Pressure: 1013.25 hPa  
Equipment Condition: Good Pass  
Measurement Uncertainty: UKAS Publication Ref: Lab 14  
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 the Expression of Uncertainty in Measurement (GUM). The calibration certificate documents the traceability to National Standards, which realize the unit of measurement according to the International System of Units (SI). Report of Tolerance came from list of Sartorius Metrological Specifications.  
Traceability: Model Number Description Traceability Certificate No. Due Date  
YC8011-522-00 Sartorius weight set 1mg - 1kg 5h 3702919 SPC-RT C0212565 14-Sep-2023  
MNB-38250 Sartorius weight set 1mg - 1kg 5h 3702919 UKSH C19220444 5-Sep-2023  
This certificate states and attests the equipment only. This certificate may not be reproduced either in full or in part without the prior written approval of the Verification/Calibration Division, Sartorius (Thailand) Co., Ltd.  
W. Chonchai Intham (Technical Manager)

Sartorius (Thailand) Co., Ltd.

Certificate of Calibration

Model Number: XP105DU  
Description: Semi-micro Balance  
Serial Number: 1123001884  
ID No: BKK\_EN0004  
Manufacturer: Mettler Toledo  
Certificate No.: 23BCI0071  
Issued Date: Monday, February 13, 2023  
Reference No.: 203245  
Page No.: 2 of 3  
Calibration Results: Without Adjustment  
Repeatability: The repeatability is the ability of a weighing instrument to display nearly identical results under constant conditions when the same load with a measurement series is placed repeatedly on the weighing pan in the same manner. The standard deviation is used to express repeatability quantitatively.  
Nominal Value: (Low Load) 20.0002 g  
Tolerance: ± 0.0002 g  
Nominal Value: (High Load) 20.0002 g  
Tolerance: ± 0.0002 g  
Standard Deviation: 0.000005, 0.000007  
Linearity: The linearity, also called linearity error, describes the deviation of the characteristic curve of a weighing instrument from the linear slope.  
Tolerance: N/A g  
Nominal Value: Conventional Mass Value Displayed Value Deviation Uncertainty  
0.1 0.10000 0.10000 0.00000 0.00002  
0.5 0.50001 0.50000 -0.00001 0.00003  
1 1.00000 1.00000 0.00000 0.00004  
2 2.00002 2.00001 -0.00001 0.00004  
5 5.00002 5.00002 0.00000 0.00006  
10 10.00003 10.00002 0.00001 0.00006  
15 15.00004 15.00004 0.00000 0.00005  
20 20.00000 20.00000 0.00000 0.00005  
25 25.00002 25.00002 0.00000 0.00009  
30 30.00002 30.00004 0.00002 0.00009

Sartorius (Thailand) Co., Ltd.

Certificate of Calibration

Model Number: XS105DU  
Description: Semi-micro Balance  
Serial Number: 1123001884  
ID No: BKK\_EN0004  
Manufacturer: Mettler Toledo  
Certificate No.: 23BCI0071  
Issued Date: Monday, February 13, 2023  
Reference No.: 203245  
Page No.: 3 of 3  
Calibration Results: Without Adjustment  
Repeatability: The repeatability is the ability of a weighing instrument to display nearly identical results under constant conditions when the same load with a measurement series is placed repeatedly on the weighing pan in the same manner. The standard deviation is used to express repeatability quantitatively.  
Nominal Value: (Low Load) 100.0000 g  
Tolerance: ± 0.0002 g  
Nominal Value: (High Load) 100.0000 g  
Tolerance: ± 0.0002 g  
Standard Deviation: 0.00003  
Linearity: The linearity, also called linearity error, describes the deviation of the characteristic curve of a weighing instrument from the linear slope.  
Tolerance: N/A g  
Nominal Value: Conventional Mass Value Displayed Value Deviation Uncertainty  
50 50.0000 50.0000 0.0000 0.00013  
55 55.0000 55.0000 0.0000 0.00013  
60 60.0000 60.0000 0.0000 0.00013  
65 65.0001 65.0001 0.0000 0.00013  
70 70.0000 70.0000 0.0000 0.00013  
75 75.0000 75.0000 0.0000 0.00013  
80 80.0000 80.0000 0.0000 0.00013  
85 85.0001 85.0001 0.0000 0.00013  
90 90.0001 90.0001 0.0000 0.00013  
100 100.0000 100.0000 0.0000 0.00018  
110 110.0000 110.0000 0.0000 0.00018  
120 120.0000 120.0000 0.0000 0.00018

High Volume Air Sampler Calibration Worksheet

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Calibrator Location: WML Surface Industrial Land Co., Ltd.  
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Calibrator Model: TE-5020A  
Calibrator S/N: 2305  
Barometric Pressure (mm Hg): 757  
Temperature (°C): 32  
High Volume ID: BKK-F30364  
High Volume Model: TE-5020A  
High Volume S/N: 4376  
Calibrator Slope: 1.0029  
Calibrator Intercept: -0.0224  
Linear Regression:  $y = 49.218x - 9.3461$

Test No. Delta H<sub>2</sub>O (mm) Q<sub>air</sub> (m³/min) F-Chart (CFM) Slope Intercept Correlation Coefficient

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2 4.0 1.3195 80 49.218 -9.3461 0.9999

3 4.3 1.2432 50 49.218 -9.3461 0.9999

4 5.1 1.3729 50 49.218 -9.3461 0.9999

5 5.0 1.4418 60 49.218 -9.3461 0.9999

Calibrated by: [Signature] Approved by: [Signature]

(Mr. Theerachai Subhan) (Mr. Noppang Intanang) Field Scientist(2) Senior Field Coordinator Scientist(1)

FORM NO. F-06-071 REVISION NO.: 0008 DATE: 14/03/16

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2 4.0 1.3195 80 45.185 -9.3461 0.9999

3 4.3 1.2432 50 45.185 -9.3461 0.9999

4 5.1 1.3729 50 45.185 -9.3461 0.9999

5 5.0 1.4418 60 45.185 -9.3461 0.9999

Calibrated by: [Signature] Approved by: [Signature]

(Mr. Theerachai Subhan) (Mr. Noppang Intanang) Field Scientist(2) Senior Field Coordinator Scientist(1)

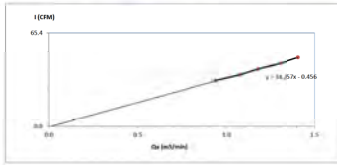
FORM NO. F-06-071 REVISION NO.: 0008 DATE: 14/03/16



# High Volume Air Sampler Calibration Worksheet

Project Name: WMS Standard Instrument Lead Co. Ltd. Barometric Pressure (mm Hg): 755  
 Calibration Location: in SePhase Instrument Calibration Temperature (°C): 32  
 Calibration Date: 11-Oct-22 High Volume ID: BKS-130109  
 Calibration Sheet No.: C-1110021-BKS-130109 High Volume Model: TE-5000P  
 Calibrator ID: RTS-20020 High Volume S/N: 4720  
 Calibrator Model: TS-5000P Calibration Slope: 0.9999  
 Calibrator S/N: 2104 Calibration Intercept: -0.0170

Test No.	Delta R.D. (m/s)	Qa	1-Chart (CPM)	Linear Regression
1	1.9	0.000	32	Slope: $0.9999$
2	2.5	1.076	38	Intercept: $-0.0170$
3	3.8	1.177	49	Correlation Coefficient: $0.9999$
4	3.7	1.104	49	
5	4.5	1.107	49	



Calibrated by: [Signature]  
 (No Theoretical Solution)  
 Field Scientist(2)

Approved by: [Signature]  
 (No Theoretical Solution)  
 Extra Field Coordinator Scientist(1)

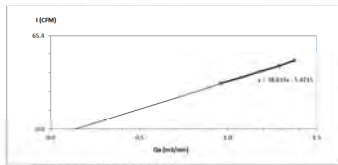
FORM NO. F-06-074 REVISION NO.: ISSUE DATE: 14/06/14



# High Volume Air Sampler Calibration Worksheet

Project Name: WMS Standard Instrument Lead Co. Ltd. Barometric Pressure (mm Hg): 755  
 Calibration Location: in SePhase Instrument Calibration Temperature (°C): 32  
 Calibration Date: 11-Oct-22 High Volume ID: BKS-130109  
 Calibration Sheet No.: C-1110021-BKS-130109 High Volume Model: TE-5000P  
 Calibrator ID: RTS-20020 High Volume S/N: 4720  
 Calibrator Model: TS-5000P Calibration Slope: 0.9999  
 Calibrator S/N: 2104 Calibration Intercept: -0.0170

Test No.	Delta R.D. (m/s)	Qa	1-Chart (CPM)	Linear Regression
1	1.9	0.000	32	Slope: $0.9999$
2	2.5	1.076	38	Intercept: $-0.0170$
3	3.8	1.177	49	Correlation Coefficient: $0.9999$
4	3.7	1.104	49	
5	4.5	1.107	49	



Calibrated by: [Signature]  
 (No Theoretical Solution)  
 Field Scientist(2)

Approved by: [Signature]  
 (No Theoretical Solution)  
 Extra Field Coordinator Scientist(1)

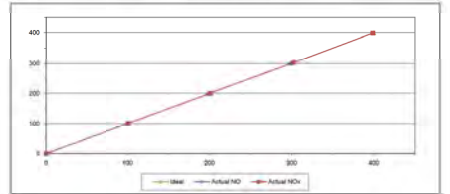
FORM NO. F-06-074 REVISION NO.: ISSUE DATE: 14/06/14



# MULTIPOINT CALIBRATION REPORT

Calibration Date: 1-Jul-23 Equipment Name: NOx Analyzer  
 Manufacturer: HORIBA Model: APNA-370  
 Serial No.: R2H000W Equipment ID: BKX-F30788  
 Calibrator Manufacturer: Teledyne API Model: 700  
 Serial No.: 947  
 Std. Gas Concentration (PPM): 55.88 Cylinder No.: GN0027222  
 Cylinder Pressure (psi): 1800 Certified By: Algas Inc.  
 Certified Date: 8-Feb-22 Expired Date: 8-Feb-23

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	99.00	-1.00	-1.00	101.10	1.10	1.10
2	200.00	198.20	-1.80	-0.90	201.30	1.30	0.65
3	300.00	298.50	-1.50	-0.50	302.50	2.50	0.83
4	400.00	398.50	-1.50	-0.38	399.00	-1.00	-0.25
AVERAGE (%)				-0.54			0.48



Calibrated By: [Signature]

(Mr. Jirawut Sakam)  
 Field Environmental Scientist (2)

Approved By: [Signature]

(Mr. Sarayuth Jittanont)  
 Assistant General Manager

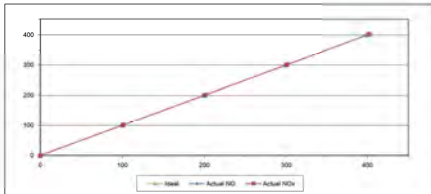
AL3 Laboratory Group  
 FORM NO. F-06-056 REVISION NO.: ISSUE DATE: 03/04/12



# MULTIPOINT CALIBRATION REPORT

Calibration Date: 1-Jul-23 Equipment Name: NOx Analyzer  
 Manufacturer: Teledyne API Model: T200  
 Serial No.: 6308 Equipment ID: BKX-F31058  
 Calibrator Manufacturer: Teledyne API Model: 700  
 Serial No.: 947  
 Std. Gas Concentration (PPM): 55.88 Cylinder No.: GN0027222  
 Cylinder Pressure (psi): 1800 Certified By: Algas Inc.  
 Certified Date: 8-Feb-22 Expired Date: 8-Feb-23

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	99.40	-0.60	-0.60	101.20	1.20	1.20
2	200.00	198.60	-1.40	-0.70	201.40	1.40	0.70
3	300.00	298.50	-1.50	-0.50	301.30	1.30	0.43
4	400.00	398.50	-1.50	-0.38	392.20	-7.80	-1.95
AVERAGE (%)				-0.43			0.60



Calibrated By: [Signature]

(Mr. Jirawut Sakam)  
 Field Environmental Scientist (2)

Approved By: [Signature]

(Mr. Sarayuth Jittanont)  
 Assistant General Manager

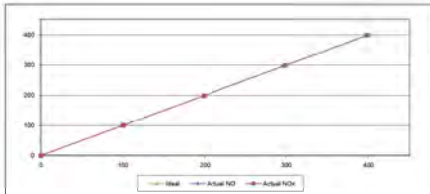
AL3 Laboratory Group  
 FORM NO. F-06-056 REVISION NO.: ISSUE DATE: 03/04/12



# MULTIPOINT CALIBRATION REPORT

Calibration Date: 1-Jul-23 Equipment Name: NOx Analyzer  
 Manufacturer: HORIBA Model: APNA-370  
 Serial No.: R2H000W Equipment ID: BKX-F30788  
 Calibrator Manufacturer: Teledyne API Model: 700  
 Serial No.: 947  
 Std. Gas Concentration (PPM): 55.88 Cylinder No.: GN0027222  
 Cylinder Pressure (psi): 1800 Certified By: Algas Inc.  
 Certified Date: 8-Feb-22 Expired Date: 8-Feb-23

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	99.40	-0.60	-0.60	100.20	0.20	0.20
2	200.00	198.20	-1.80	-0.90	198.60	-1.40	-0.70
3	300.00	297.50	-2.50	-0.83	299.70	-1.30	-0.43
4	400.00	398.50	-1.50	-0.38	398.10	-1.90	-0.47
AVERAGE (%)				-0.61			-0.21



Calibrated By: [Signature]

(Mr. Jirawut Sakam)  
 Field Environmental Scientist (2)

Approved By: [Signature]

(Mr. Sarayuth Jittanont)  
 Assistant General Manager

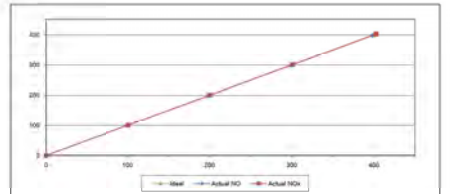
AL3 Laboratory Group  
 FORM NO. F-06-056 REVISION NO.: ISSUE DATE: 03/04/12



# MULTIPOINT CALIBRATION REPORT

Calibration Date: 1-Jul-23 Equipment Name: NOx Analyzer  
 Manufacturer: HORIBA Model: APNA-370  
 Serial No.: XL1W000W Equipment ID: BKX-F31058  
 Calibrator Manufacturer: Teledyne API Model: 700  
 Serial No.: 947  
 Std. Gas Concentration (PPM): 55.88 Cylinder No.: GN0027222  
 Cylinder Pressure (psi): 1800 Certified By: Algas Inc.  
 Certified Date: 8-Feb-22 Expired Date: 8-Feb-23

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	198.10	-1.90	-0.95	201.00	1.00	0.50
3	300.00	299.10	-0.90	-0.30	301.40	1.40	0.47
4	400.00	398.20	-1.80	-0.45	392.80	-7.20	-1.80
AVERAGE (%)				-0.38			0.55



Calibrated By: [Signature]

(Mr. Jirawut Sakam)  
 Field Environmental Scientist (2)

Approved By: [Signature]

(Mr. Sarayuth Jittanont)  
 Assistant General Manager

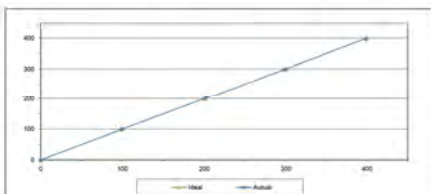
AL3 Laboratory Group  
 FORM NO. F-06-056 REVISION NO.: ISSUE DATE: 03/04/12



# MULTIPOINT CALIBRATION REPORT

Calibration Date: 2-Jul-23 Equipment Name: SO2 Analyzer  
 Manufacturer: HORIBA Model: APSA-370  
 Serial No.: P90W000W Equipment ID: BKX-F30788  
 Calibrator Manufacturer: Teledyne API Model: 700  
 Serial No.: 947  
 Std. Gas Concentration (PPM): 56.3 Cylinder No.: GN0027222  
 Cylinder Pressure (psi): 1800 Certified By: Algas Inc.  
 Certified Date: 8-Feb-22 Expired Date: 8-Feb-23

Point	Ideal	Actual	Error	%Error
ZERO	0.00	0.05	0.05	0.05
1	100.00	99.00	-1.00	-1.00
2	200.00	201.30	1.30	0.65
3	300.00	298.30	-1.70	-0.57
4	400.00	399.00	-1.00	-0.25
AVERAGE (%)				-0.24



Calibrated By: [Signature]

(Mr. Jirawut Sakam)  
 Field Environmental Scientist (2)

Approved By: [Signature]

(Mr. Sarayuth Jittanont)  
 Assistant General Manager

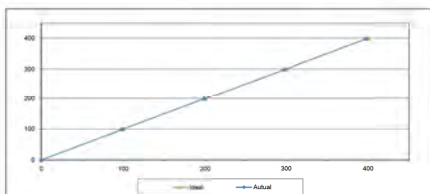
AL3 Laboratory Group  
 FORM NO. F-06-056 REVISION NO.: ISSUE DATE: 03/04/12



# MULTIPOINT CALIBRATION REPORT

Calibration Date: 2-Jul-23 Equipment Name: SO2 Analyzer  
 Manufacturer: Teledyne API Model: T100  
 Serial No.: 5365 Equipment ID: BKX-F31097  
 Calibrator Manufacturer: Teledyne API Model: 700  
 Serial No.: 947  
 Std. Gas Concentration (PPM): 56.3 Cylinder No.: GN0027222  
 Cylinder Pressure (psi): 1800 Certified By: Algas Inc.  
 Certified Date: 8-Feb-22 Expired Date: 8-Feb-23

Point	Ideal	Actual	Error	%Error
ZERO	0.00	0.10	0.10	0.10
1	100.00	99.00	-1.00	-1.00
2	200.00	199.00	-1.00	-0.50
3	300.00	298.00	-2.00	-0.67
4	400.00	397.00	-3.00	-0.75
AVERAGE (%)				-0.60



Calibrated By: [Signature]

(Mr. Jirawut Sakam)  
 Field Environmental Scientist (2)

Approved By: [Signature]

(Mr. Sarayuth Jittanont)  
 Assistant General Manager

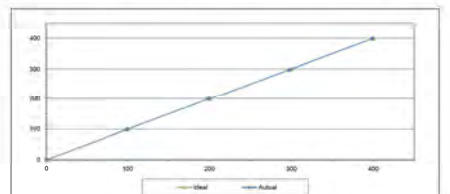
AL3 Laboratory Group  
 FORM NO. F-06-056 REVISION NO.: ISSUE DATE: 03/04/12



# MULTIPOINT CALIBRATION REPORT

Calibration Date: 2-Jul-23 Equipment Name: SO2 Analyzer  
 Manufacturer: HORIBA Model: APSA-370  
 Serial No.: 2B0DA00W Equipment ID: BKX-F30788  
 Calibrator Manufacturer: Teledyne API Model: 700  
 Serial No.: 947  
 Std. Gas Concentration (PPM): 56.3 Cylinder No.: GN0027222  
 Cylinder Pressure (psi): 1800 Certified By: Algas Inc.  
 Certified Date: 8-Feb-22 Expired Date: 8-Feb-23

Point	Ideal	Actual	Error	%Error
ZERO	0.00	0.10	0.10	0.10
1	100.00	99.00	-1.00	-1.00
2	200.00	198.70	-1.30	-0.65
3	300.00	297.30	-2.70	-0.90
4	400.00	398.50	-1.50	-0.38
AVERAGE (%)				-0.58



Calibrated By: [Signature]

(Mr. Jirawut Sakam)  
 Field Environmental Scientist (2)

Approved By: [Signature]

(Mr. Sarayuth Jittanont)  
 Assistant General Manager

AL3 Laboratory Group  
 FORM NO. F-06-056 REVISION NO.: ISSUE DATE: 03/04/12

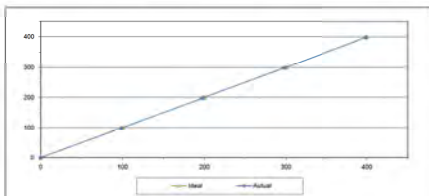




# MULTIPOINT CALIBRATION REPORT

Calibration Date	2-Jul-23	Equipment Name	502 Analyzer
Manufacturer	HORIBA	Model	APSA-370
Serial No.	65WBP0K	Equipment ID	BK1-F31091
Calibrator/Manufacturer	Teddyline API	Model	700
Serial No.	947		
Std. Gas Concentration (PPM)	56.3	Cylinder No.	GN027222
Cylinder Pressure (psi)	1800	Certified By	Algas Inc.
Certified Date	9-Feb-22	Expired Date	9-Feb-30

Point	Ideal	Actual	Error	%Error
ZERO	0.00	0.10	-0.10	-0.10
1	100.00	98.30	-1.70	-1.70
2	200.00	198.30	-1.70	-0.85
3	300.00	297.80	-2.20	-0.73
4	400.00	398.30	-1.70	-0.43
AVERAGE (%)				-0.67



Calibrated By

(Mr. Jirawat Sakam)  
Field Environmental Scientist (2)

Approved By

(Mr. Sarawut Jitranon)  
Assistant General Manager

ALS Laboratory Group  
FORM NO. 1 (05/06) REVISION NO. - ISSUE DATE 02/04/12



63/14-15/67/35-35, Soi Petchkasem 7/71, Petchkasem Rd.  
Wattana, Bangkok 10600 Thailand.  
Tel: (66) 02-86081213 Fax: (66) 02-8608060 www.jnacs.com

# CERTIFICATE OF CALIBRATION

Measurement Item	1. Gas flowmeter with 500 L/min
Manufacturer	1. Flow Meter (Model: 500 L/min)
Model/Type	1. Flow Meter (Model: 500 L/min)
Serial Number	1. Flow Meter (Model: 500 L/min)
Q No.	1. Flow Meter (Model: 500 L/min)
Customer	1. Flow Meter (Model: 500 L/min)
Test Condition	1. Flow Meter (Model: 500 L/min)
Calibration Precision	1. Flow Meter (Model: 500 L/min)
Traceability	1. Flow Meter (Model: 500 L/min)
Measurement Date	1. Flow Meter (Model: 500 L/min)
Calibrated By	1. Flow Meter (Model: 500 L/min)
Approved By	1. Flow Meter (Model: 500 L/min)

Calibration provided by J NAC. The certificate is valid for 12 months. The next calibration is due on 09/02/2024. The certificate is valid for 12 months. The next calibration is due on 09/02/2024.

Calibrated By: (Mr. Jirawat Sakam)  
Approved By: (Mr. Sarawut Jitranon)

ALS Laboratory Group  
FORM NO. 1 (05/06) REVISION NO. - ISSUE DATE 02/04/12



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Continuation of Certificate of Calibration Number

Certificate No. 01/01/02/02  
Page 2 of 2 Pages

Point	Ideal	Actual	Error	%Error
ZERO	0.00	0.10	-0.10	-0.10
1	100.00	98.30	-1.70	-1.70
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AVERAGE (%)				-0.67

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Calibrated By: (Mr. Jirawat Sakam)  
Approved By: (Mr. Sarawut Jitranon)

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Manufacturer	1. Flow Meter (Model: 500 L/min)
Model/Type	1. Flow Meter (Model: 500 L/min)
Serial Number	1. Flow Meter (Model: 500 L/min)
Q No.	1. Flow Meter (Model: 500 L/min)
Customer	1. Flow Meter (Model: 500 L/min)
Test Condition	1. Flow Meter (Model: 500 L/min)
Calibration Precision	1. Flow Meter (Model: 500 L/min)
Traceability	1. Flow Meter (Model: 500 L/min)
Measurement Date	1. Flow Meter (Model: 500 L/min)
Calibrated By	1. Flow Meter (Model: 500 L/min)
Approved By	1. Flow Meter (Model: 500 L/min)

Calibration provided by J NAC. The certificate is valid for 12 months. The next calibration is due on 09/02/2024. The certificate is valid for 12 months. The next calibration is due on 09/02/2024.

Calibrated By: (Mr. Jirawat Sakam)  
Approved By: (Mr. Sarawut Jitranon)

ALS Laboratory Group  
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Calibrated By: (Mr. Jirawat Sakam)  
Approved By: (Mr. Sarawut Jitranon)

ALS Laboratory Group  
FORM NO. 1 (05/06) REVISION NO. - ISSUE DATE 02/04/12

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# MEASUREMENT RESULTS

Point	Ideal	Actual	Error	%Error
ZERO	0.00	0.10	-0.10	-0.10
1	100.00	98.30	-1.70	-1.70
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Calibrated By: (Mr. Jirawat Sakam)  
Approved By: (Mr. Sarawut Jitranon)

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Approved By: (Mr. Sarawut Jitranon)

ALS Laboratory Group  
FORM NO. 1 (05/06) REVISION NO. - ISSUE DATE 02/04/12

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Calibrated By: (Mr. Jirawat Sakam)  
Approved By: (Mr. Sarawut Jitranon)

ALS Laboratory Group  
FORM NO. 1 (05/06) REVISION NO. - ISSUE DATE 02/04/12





Cert. No. : ACC2304  
Job No. : YC6AC0809  
Page : 2 of 3

Calibration Procedure : CP-AC-01

#### Calibration Method :

This equipment was calibrated by based on IEC-60642:2003 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-001-23	07-FEB-24
Digital Multimeter	34461A	MY53220104	EEL-RP 202066	13-FEB-24
Digital Multimeter	34461A	MY53220076	EEL-RP 202067	13-FEB-24
Digital Multimeter	34461A	MY53220076	EEL-RP 202066	13-FEB-24
Programmable Attenuator	MAT-070	62100114	EF-001-23	06-FEB-24
Condenser Microphone	4180	2977960	AA-100-23	14-FEB-24
Measuring Amplifier	NA-42KAJ	34540005	AA-100-23	14-FEB-24
Audio Analyzer	AVR-3360A	V74409669	EF-002-23	10-FEB-24

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

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

QP-TS12-04-04-02064

T. Petch.

Cert. No. : ACC2304  
Job No. : YC6AC0809  
Page : 3 of 3

#### Result of calibration :

##### 1. Sound pressure level

Specified sound pressure level (dB)	Measured value (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit (dB)
94	94.16	0.16	0.14	0.40

##### 2. Frequency

Specified Frequency (Hz)	Measured value (Hz)	Deviated value (%)	Uncertainty (%)	Tolerance limit (%)
1000	1000.7	0.2	0.1	1.0

##### 3. Total distortion

Measured value (%)	Uncertainty (%)	Tolerance limit (%)
1.69	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

QP-TS12-04-04-02064

T. Petch.

031-0511 Sithiporn Rd, Banghuan, Bangkok, Thailand 10700 THAILAND  
Tel: 02-015-8030 Fax: 02-015-4079 e-mail: cal-center@sithiporn.com http://www.sithiporn.com

Cert. No. : ACL2355  
Job No. : YC6AC0809  
Page : 1 of 8

#### Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : ESON  
Model : NL-62 Microphone UC-52 / Preampifier NH-24  
Serial No. : 06030241 / 158747 / 26709  
ID No. : BSK\_P50008

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
106 PHATHANAKAN 46 PHATHANAKAN ROAD,  
KIWAENG PHATHANAKAN, KHUET SUAN LUANG,  
BANGKOK, 10259 THAILAND.

Location :  
Ambient Temperature : ( 23.0 ± 3 ) °C  
Pressure : ( 101.3 ± 3 ) kPa  
Relative Humidity : ( 50.0 ± 20 ) %  
Received Date : 25 JULY 2023  
Calibration Date : 14-15 AUGUST 2023  
Date of Issue : 22 AUGUST 2023

APPROVED BY :  
THAI CAL DATE : 14/8/24

Calibrated by : Natchanon Pitsupat

Approved by : T. Petch.  
( Thanakul Petchum )

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

QP-TS12-04-04-02064

Cert. No. : ACL23255  
Job No. : YC6AC0809  
Page : 2 of 8

Calibration Procedure : CP-AC-01

#### Calibration Method :

This equipment was calibrated by based on IEC-61072-3 (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 test results of each item were made by observation of each instrument display and also with SLM's display.

#### Condition of this result of calibration :

##### 1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017876	IF-009-23	07-FEB-24
Waveform Generator	33511B	MY52302742	IF-010-23	07-FEB-24
Digital Multimeter	34461A	MY53220104	EEL-RP 202066	13-FEB-24
Digital Multimeter	34461A	MY53220076	EEL-RP 202066	13-FEB-24
Digital Multimeter	34461A	MY53220076	EEL-RP 202066	13-FEB-24
Programmable Attenuator	MAT-070	62100114	EF-001-23	06-FEB-24
Condenser Microphone	4180	2977960	AA-100-23	14-FEB-24
Measuring Amplifier	NA-42KAJ	34540005	AA-100-23	14-FEB-24

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

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

QP-TS12-04-04-02064

T. Petch.

Cert. No. : ACL23255  
Job No. : YC6AC0809  
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#### Summary of Measurement Result :

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

Note : Pass/Fail evaluation for each parameter, will be considered together from the acceptance limit and the Maximum-permitted uncertainty of measurement.

QP-TS12-04-04-02064

T. Petch.

Cert. No. : ACL23255  
Job No. : YC6AC0809  
Page : 4 of 8

#### Result of calibration :

##### 1. Absolute sensitivity

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

##### 2. Self-generated noise

###### 2.1 Normal test

Measured Value (dB)
15.9

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

Frequency Weighting	Measured value (dB)
A-weight	12.0
C-weight	18.2
Flat	23.9

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

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

Frequency (Hz)	Flat Value	C-weight	A-weight	Acceptance Limits
125	0.4	0.4	0.4	± 1.5
1000	0.0	-0.3	0.0	± 1.0
8000	-1.1	-1.0	-1.0	± 1.0

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Job No. : YC6AC0809  
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#### 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	0.0	±2.0
125	0.0	0.0	0.1	±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	±2.0
8000	0.0	0.1	0.1	±2.0

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

##### 5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits
A-weight	94.0	94.0	0.0	± 0.3
C-weight	94.0	94.0	0.0	± 0.2
Flat	94.0	94.0	0.0	± 0.2

##### 5.2 Time weighting at 1 kHz

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

#### 6. Long-term stability

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

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T. Petch.

Cert. No. : ACL23255  
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#### 7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
29.0	29.0	0.0	± 1.1
24.0	24.0	0.0	± 1.1
19.0	19.0	0.1	± 1.1
14.0	14.0	0.1	± 1.1
9.0	9.0	0.1	± 1.1
4.0	4.0	0.1	± 1.1

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T. Petch.

Cert. No. : ACL23255  
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#### 8. Level linearity including the level range control

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

#### 9. Time burst response

Time Weighting	Time burst duration, T5 (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	108.0	0.0	1.5; -5.0
	2	8	117.0	117.0	0.0	1.0; -2.5
	200	800	134.0	134.1	0.1	± 0.0
	2	8	108.0	108.0	0.0	1.5; -5.0
Slow	200	800	127.6	127.6	0.0	± 1.0
	0.25	1	99.0	99.0	0.0	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, 1 cycle (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	132.0	133.0	0.0	± 0.0
One	136.4	137.4	-0.0	± 0.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	132.0	132.0	0.0	± 0.0
Positive half cycle	135.4	135.1	-0.3	± 0.0
Negative half cycle	135.4	135.1	-0.3	± 0.0

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T. Petch.



## Continuation of Calibration Certificate

Cert. No. : ACL23236  
Job No. : YC66AC0072  
Pages : 3 of 8

## 11. Overload indication

Measured value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle	
89.3	89.7	±0.2

## 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

433-4337 Sathorn Rd, Bangkok, Bangkok 10120 THAILAND  
Tel: 02-245-8808 Fax: 02-245-8829 e-mail: info@sithiporn.com http://www.sithiporn.comCert. No. : ACL23236  
Pages : 1 of 8

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NR-02 Microphone UC-02 / Frequency 50-24  
Serial No. : 0609042 / 13770 / 48097  
ID No. : BKR F50099

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATHANAKAN 46, PHATHANAKAN ROAD,  
KIWAENG PHATHANAKAN, KHEE SUAN LUANG,  
BANGKOK, 10250 THAILAND.

Location :  
Ambient Temperature : ( 23.0 ± 3.3 ) °C  
Pressure : ( 101.3 ± 3.3 ) kPa  
Relative Humidity : ( 50.0 ± 2.0 ) %  
Received Date : 06 JULY 2023  
Calibration Date : 17-18 JULY 2023  
Date of Issue : 19 JULY 2023

TESTED BY : *[Signature]*  
APPROVED BY : *[Signature]*  
NEXT CAL DATE : 17/14

Calibrated by : Nathorn Pitsuphan

Approved by :

*[Signature]*  
( Thanakul Petchana )

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## Continuation of Calibration Certificate

Cert. No. : ACL23236  
Job No. : YC66AC0072  
Pages : 2 of 8

Calibration Procedure : CP-AC-01

## Calibration Method :

This equipment was calibrated by based on IEC-61672-1 (20) 0 Standard for sound level meter (SLM).  
The SLM had been to Acoustical and Electrical signal tests of frequency weighting with Acoustic chamber and Reference Standard Instruments.

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

## Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33230A	MY48017976	EP-0009-23	07-01-24
Waveform Generator	33511B	MY23202742	EP-0010-21	07-01-24
Digital Multimeter	73461A	MY3320104	EEL-BP-201046	12-01-24
Digital Multimeter	73461A	MY3320076	EEL-BP-201046	12-01-24
Digital Multimeter	73461A	MY60024273	EEL-BP-201046	12-01-24
Programmable Amplifier	MAF-1670	62100134	EP-0011-23	08-01-24
Condenser Microphone	4380	2977900	AA-100-23	14-01-24
Measuring Amplifier	NA-42KAJ	3450465	AA-3002-23	14-01-24

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. : ACL23236  
Job No. : YC66AC0072  
Pages : 3 of 8

## Summary of Measurement Result :

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

Note : Pass/Fail evaluation for each parameter, will be considered together from the acceptance limits and the Maximum-permitted uncertainty of measurement.

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## Continuation of Calibration Certificate

Cert. No. : ACL23236  
Job No. : YC66AC0072  
Pages : 5 of 8

## 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits (dB)
43	-0.1	-0.1	-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	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.2
C-weight	94.0	94.0	0.0	±0.2
Flat	94.0	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

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

## 6. Long-term stability

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

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## Continuation of Calibration Certificate

Cert. No. : ACL23236  
Job No. : YC66AC0072  
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
134.0	134.0	0.0	±1.1
133.0	133.0	0.0	±1.1
132.0	132.0	0.0	±1.1
131.0	131.0	0.0	±1.1
129.0	129.0	0.0	±1.1
124.0	124.0	0.0	±1.1
119.0	119.0	0.0	±1.1
114.0	114.0	0.0	±1.1
109.0	109.0	0.0	±1.1
104.0	104.0	0.0	±1.1
99.0	99.0	0.0	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	39.0	-0.1	±1.1
34.0	34.0	-0.1	±1.1
29.0	29.0	-0.1	±1.1
24.0	24.0	-0.1	±1.1
19.0	19.0	-0.1	±1.1
14.0	14.0	-0.1	±1.1
9.0	9.0	-0.1	±1.1
4.0	4.0	-0.1	±1.1

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## Continuation of Calibration Certificate

Cert. No. : ACL23236  
Job No. : YC66AC0072  
Pages : 7 of 8

## 8. Level linearity including the level range control

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

## 9. Time burst response

Time Weighting	Time burst duration, T <sub>b</sub> (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)	
Fast	0.25	1	108.0	107.9	-0.1	1.5; -5.0	
		2	8	117.0	117.0	0.0	1.0; -2.5
		200	800	134.0	134.1	0.1	±1.0
Slow	0.25	1	108.0	108.0	0.0	1.5; -5.0	
		2	8	108.0	108.0	0.0	1.5; -5.0
		200	800	127.6	127.6	0.0	±3.0
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-weight level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L <sub>peak</sub> (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
One	136.4	136.1	-0.3	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

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## Continuation of Calibration Certificate

Cert. No. : ACL23236  
Job No. : YC66AC0072  
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## 11. Overload indication

Measured value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle	
89.5	89.5	±0.2

## 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

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Cert. No.: ACL22302  
Pages: 1 of 8

## Calibration Certificate

Equipment: SOUND LEVEL METER  
Manufacturer: RION  
Model: NL-42 Microphone UC-52 / Pre-amplifier NH-24  
Serial No.: 6065851 / 158762 / 28767  
ID No.: BKK\_F5011

Condition As Found: GOOD

Customer: A/S LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTANAKAN 40, PHATTANAKAN ROAD,  
KHWAENG PHATTANAKAN, KHUET SUANLUANG,  
BANGKOK, 10250 THAILAND.

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

Received Date: 07 DECEMBER 2022  
Date of Issue: 21 DECEMBER 2022

Calibrated by: Natchanon Pongpau

Approved by: T. Petchu  
( Thumak Petchu )

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other than in full, except with the prior written approval of the head of Calibration Laboratory.

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## Continuation of Calibration Certificate

Cert. No.: ACL22302  
Job No.: YC6AC0016  
Pages: 4 of 8

## Result of calibration:

## 1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limits (dB)
93.9 (93.95)	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	18.1
Flat	23.8

## 3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	-0.3	0.3	0.0	±1.5
1000	-0.3	0.0	0.0	±1.0
8000	-1.9	-1.8	-1.3	±3.0

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## Continuation of Calibration Certificate

Cert. No.: ACL22302  
Job No.: YC6AC0016  
Pages: 5 of 8

Calibration Procedure: CP-AC-01

## Calibration Method:

This equipment was calibrated by based on IEC-61672-2 (2) 1) Standard for sound level meter (SLM).  
The SLM had tests in Acoustical and Electrical signal tests of frequency weighting with Acoustic chamber and Reference  
Standard Instruments.

For test results of each item were made by observation of each instrument display and also with SLMs display.

## Condition of this result of calibration:

## 1. Reference Standard Instruments:

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017976	IF-007-22	04-Feb-23
Waveform Generator	33511A	MY52302742	IF-008-22	04-Feb-23
Digital Multimeter	33461A	MY5320104	EEL-8P-04/05	09-Feb-23
Digital Multimeter	33461A	MY5320105	EEL-8P-05/05	09-Feb-23
Digital Multimeter	34461A	MY6004272	EEL-8P-05/05	09-Feb-23
Programmable Attenuator	MAT-1000	62100114	IF-009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-101-22	24-Feb-23
Measuring Amplifier	NA-42KAI	3456085	AA-300-22	22-Feb-23

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

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.: ACL22302  
Job No.: YC6AC0016  
Pages: 5 of 8

## 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

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

## 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 weightings 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
Long	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.: ACL22302  
Job No.: YC6AC0016  
Pages: 6 of 8

## 11. Overload indication

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

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	135.4	-1.0	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.8	135.2	-0.6	±2.0

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## Continuation of Calibration Certificate

Cert. No.: ACL22302  
Job No.: YC6AC0016  
Pages: 3 of 8

## Summary of Measurement Result:

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of dB
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings	✓	-	0.3	0.6
For 10 Hz to 4 kHz	✓	-	0.3	0.7
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
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 in the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Time burst response	✓	-	0.2	0.3
10. Peak C-weight level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

QP-TS12-04-04-02064

## Continuation of Calibration Certificate

Cert. No.: ACL22302  
Job No.: YC6AC0016  
Pages: 3 of 8

## 7. Level linearity in 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
130.0	130.0	0.0	±1.1
129.0	129.0	0.0	±1.1
128.0	128.0	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	59.1	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
29.0	29.0	0.0	±1.1
24.0	24.0	0.0	±1.1
19.0	19.0	0.0	±1.1
14.0	14.0	0.0	±1.1
9.0	9.0	0.0	±1.1

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## Continuation of Calibration Certificate

Cert. No.: ACL22302  
Job No.: YC6AC0016  
Pages: 7 of 8

## 8. Level linearity including the level range control

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

## 9. Time burst response

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

## 10. Peak C-weight level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	135.4	-1.0	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.8	135.2	-0.6	±2.0

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QP-TS12-04-04-02064

## Continuation of Calibration Certificate

Cert. No. : ACL23049  
Job No. : VCMAC0026  
Pages : 2 of 8

Calibration Procedure : CP-AC-01

## Calibration Method :

This equipment was calibrated by based on IEC-61673-3 (2013) Standard for sound level meter (SLM).  
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Acoustic chamber and Reference Standard Instruments.

For test results of each item were made by observation of each instrument display and also with SLMs display.

## Condition of this result of calibration :

## 1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33511A	MY 8017676	IF-0007-22	04-Feb-23
Waveform Generator	33511B	MY52302742	IF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY5320104	EELBP-040265	09-Feb-23
Digital Multimeter	33461A	MY5320076	EELBP-030265	09-Feb-23
Digital Multimeter	34481A	MY190024213	FELBP-080008	09-Feb-23
Programmable Attenuator	MAF-107B	42100114	IF-0009-22	07-Feb-23
Oscilloscope	4180	2977900	JA-1813-22	24-Feb-23
Measuring Amplifier	NA-42KAJ	34260495	JA-0005-22	22-Feb-23

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

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

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

QP-TS12-04-04-020664

7. B.A.H.

## Continuation of Calibration Certificate

Cert. No. : ACL23049  
Job No. : VCMAC0026  
Pages : 3 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	0.0	±0.0
125	0.0	0.1	0.0	±0.5
250	0.0	0.0	0.0	±0.5
500	0.0	0.1	0.0	±0.5
1000	0.0	0.0	0.0	±0.0
2000	0.0	0.0	0.0	±0.0
4000	0.0	0.0	0.0	±0.0
8000	0.0	0.1	0.1	±0.0

## 5. Frequency and time weightings at 1 kHz

## 5.1 Frequency weightings at 1 kHz

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

## 5.2 Time weighting at 1 kHz

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

## 6. Long-term stability

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

QP-TS12-04-04-020664

7. B.A.H.

## Continuation of Calibration Certificate

Cert. No. : ACL23049  
Job No. : VCMAC0026  
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	137.6	137.6	0.0	±0.3

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

End of Calibration Certificate

QP-TS12-04-04-020664

7. B.A.H.

## Continuation of Calibration Certificate

Cert. No. : ACL23049  
Job No. : VCMAC0026  
Pages : 3 of 8

## Summary of Measurement Result :

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

QP-TS12-04-04-020664

7. B.A.H.

## Continuation of Calibration Certificate

Cert. No. : ACL23049  
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Pages : 6 of 8

## 7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
117.0	117.0	0.0	±1.1
116.0	116.0	0.0	±1.1
115.0	115.0	0.0	±1.1
114.0	114.0	0.0	±1.1
113.0	113.0	0.0	±1.1
112.0	112.0	0.0	±1.1
111.0	111.0	0.0	±1.1
110.0	110.0	0.0	±1.1
109.0	109.0	0.0	±1.1
108.0	108.0	0.0	±1.1
107.0	107.0	0.0	±1.1
106.0	106.0	0.0	±1.1
105.0	105.0	0.0	±1.1
104.0	104.0	0.0	±1.1
103.0	103.0	0.0	±1.1
102.0	102.0	0.0	±1.1
101.0	101.0	0.0	±1.1
100.0	100.0	0.0	±1.1
99.0	99.0	0.0	±1.1
98.0	98.0	0.0	±1.1
97.0	97.0	0.0	±1.1
96.0	96.0	0.0	±1.1
95.0	95.0	0.0	±1.1
94.0	94.0	0.0	±1.1
93.0	93.0	0.0	±1.1
92.0	92.0	0.0	±1.1
91.0	91.0	0.0	±1.1
90.0	90.0	0.0	±1.1
89.0	89.0	0.0	±1.1
88.0	88.0	0.0	±1.1
87.0	87.0	0.0	±1.1
86.0	86.0	0.0	±1.1
85.0	85.0	0.0	±1.1
84.0	84.0	0.0	±1.1
83.0	83.0	0.0	±1.1
82.0	82.0	0.0	±1.1
81.0	81.0	0.0	±1.1
80.0	80.0	0.0	±1.1
79.0	79.0	0.0	±1.1
78.0	78.0	0.0	±1.1
77.0	77.0	0.0	±1.1
76.0	76.0	0.0	±1.1
75.0	75.0	0.0	±1.1
74.0	74.0	0.0	±1.1
73.0	73.0	0.0	±1.1
72.0	72.0	0.0	±1.1
71.0	71.0	0.0	±1.1
70.0	70.0	0.0	±1.1
69.0	69.0	0.0	±1.1
68.0	68.0	0.0	±1.1
67.0	67.0	0.0	±1.1
66.0	66.0	0.0	±1.1
65.0	65.0	0.0	±1.1
64.0	64.0	0.0	±1.1
63.0	63.0	0.0	±1.1
62.0	62.0	0.0	±1.1
61.0	61.0	0.0	±1.1
60.0	60.0	0.0	±1.1
59.0	59.0	0.0	±1.1
58.0	58.0	0.0	±1.1
57.0	57.0	0.0	±1.1
56.0	56.0	0.0	±1.1
55.0	55.0	0.0	±1.1
54.0	54.0	0.0	±1.1
53.0	53.0	0.0	±1.1
52.0	52.0	0.0	±1.1
51.0	51.0	0.0	±1.1
50.0	50.0	0.0	±1.1
49.0	49.0	0.0	±1.1
48.0	48.0	0.0	±1.1
47.0	47.0	0.0	±1.1
46.0	46.0	0.0	±1.1
45.0	45.0	0.0	±1.1
44.0	44.0	0.0	±1.1
43.0	43.0	0.0	±1.1
42.0	42.0	0.0	±1.1
41.0	41.0	0.0	±1.1
40.0	40.0	0.0	±1.1
39.0	39.0	0.0	±1.1
38.0	38.0	0.0	±1.1
37.0	37.0	0.0	±1.1
36.0	36.0	0.0	±1.1
35.0	35.0	0.0	±1.1
34.0	34.0	0.0	±1.1
33.0	33.0	0.0	±1.1
32.0	32.0	0.0	±1.1
31.0	31.0	0.0	±1.1
30.0	30.0	0.0	±1.1
29.0	29.0	0.0	±1.1
28.0	28.0	0.0	±1.1
27.0	27.0	0.0	±1.1
26.0	26.0	0.0	±1.1
25.0	25.0	0.0	±1.1

QP-TS12-04-04-020664

7. B.A.H.

## Continuation of Calibration Certificate

Cert. No. : ACL23049  
Job No. : VCMAC0026  
Pages : 4 of 8

## Result of calibration :

## 1. Absolute sensitivity

Reference acoustic signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limits (dB)
92.0 (92.0)	92.0	0.0	±0.3

## 2. Self-generated noise

## 2.1 Normal test

Measured Value (dB)
13.8

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

Frequency Weighting	Measured value (dB)
A-weight	9.9
C-weight	16.6
Flat	22.5

## 3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)				Acceptance Limits
	Flat	C-weight	A-weight	A-weight	
125	0.3	0.3	0.3	0.3	±1.5
1000	-0.1	-0.1	-0.1	-0.1	±1.0
8000	-1.5	-1.5	-1.4	-1.4	±1.0
Avg	94.0	94.0	94.0	94.0	±1.1

QP-TS12-04-04-020664

7. B.A.H.

## Continuation of Calibration Certificate

Cert. No. : ACL23049  
Job No. : VCMAC0026  
Pages : 7 of 8

## 8. Level linearity increasing the level range control

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

## 9. Time burst response

Time Weighting	Time burst duration, T <sub>B</sub> (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5; -5.0
	2	8	117.0	117.0	0.0	1.0; +2.5
	200	800	134.0	134.0	0.0	+5; -5.0
Slow	2	8	108.0	108.0	0.0	1.5; -5.0
	200	800	127.6	127.6	0.0	+1.0; -2.5
	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; -2.5

## 10. Peak C sound level

Number of cycle in (sec signal)	Anticipated Value (dB)				Measured Value (dB)				Deviated Value (dB)				Acceptance Limits (dB)			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Continuous	135.0	135.0	135.0	135.0	135.0	135.0	135.0	135.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dec	136.4	136.4	136.4	136.4	136.4	136.4	136.4	136.4	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1

Number of cycle in (sec signal)	Anticipated Value (dB)				Measured Value (dB)				Deviated Value (dB)				Acceptance Limits (dB)			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Continuous	135.0	135.0	135.0	135.0	135.0	135.0	135.0	135.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dec	136.4	136.4	136.4	136.4	136.4	136.4	136.4	136.4	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1

QP-TS12-04-04-020664



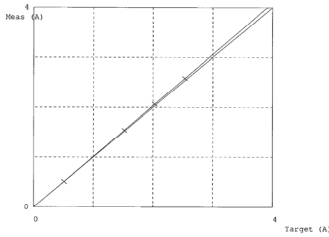
7/12/2023 21:21

Linearity of sample dispensing

Test Absorbance (A)  
XDI8P2 0.311  
XDI8P4 0.416  
XDI8P10 1.478

Linearity of photometer

Wavelength (nm)	Target (A)	Mean (A)	Delta (A)	Delta %
3	0.311	0.305	-0.006	-1.9
4	0.416	0.412	-0.004	-1.0
5	1.478	1.450	-0.028	-1.9



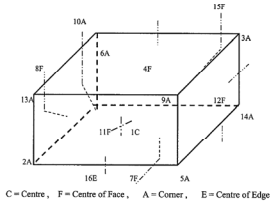
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SCI ECO Services Company Limited  
33/2 Moo 3, T.Banpa, A.Kaengkhoh, Saraburi 18110, Thailand.



Certificate No. T221645

## Calibration Report

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

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

Approved By:

PM-LIS 11715-05-03



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Bangkok Tel: +668 9265 6851, +668 8247 2300  
Website: www.scieco.co.th E-Mail: calibrate@scieco.co.th



Certificate No. T221645

Page 1 of 4

## Certificate of Calibration

Equipment : Chamber ( Cold Room )

Manufacturer : KOLDTECH

Model : KM-240

Serial No. : TBN-1012061/06

Customer Code : BKK\_EN0168

ID No. : T2462A3

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

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

Customer Location : Environmental Laboratory

Date of Receipt : 27 June 2022

Calibrated By : Sujjar Nakkraek (Site Calibration Manager)

Approved By : / Boonchai Suriyawong (Site Calibration Manager)

Date of Issue : 04 JUL 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.

PM-LIS 11715-05-04



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Certificate No. T221645

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## Calibration Report

Measurement Results:

Calibration Point	Average Standard Reading at each position (°C)									
	TN161	TN162	TN163	TN164	TN165	TN166	TN167	TN168	TN169	TN170
3	2.91	2.97	2.80	3.48	3.06	2.98	3.22	3.46	3.17	3.18
	TN171	TN172	TN173	TN174	TN175	TN176				
	2.95	3.41	2.71	3.30	3.04	3.01				

Setting (°C)	Chamber ( Cold Room )		Temperature Distribution:				Coverage
	Reading (°C)		Average (°C)	Stability (°C)	Uniformity (°C)	Heterogeneity (°C)	
	Min, Max	Average					
3.0	2.8, 4.0	3.2	3.04	1.33	0.93	1.61	2.01

\* The quoted uncertainty exclude " uniformity "

The calibration result apply only the above calibrated item.

The result of test was based accuracy 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 distribution possessing a level of confidence of approximately 95%.

Approved By:

PM-LIS 11715-05-04



Metrological Center  
SCI ECO Services Company Limited  
33/2 Moo 3, T.Banpa, A.Kaengkhoh, Saraburi 18110, Thailand.



Certificate No. T221645

Page 2 of 4

## Calibration Report

Equipment : Chamber ( Cold Room )

Date of Calibration : 1 July 2022

Environment : Temperature : 18.9-23.7 °C

Line Voltage : 220-240 V

Relative Humidity : 55-65 %RH

Condition of this result of calibration :

1. This equipment was calibrated by insert into standard thermocouples type T into its chamber, the other one standard thermocouples type T use for ambient temperature measurement. The calibration was done in accordance to WI-T20 (based on ASTM E145-94 (Reapproved 2001) and AS2833-1986). 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	T21009	30 July 2022
TC	TYPE T	TN171-TN180	T21009	30 July 2022
DATA LOGGER	3470A	T149	T21009	30 July 2022

3. This certificate is traceable to National Institute of Metrology (TIS) through Metrological Center (NSC-TISI-TIS 17025 CALIBRATION 0244).

4. National of calibrated item : good

Equipment Description :

Time Constant : 6 Hour 28 Minute At 3 °C  
Fresh Air Dumper : ☐ Open ☐ Min ☐ Medium ☐ Max  
☒ Close  
☒ Not Available

5. Adjustment : ( ) without adjustment ( X ) after adjustment

Approved By:

PM-LIS 11715-05-03

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## Certificate of Calibration

REVIEW BY:   
APPROVED BY:   
NEXT CAL DATE: 16/09/23

Customer name: ALS Laboratory Group (Thailand) Co., Ltd.  
Address: 104 Phatthanakan 40, Phatthanakan Road, Phatthanakan, Suan Luang, Bangkok 10250

Temperature: 22.1-25.31 °C (On site)  
Humidity: (58.4-63.2) %RH (On site)

Equipment condition: Good Operation  
Calibration Location: Organic Prep  
Calibration Procedure: In-house method: WI-T20-01 based on ASTM E275-01  
Traceability: Wavelength Accuracy is traceable to certificate No. 95917 and 95918  
Photometric Accuracy is traceable to certificate No. 95924 and 95927  
Spectral Light is traceable to certificate No. 95928  
The above certificate are traceable to SI and through Bara Scientific Ltd.  
(UKAS accredited calibration laboratory No. 0650)

Calculated by: Dr. Wanchai Jongsomjit  
Approved by:   
Mr. Kanchana Chaisriwong  
Technical Manager

For more details, you will receive a copy of the calibration certificate and also a copy of the calibration certificate.  
Accuracy is a key factor in the calibration process and the results are provided and also shall not be reproduced  
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PM-LIS 11715-05-02 Rev.01 (2016/03)

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## Certificate of Calibration

Certificate No. BSCC-UV-30722 Number of Page(s) 2 of 3

Calibration Results:

1. Wavelength Accuracy

Certified Wavelength (nm)	UUC (nm)	Error (nm)	Uncertainty (nm)
241.70	241.65	-0.05	0.18
334.02	333.92	-0.10	0.18
418.53	418.46	-0.07	0.18
512.99	512.96	-0.03	0.18
679.41	679.17	-0.24	0.18

2. Photometric Accuracy (UV)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (A)
235	0.0000	0.0000	0.0000	0.0075
	0.7487	0.7461	-0.0026	0.0075
257	0.0000	0.0000	0.0000	0.0075
	0.8667	0.8647	-0.0020	0.0075
313	0.0000	0.0000	0.0000	0.0075
	0.2004	0.2011	0.0007	0.0075
360	0.0000	0.0000	0.0000	0.0075
	0.6429	0.6426	-0.0003	0.0075

\*CNR = Customer not request

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate.  
Advertising the report / Certificate and validity of the results are prohibited and also shall not be reproduced  
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PM-LIS 11715-05-02 Rev.01 (2016/03)

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## Certificate of Calibration

Certificate No. BSCC-UV-30722 Number of Page(s) 3 of 3

Calibration Results:

3. Photometric Accuracy (Visible)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (A)
420.0	0.0000	0.0000	0.0000	0.0042
	0.5783	0.5777	-0.0006	0.0042
	0.7628	0.7605	-0.0023	0.0042
	1.0006	1.0000	-0.0006	0.0042
440.0	0.0000	0.0000	0.0000	0.0042
	0.9621	0.9588	-0.0033	0.0042
	0.7405	0.7400	-0.0005	0.0042
	0.8886	0.8885	-0.0001	0.0042
465.0	0.0000	0.0000	0.0000	0.0042
	0.5227	0.5219	-0.0008	0.0042
	0.6880	0.6884	0.0004	0.0042
	0.8427	0.8423	-0.0004	0.0042
546.1	0.0000	0.0000	0.0000	0.0042
	0.5207	0.5199	-0.0008	0.0042
	0.6912	0.6911	-0.0001	0.0042
	0.8659	0.8654	-0.0005	0.0042
600.0	0.0000	0.0000	0.0000	0.0042
	0.5644	0.5634	-0.0010	0.0042
	0.7293	0.7282	-0.0011	0.0042
	1.0842	1.0833	-0.0009	0.0042
635.0	0.0000	0.0000	0.0000	0.0042
	0.5616	0.5606	-0.0010	0.0042
	0.6827	0.6821	-0.0006	0.0042
	0.8811	0.8805	-0.0006	0.0042

\*CNR = Customer not request

4. Stray Light

Standard	Wavelength (nm)	Unit Under Calibration (UUC)
Co-60 wavelength	220.39	Transmission (%)
220.39 nm	220.39	Absorbance (%)

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

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

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

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

PM-LIS 11715-05-02 Rev.01 (2016/03)

Bara Scientific Co., Ltd.  
988 U Chu Liang Building Floor 7 Ramat Road  
Siam Bangkok Bangkok Thailand 10500  
Tel: 02-6334300 Fax: 02-6334307  
www.barscientific.com

Bara Scientific Co., Ltd.  
988 U Chu Liang Building Floor 7 Ramat Road  
Siam Bangkok Bangkok Thailand 10500  
Tel: 02-6334300 Fax: 02-6334307  
www.barscientific.com

## Certificate of Calibration

Certificate No. BSCC-UV-30722 Number of Page(s) 3 of 3

Calibration Results:

3. Photometric Accuracy (Visible)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (A)
420.0	0.0000	0.0000	0.0000	0.0042
	0.5783	0.5777	-0.0006	0.0042
	0.7628	0.7605	-0.0023	0.0042
	1.0006	1.0000	-0.0006	0.0042
440.0	0.0000	0.0000	0.0000	0.0042
	0.9621	0.9588	-0.0033	0.0042
	0.7405	0.7400	-0.0005	0.0042
	0.8886	0.8885	-0.0001	0.0042
465.0	0.0000	0.0000	0.0000	0.0042
	0.5227	0.5219	-0.0008	0.0042
	0.6880	0.6884	0.0004	0.0042
	0.8427	0.8423	-0.0004	0.0042
546.1	0.0000	0.0000	0.0000	0.0042
	0.5207	0.5199	-0.0008	0.0042
	0.6912	0.6911	-0.0001	0.0042
	0.8659	0.8654	-0.0005	0.0042
600.0	0.0000	0.0000	0.0000	0.0042
	0.5644	0.5634	-0.0010	0.0042
	0.7293	0.7282	-0.0011	0.0042
	1.0842	1.0833	-0.0009	0.0042
635.0	0.0000	0.0000	0.0000	0.0042
	0.5616	0.5606	-0.0010	0.0042
	0.6827	0.6821	-0.0006	0.0042
	0.8811	0.8805	-0.0006	0.0042

\*CNR = Customer not request

4. Stray Light

Standard	Wavelength (nm)	Unit Under Calibration (UUC)
Co-60 wavelength	220.39	Transmission (%)
220.39 nm	220.39	Absorbance (%)

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

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

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

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

PM-LIS 11715-05-02 Rev.01 (2016/03)





# Condition of this calibration result

1. Reference Standard Instrument :-  
Instrument Serial No. ID No. Cert. No. Due Date  
1) Document Process Calibrator 5403049 150C118 22E2789 24 Aug 2023  
This certificate 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. AP-1835  
Buffer Solution Manufacturer Lot No. Exp. date  
pH 4.008 CPA chem 823200 20 June 2024  
pH 6.865 CPA chem 784122 14 Feb 2023  
pH 10.008 CPA chem 823323 20 June 2023

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	
pH Meter	4.008	177.48	177.4	0.006	2.00
SN : B520948428	7.000	0.00	0.0	0.008	2.00
	10.000	-177.48	-177.5	0.008	2.00

## Function : pH Measurement

Performing three buffer standard curve by using buffer nominal pH (4.7,10)

Unit Under Calibration	Standard Buffer Solution	Actual mV Reading	Uncertainty of pH measurement	Coverage factor
	Buffer Solution	(mV)	(pH)	
pH Electrode	4.008	3.999	0.0005	2.00
SN: PCE-66-EX101	6.865	7.017	-13.7	0.004
	10.008	9.996	-179.0	0.008

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-

Cert. No.: 22CH1222  
Page: 2 of 2



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND)-JAPAN  
CORPORATE SERVICES 3-EQUIPMENT CALIBRATION AND TESTING SERVICES  
204 PATTANAKARN ROAD 3/F. BANGKOK, THAILAND 10260  
TEL: 0-2710-3887 FAX: 0-2710-3888



Cert. No.: 22CG3154  
Page: 1 of 2

# Certificate of Calibration

Equipment :

Burette

Capacity :

50 mL

Serial No. :

ID No. :

Manufacturer :

Made in :

Submitted by :

Ambient Temperature :

Relative Humidity :

Barometric Pressure :

Calibration Procedure :

Calibrated by :

Approved by :

( ) Pongthip Tanayakul

( ) Malee Burkrua

( ) Porpan Paipin

( ) Sirisuda Kharmha

Issue Date :

31 August 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 0044607

a 1123508

Sartorius (Thailand) Co., Ltd.  
101 Moo 3, T. Bangpa, A. Kaengkhro, Saraburi 18110, Thailand  
Tel: +66 2 586 5192 Fax: +66 2 586 5193  
E-mail: saraburi@ Sartorius.co.th



SARTORIUS  
Certificate of Calibration

Model Number : MSE2245-100-00  
Description : Analytical Balance  
Serial Number : 27405555  
ID No. : BKK\_EN0003  
Manufacturer : Sartorius  
Customer Name : ALS Laboratory Group (Thailand) Co., Ltd.  
154 Phatthanakan Rd., Phatthanakan Rd., Khwaeng Bang Luang, Khet Bang Luang, Bangkok 10250  
Calibrated Place : Lab Room  
Calibrated By : Mr. Chonchai Iritthana  
Calibration Date : Wednesday, August 05, 2023  
Calibration Procedure No. : This calibration was completed by (Using in-house calibration procedure number (REV.02))  
Based on UKAS LAB 14 : 2019  
Antistatic Condition :  
Temperature : 22.8 °C ± 0.1 °C  
Humidity : 50.0 % RH ± 10.0 % RH  
Pressure :  
Reasons for calibration :  
New installation ☐ Change ☐ Repair ☐ Periodic Maintenance  
Equipment Condition : ☐ New ☐ Used

Measurement Uncertainty : UKAS Publication Ref. Lab 14  
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 the Expression of Uncertainty in Measurement (GUM). The calibration certificate documents the traceability by National Standard which defines the unit of measurement according to the International Standard System of Units (SI). Report of Testers name from list of Statutory Metrology Specifications.

Traceability :  
Model Number : Observation : Traceability : Certificate No. : Due Date :  
YD011-020-00 : Sartorius weight set (mg) : 100g : 12-NC1001-100-00 : SPC-ART : 02021280 : 14-Sep-2023  
100g-500g : Sartorius weight set (mg) : 100g : 12-NC1001-100-00 : SPC-ART : 02021280 : 14-Sep-2023

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

This certificate may not be reproduced other than in full except with the prior written approval of the Verification Operation Division, Sartorius (Thailand) Co., Ltd.

SCF PM 30 : 05 February 2022

SCF PM 30 : 05 February 2022

SCF PM 30 : 05 February 2022

SCF PM 30 : 05 February 2022

SCF PM 30 : 05 February 2022

SCF PM 30 : 05 February 2022

SCF PM 30 : 05 February 2022

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SCF PM 30 : 05 February 2022

SCF PM 30 : 05 February 2022

SCF PM 30 : 05 February 2022

SCF PM 30 : 05 February 2022

SCF PM 30 : 05 February 2022

Certificate No. T230902

Page 2 of 5

### Calibration Report

Equipment : Digestion Unit  
Date of Calibration : 17 May 2023  
Environment : Temperature : 23.9 - 26.3 °C  
Line Voltage : 221.8 - 225.9 V  
Relative Humidity : 55 - 65 %RH

#### Condition of this results of calibration :

- This equipment was calibrated by insert four standard thermocouples type S into its chamber, the other one thermocouple type T use for ambient temperature measurement. The calibration was done in according to WI-T10.
- Reference Standard Instrument :  
Instrument Model Instrument No. Certificate No. Due Date  
TC Type S M20A1-CH17-CH20 T230547 18 April 2024  
DATA LOGGER 34970A T149 T230547 18 April 2024
- This certificate is traceable to :  
National Institute of Metrology (Thailand) through Metrological Center (NSC-TIS-TIS 17025 CALIBRATION 0244).
- Condition of calibrated item : good  
Equipment Description :  
Time Constant 1 Hour 54 Minute At 380 °C  
Fresh Air Damper ☐ Open ☐ Min ☐ Medium ☐ Max  
☒ Not Available
- Adjustment :  
( X ) without adjustment ( ) after adjustment

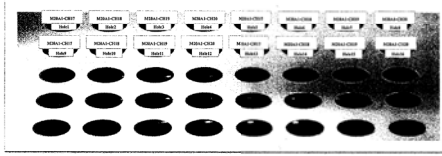
Approved By:

PM4-L13 388/30-05-57

Certificate No. T230902

Page 3 of 5

### Calibration Report



FRONT

#### Measurement Results

Cal. Point	Setting	Reading	STD.	Position of Standards at Block
°C	°C	°C	Reading	Block1 Block2 Block3 Block4 Block5 Block6 Block7 Block8
380.0	380.0	379.4 - 380.7		
		Max °C	377.3 379.0 379.2 380.2 377.5 378.5 380.7 380.1	
		Min °C	376.8 378.6 378.9 379.9 377.0 378.0 380.2 379.6	
		Average °C	377.8 378.8 379.1 380.4 377.2 379.2 380.4 379.9	
		Stability °C	0.2 0.2 0.2 0.2 0.3 0.3 0.2 0.2	

Cal. Point	Setting	Reading	STD.	Position of Standards at Block
°C	°C	°C	Reading	Block1 Block2 Block3 Block4 Block5 Block6 Block7 Block8
380.0	380.0	379.4 - 380.7		
		Max °C	377.1 378.9 379.2 379.8 379.3 379.4 379.5 377.4	
		Min °C	376.7 378.5 378.3 379.3 378.7 379.1 379.0 377.0	
		Average °C	376.9 378.7 378.4 379.7 379.1 379.4 379.3 377.2	
		Stability °C	0.2 0.2 0.2 0.2 0.2 0.3 0.3 0.2	

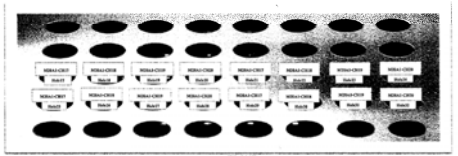
Approved By:

PM4-L13 388/30-05-57

Certificate No. T230902

Page 4 of 5

### Calibration Report



FRONT

#### Measurement Results

Cal. Point	Setting	Reading	STD.	Position of Standards at Block
°C	°C	°C	Reading	Block1 Block2 Block3 Block4 Block5 Block6 Block7 Block8
380.0	380.0	379.4 - 380.7		
		Max °C	378.4 380.1 380.1 380.0 379.1 379.8 379.6 377.8	
		Min °C	377.8 379.6 379.7 379.3 378.8 379.2 379.2 377.3	
		Average °C	378.1 379.8 379.9 379.3 379.8 379.4 379.4 378.7	
		Stability °C	0.3 0.3 0.2 0.3 0.3 0.3 0.2 0.2	

Cal. Point	Setting	Reading	STD.	Position of Standards at Block
°C	°C	°C	Reading	Block1 Block2 Block3 Block4 Block5 Block6 Block7 Block8
380.0	380.0	379.4 - 380.7		
		Max °C	377.9 379.4 380.1 380.1 379.2 379.4 379.0 377.3	
		Min °C	377.4 378.9 379.7 379.3 379.4 379.9 379.4 378.7	
		Average °C	377.7 379.2 379.8 379.8 379.4 379.3 379.4 378.8	
		Stability °C	0.3 0.3 0.2 0.2 0.3 0.4 0.3 0.3	

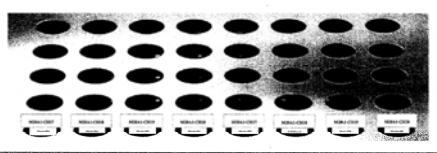
Approved By:

PM4-L13 388/30-05-57

Certificate No. T230902

Page 5 of 5

### Calibration Report



FRONT

Cal. Point	Setting	Reading	STD.	Position of Standards at Block
°C	°C	°C	Reading	Block1 Block2 Block3 Block4 Block5 Block6 Block7 Block8
380.0	380.0	379.4 - 380.7		
		Max °C	377.3 378.0 378.3 379.0 378.2 378.5 377.3 377.4	
		Min °C	377.3 377.6 377.9 378.6 377.7 378.1 378.9 377.8	
		Average °C	377.8 377.8 378.1 378.8 378.4 378.3 377.1 377.2	
		Stability °C	0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	

The expanded uncertainty of temperature measurement was  $\pm 1.85$  °C  
The calibration result apply only the above calibrated item.  
The result of test was found accurate as shown on date and place of test only.  
The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95 %.

Approved By:

PM4-L13 388/30-05-57

Certificate No. T222502

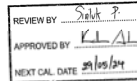
Page 1 of 4

### Certificate of Calibration

Equipment : Chamber ( Oven )  
Manufacturer : Memmert  
Model : UF 450  
Serial No. : B7170531  
Customer Code : BKK\_EN0273  
ID No. : T8042A4  
Customer : ALS Laboratory Group (Thailand) Co.,Ltd.  
104 Phathanakan 40, Phathanakan Rd., Khwaeng Phathanakan,  
Khet Suan Luang, Bangkok 10250  
Customer Location : Oven Room  
Date of Receipt : 23 November 2022  
Calibrated By : Sujjar Naknakred ( Site Calibration Manager )  
Approved By : / Boonchai Suriyawong (Site Calibration Manager)  
Date of Issue : 8 DEC 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.

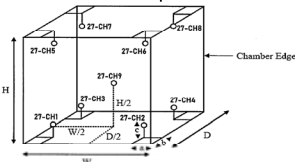


PM4-L13 388/30-05-57

Certificate No. T222502

Page 3 of 4

### Calibration Report



Remark :  
Internal Dimensions of Chamber : W (Width) = 104 cm, H (Height) = 72 cm, and D (Depth) = 68 cm.  
Size of Installed Standard sensor number T21-CH1 : 1.5 cm, 1.5 cm, and 1.5 cm.  
Size of Installed Standard sensor number T21-CH2 : 1.5 cm, 1.5 cm, and 1.5 cm.  
Size of Installed Standard sensor number T21-CH3 : 1.5 cm, 1.5 cm, and 1.5 cm.  
Size of Installed Standard sensor number T21-CH4 : 1.5 cm, 1.5 cm, and 1.5 cm.  
Size of Installed Standard sensor number T21-CH5 : 1.5 cm, 1.5 cm, and 1.5 cm.  
Size of Installed Standard sensor number T21-CH6 : 1.5 cm, 1.5 cm, and 1.5 cm.  
Size of Installed Standard sensor number T21-CH7 : 1.5 cm, 1.5 cm, and 1.5 cm.  
Size of Installed Standard sensor number T21-CH8 : 1.5 cm, 1.5 cm, and 1.5 cm.

Temperature Results									
Average Standard Reading at each position (°C)									
Calibration Point	21-CH1	21-CH2	21-CH3	21-CH4	21-CH5	21-CH6	21-CH7	21-CH8	21-CH9
104	104.07	103.60	103.45	104.02	104.47	103.57	104.59	104.78	104.18

Chamber (Oven)			Temperature Distribution				Coverage Factor k
Setting (°C)	Reading (°C)		Average (°C)	Stability (± °C)	Uniformity (°C)	Uncertainty (± °C)	
	Min, Max	Average					
104.0	-	104.0	103.97	0.07	0.70	0.42	2.00

\* 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=2, providing a level of confidence of approximately 95 %.

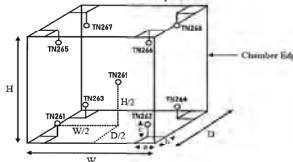
Approved By:

PM4-L13 11715-05-63

Certificate No. T222502

Page 4 of 4

### Calibration Report



Remark :  
Internal Dimensions of Chamber : W (Width) = 104 cm, H (Height) = 72 cm, and D (Depth) = 68 cm.  
Size of Installed Standard sensor number T2061 : 1.5 cm, 1.5 cm, and 1.5 cm.  
Size of Installed Standard sensor number T2062 : 1.5 cm, 1.5 cm, and 1.5 cm.  
Size of Installed Standard sensor number T2063 : 1.5 cm, 1.5 cm, and 1.5 cm.  
Size of Installed Standard sensor number T2064 : 1.5 cm, 1.5 cm, and 1.5 cm.  
Size of Installed Standard sensor number T2065 : 1.5 cm, 1.5 cm, and 1.5 cm.  
Size of Installed Standard sensor number T2066 : 1.5 cm, 1.5 cm, and 1.5 cm.  
Size of Installed Standard sensor number T2067 : 1.5 cm, 1.5 cm, and 1.5 cm.  
Size of Installed Standard sensor number T2068 : 1.5 cm, 1.5 cm, and 1.5 cm.  
Size of Installed Standard sensor number T2069 : 1.5 cm, 1.5 cm, and 1.5 cm.

Measurement Results									
Average Standard Reading at each position (°C)									
Calibration Point	T2061	T2062	T2063	T2064	T2065	T2066	T2067	T2068	T2069
180	179.14	179.17	179.65	179.26	180.41	179.64	181.18	180.59	180.36

Chamber (Oven)		Temperature Distribution			Coverage Factor k
Setting (°C)	Reading (°C) Min, Max, Average	Average (°C)	Stability (°C)	Uniformity (°C)	
180.0	-160.0, -160.0, -160.0	-159.28	0.00	0.00	2.00

\* 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=2, providing a level of confidence of approximately 95 %.

Approved By:

PM4-L13 11715-05-63

Certificate No. T2201718

Page 1 of 2

### Certificate of Calibration

Equipment : pH Meter  
Manufacturer : Mettler Toledo  
Model : SevenGo S2  
Serial No. : C3126C0888  
ID No. : BKK\_L00074  
Condition As-Received : Used Item  
Received Date : 07 June 2023  
Calibration Date : 08 June 2023  
Reference : 2309-0206050-6  
Submitted by : ALS Laboratory Group (Thailand) Co.,Ltd.  
104 Phathanakan 40, Phathanakan Rd.,  
Khwaeng Phathanakan, Khet Suan Luang,  
Bangkok 10250 Thailand  
Ambient Temperature : 25 ± 2.5 °C  
Relative Humidity : (50 ± 10) %  
Calibration Procedure : 1- house method ;  
2- pH 6.86 by direct measurement with standard voltage calibration and direct measurement with certified reference material (CRM)  
Calibrated by : Watsorn Luangphongkul  
Approved by :   
Issue Date : 12 June 2023  
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 Metrological Center.

A 0055202



Certificate of Calibration

Condition of this calibration result

1. Reference Standard Instrument

2. Certified Reference Materials

Calibration Results

Unit Under Calibration	Nominal Value	Standard Value	Actual Reading	Uncertainty of Measurement	Coverage Factor
pH Meter	4.00	177.48	177	0.005	2.00
SN: C21090288	7.00	0.00	0	0.01	2.00
	10.00	-177.48	-177	0.005	2.00

Function: pH Measurement

Performing standard curve by Fricke at pH (4.7, 10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Uncertainty of pH measurement	Coverage Factor
pH Electrode	4.008	4.02	0.005	2.00
SN: 2484182	6.866	6.89	0.01	2.00
	10.010	10.02	0.003	2.00

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

a 1162328

Certificate of Calibration

Equipment: pH Meter with Sensor

Manufacturer: Mettler Toledo

Model: SevenGo S2

Serial No.: C21090288

ID No.: BIOC\_00074

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

Location: TPA On Site Calibration Laboratory

Received Order: 07 June 2023

Calibrated Date: 08 June 2023

Relative Humidity: (50 ± 30) %

AC Line Voltage: (220 ± 22) V

Calibrated by: Preecha Hahb

Approved by: Preecha Hahb

Issue Date: 13 June 2023

The Uncertainty are for a confidence probability of approximately 95%

A 0055140

Certificate of Calibration

Equipment: pH Meter with Sensor

Condition As-Received: Used Item

Reference: 2305-020302C-1

Procedure Used: Calibration was conducted using in-house calibration procedure CP-Q071 according to comparison with Industrial Platinum Resistance Thermometer (IPRT) in Temperature Bath.

Calibration Results

Calibration Point (°C)	Immersion Depth (mm)	Standard Temperature (°C)	UUT Temperature (°C)	Error (°C)	Uncertainty (°C)	Coverage Factor
20.0	100	20.004	20.0	-0.004	0.16	2.00
25.0	100	25.005	25.0	-0.005	0.16	2.00
30.0	100	30.008	30.0	-0.008	0.16	2.00
35.0	100	35.010	35.0	-0.010	0.16	2.00
40.0	100	40.005	40.0	-0.005	0.16	2.00
45.0	100	45.003	45.0	-0.003	0.16	2.00

UUT: 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 %.

a 1166216

Certificate of Calibration

Equipment: CONDUCTIVITY METER

Model: ORION STAR A215

Serial No. (or ID): X58031

Manufacturer: Thermo Scientific

Electrode Serial No.: YV1-18416

Condition: In Condition

Certificate No.: C24230001

Issued Date: 5 January 2023

Job No.: KSPR2216356

Page: 1 of 2

Band: Thermo Scientific

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

Environment Condition: Temperature 21.6 °C ± 0.2 °C, Humidity 58.0 %RH ± 2.0 %RH

Calibration Place: ALS Laboratory Group (Thailand) Co., Ltd. (Wet Chemistry Lab 2)

Calibration By: Mr. Nattapat Rungrueang

Calibration Date: 3 January 2023

The Method used: In house method, CAL-WI-49, base on ASTM D 1125-14 and D 5391-14

Traceability: This certificate is traceable to the SI Units maintained by CRM of NIST(SRM) through CPA chem Co., Ltd. (ISO/IEC 17034) Certificate No. 83817, 83813, 83815

DKSH

Calibration Results:

Before Adjustment

Standard	Unit Under Calibration	Reading	Correction	Coverage Factor (k)	Uncertainty (±)
Conductivity Solution					
84.000 µS/cm	102.4 µS/cm	-18.400 µS/cm	2.00	0.69 µS/cm	
1413.0 µS/cm	1689 µS/cm	-276.0 µS/cm	2.00	11 µS/cm	
12.881 mS/cm	15.42 mS/cm	-2.5390 mS/cm	2.00	0.098 mS/cm	

After Adjustment: at 84.0 µS/cm, 1413 µS/cm, 12.88 mS/cm

Standard	Unit Under Calibration	Reading	Correction	Coverage Factor (k)	Uncertainty (±)
Conductivity Solution					
84.000 µS/cm	84.09 µS/cm	-0.090 µS/cm	2.00	0.68 µS/cm	
1413.0 µS/cm	1413 µS/cm	0.0 µS/cm	2.00	11 µS/cm	
12.881 mS/cm	12.88 mS/cm	-0.0000 mS/cm	2.00	0.098 mS/cm	

The End of Certificate

DKSH

ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: KSPR2216356

หน้างานเลขที่: X58031

ชนิดเครื่องมือ: CONDUCTIVITY METER รุ่น: ORION STAR A215

ตรวจสอบ (รับ) 03 Jan 2023

ตรวจสอบ (ส่ง) 03 Jan 2023

หน้างาน

General

1. ความถูกต้องของเครื่องวัด

2. ความสะอาด (ช่องใส่ตัวอย่าง, ท่อวัด, ท่อระบายน้ำ)

3. สวิตช์ On - Off (On-Off Switch)

4. ปุ่มกด (Keypad)

5. หน้าจอ (Display, Screen Contrast)

Good photo meter

6. แบตเตอรี่ (Battery Backup) >= 2.5 VDC

7. ความยาวคลื่นการวัด (Wavelength Control)

8. ความยาวคลื่น (Wavelength Check)

9. เวลาการวัด (UV < 3,000 hour)

10. เวลาการวัด (Visible < 5,000 hour)

11. ช่องวัดความยาวคลื่น (Carousel Module)

pH Meter and Conductivity Meter

12. อิเล็กโทรด (Electrode and Connection Cable)

13. ขั้วต่อสายสัญญาณ Electrode (Level KCI)

14. ฝาปิดป้องกัน Electrode (Dust Protection Hood)

15. ขาตั้งอิเล็กโทรด (Stand)

Turbidimeter

16. การควบคุมอุณหภูมิ (No Sample)

17. ขั้วต่อสายสัญญาณของเครื่องวัด (>= 2.5 ไมครอน 3.0)

Automatic titrator

18. ถาด Pipette Burettes

19. Function Rinsing and Dosing

20. ระบบทำความสะอาดอุปกรณ์วัด

Certificate of Calibration

Equipment: CONDUCTIVITY METER

Model: ORION STAR A215

Serial No. (or ID): X58031

Manufacturer: Thermo Scientific

Electrode Serial No.: YV1-18416

Condition: In Condition

Certificate No.: C24230001

Issued Date: 5 January 2023

Job No.: KSPR2216356

Page: 1 of 2

Band: Thermo Scientific

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

Environment Condition: Temperature 21.6 °C ± 0.2 °C, Humidity 58.0 %RH ± 2.0 %RH

Calibration Place: ALS Laboratory Group (Thailand) Co., Ltd. (Wet Chemistry Lab 2)

Calibration By: Mr. Nattapat Rungrueang

Calibration Date: 3 January 2023

The Method used: In house method, CAL-WI-49, base on ASTM D 1125-14 and D 5391-14

Traceability: This certificate is traceable to the SI Units maintained by CRM of NIST(SRM) through CPA chem Co., Ltd. (ISO/IEC 17034) Certificate No. 83817, 83813, 83815

DKSH

Calibration Results:

Before Adjustment

Standard	Unit Under Calibration	Reading	Correction	Coverage Factor (k)	Uncertainty (±)
Conductivity Solution					
84.000 µS/cm	102.4 µS/cm	-18.400 µS/cm	2.00	0.69 µS/cm	
1413.0 µS/cm	1689 µS/cm	-276.0 µS/cm	2.00	11 µS/cm	
12.881 mS/cm	15.42 mS/cm	-2.5390 mS/cm	2.00	0.098 mS/cm	

After Adjustment: at 84.0 µS/cm, 1413 µS/cm, 12.88 mS/cm

Standard	Unit Under Calibration	Reading	Correction	Coverage Factor (k)	Uncertainty (±)
Conductivity Solution					
84.000 µS/cm	84.09 µS/cm	-0.090 µS/cm	2.00	0.68 µS/cm	
1413.0 µS/cm	1413 µS/cm	0.0 µS/cm	2.00	11 µS/cm	
12.881 mS/cm	12.88 mS/cm	-0.0000 mS/cm	2.00	0.098 mS/cm	

The End of Certificate

DKSH

ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: KSPR2216356

หน้างานเลขที่: X58031

ชนิดเครื่องมือ: CONDUCTIVITY METER รุ่น: ORION STAR A215

ตรวจสอบ (รับ) 03 Jan 2023

ตรวจสอบ (ส่ง) 03 Jan 2023

หน้างาน

General

1. ความถูกต้องของเครื่องวัด

2. ความสะอาด (ช่องใส่ตัวอย่าง, ท่อวัด, ท่อระบายน้ำ)

3. สวิตช์ On - Off (On-Off Switch)

4. ปุ่มกด (Keypad)

5. หน้าจอ (Display, Screen Contrast)

Good photo meter

6. แบตเตอรี่ (Battery Backup) >= 2.5 VDC

7. ความยาวคลื่นการวัด (Wavelength Control)

8. ความยาวคลื่น (Wavelength Check)

9. เวลาการวัด (UV < 3,000 hour)

10. เวลาการวัด (Visible < 5,000 hour)

11. ช่องวัดความยาวคลื่น (Carousel Module)

pH Meter and Conductivity Meter

12. อิเล็กโทรด (Electrode and Connection Cable)

13. ขั้วต่อสายสัญญาณ Electrode (Level KCI)

14. ฝาปิดป้องกัน Electrode (Dust Protection Hood)

15. ขาตั้งอิเล็กโทรด (Stand)

Turbidimeter

16. การควบคุมอุณหภูมิ (No Sample)

17. ขั้วต่อสายสัญญาณของเครื่องวัด (>= 2.5 ไมครอน 3.0)

Automatic titrator

18. ถาด Pipette Burettes

19. Function Rinsing and Dosing

20. ระบบทำความสะอาดอุปกรณ์วัด

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## Certificate of Testing

Equipment : DO Meter  
Manufacturer : YSI  
Model : 5100  
Serial No. : 15L103204  
ID No. : BKK\_EN0205  
Received Date : 02 August 2022  
Test Date : 03 August 2022  
Reference : 2208-0060DSC-1  
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.  
104 Phatthakanan 40, Phatthakanan Rd.,  
Khwang Phatthakanan, Khet Suan Luang,  
Bangkok 10250 Thailand  
Laboratory Condition : Temperature (25 ± 5) °C  
Humidity (50 ± 20) %  
Test Procedure : In-house method : CP-C09  
By Comparison Technique with Azide Modification Method  
Tested by : Waleak Sirithan  
Approved by :   
Approved Signatory  
( ) Molee Buksua  
( ) Sathit Mangmal  
( ) Warakorn Lengtrakul  
Issue Date : 4 August 2022

Cert.No.: 227W178  
Page: 1 of 2

### Condition of this result of calibration

1. Reference Standard Instruments :  
This certification is traceable to the International System of Unit through the reference standards  
laboratory of Industrial Calibration Center, Technology Promotion Association (Thailand-Japan).

Instruments	Serial No.	ID No.	Certificate No.	Due Date
1) Burette	130BU10	130BU10	21CG1389	25 Mar 2023
2) Balance	1126143764	140RC004	21MM430	21 Sep 2022

2. Standard Material :  
Material : Sodium Thiosulfate pentahydrate  
Manufacturer : Merck  
Lot No. : AM1763316  
Assay : 100.2%  
Result : Dissolved Oxygen Meter Adjustment With Air 100 %  
Dissolved Oxygen Probe No. : 17A100554

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.00	8.07	0.0045

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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## Certificate of Calibration

Equipment : DO Meter with Sensor  
Manufacturer : YSI  
Model : 5100  
Serial No. : 15L103204  
ID No. : BKK\_EN0205  
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.  
104 Phatthakanan 40, Phatthakanan Rd.,  
Khwang Phatthakanan, Khet Suan Luang,  
Bangkok 10250 Thailand  
Location : TPA On Site Calibration Laboratory  
Received Order : 2 August 2022  
Calibrated Date : 4 August 2022  
Ambient Temperature : (26 ± 10) °C  
Relative Humidity : (50 ± 30) %  
AC Line Voltage : (220 ± 22) V  
Calibrated by : Man Pattanasongbaobon  
Approved by :   
Approved Signatory  
( ) Pornthippa Tameyakul  
( ) Molee Buksua  
( ) Suwit Injai  
Issue Date : 9 August 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.



Equipment : DO Meter with Sensor  
Condition As-Received : Used Item  
Reference : 2208-0060DSC-2  
Procedure Used : Calibration was conducted using in-house calibration procedure CP-OT01 according to comparison with  
Industrial Platinum Resistance Thermometer (IPRT) in Temperature Bath.  
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) Digital Thermometer : 1502A : A52847 : 2111144 : 20 Oct 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 : Temperature measurement  
This instrument was connected with temperature sensor, SN: 19C100772

Calibration Point (°C)	Immersion Depth (mm)	Standard Temperature (°C)	Reading (°C)	Error (°C)	Uncertainty (°C)	Coverage Factor k
20.00	60	20.002	19.93	-0.072	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 %.

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a 112699



## Metrological Center SCI ECO Services Company Limited

332 Moo 3, T.Banpa, A.Kaengkhro, Saraburi 18110, Thailand  
Sanctuary Tel : +66 36273596 Fax : +66 36273100  
Bangkok Tel : +66 8226 8851, +66 8247 2980  
Website : www.sci-eco.co.th E-Mail : info@sci-eco.co.th



Certificate No. T231342

Page 1 of 4

## Certificate of Calibration

Equipment : Chamber ( Incubator )  
Manufacturer : MEMMERT  
Model : ICP 750  
Serial No. : F818.0033  
Customer Code : BKK\_EN0272  
ID No. : T8041A4  
Customer : ALS Laboratory Group (Thailand) Co., Ltd.  
104 Phatthakanan 40, Phatthakanan Rd., Khwang Phatthakanan,  
Khet Suan Luang, Bangkok 10250  
Customer Location : Wet Chemistry Lab 2  
Date of Receipt : 3 July 2023  
Calibrated By : Sujjar Nakkakred ( Site Calibration Manager )  
Approved By :   
Date of Issue : 11 JUL 2023

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 capability to recognize 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.

PM-LIS 11715-05-03



## Metrological Center SCI ECO Services Company Limited

332 Moo 3, T.Banpa, A.Kaengkhro, Saraburi 18110, Thailand



Certificate No. T231342

Page 2 of 4

## Calibration Report

Equipment : Chamber ( Incubator )  
Date of Calibration : 5-6 July 2023 ( Finished Time 4:30 PM )  
Environment : Temperature : 26.9-36.3 °C  
Line Voltage : 221.7-225.5 V  
Condition of this result of test :  
1. This instrument was calibrated by insert 12 standard resistance thermometer into chamber and test according  
to W-120 ( based on ASTM E145-94 ( Reapproved 1991 ) and AS2533-1996 )  
All data show below were final values and the initial data may be obtained upon request.  
The temperature scale used was based on ITS-90.  
2. Reference Standard Instrument :  
Instrument : Model : Instrument No. : Certificate No. : Due Date :  
RTD : 180 ohm : 27-CH1-101 : T230943 : 18 April 2024  
RTD : 180 ohm : 28-CH1-101 : T230943 : 18 April 2024  
DATA LOGGER : 44796A : T149 : T230943 : 18 April 2024  
3. This certificate is traceable to:  
National Institute of Metrology (Thailand) through Metrological Center ( SSC-TIS-TIS 17025 CALIBRATION 0204 )  
4. Condition of calibrated item : good  
( UUC ) Description :  
Time Constant : 6 Hour 15 Minute 20 Sec  
Power Air Flow : 0 Open 1 Min 2 Min 3 Min 4 Min 5 Min 6 Min 7 Min 8 Min 9 Min 10 Min 11 Min 12 Min 13 Min 14 Min 15 Min 16 Min 17 Min 18 Min 19 Min 20 Min 21 Min 22 Min 23 Min 24 Min 25 Min 26 Min 27 Min 28 Min 29 Min 30 Min 31 Min 32 Min 33 Min 34 Min 35 Min 36 Min 37 Min 38 Min 39 Min 40 Min 41 Min 42 Min 43 Min 44 Min 45 Min 46 Min 47 Min 48 Min 49 Min 50 Min 51 Min 52 Min 53 Min 54 Min 55 Min 56 Min 57 Min 58 Min 59 Min 60 Min 61 Min 62 Min 63 Min 64 Min 65 Min 66 Min 67 Min 68 Min 69 Min 70 Min 71 Min 72 Min 73 Min 74 Min 75 Min 76 Min 77 Min 78 Min 79 Min 80 Min 81 Min 82 Min 83 Min 84 Min 85 Min 86 Min 87 Min 88 Min 89 Min 90 Min 91 Min 92 Min 93 Min 94 Min 95 Min 96 Min 97 Min 98 Min 99 Min 100 Min 101 Min 102 Min 103 Min 104 Min 105 Min 106 Min 107 Min 108 Min 109 Min 110 Min 111 Min 112 Min 113 Min 114 Min 115 Min 116 Min 117 Min 118 Min 119 Min 120 Min 121 Min 122 Min 123 Min 124 Min 125 Min 126 Min 127 Min 128 Min 129 Min 130 Min 131 Min 132 Min 133 Min 134 Min 135 Min 136 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Approved By \_\_\_\_\_

FM-L13 108/30-05-5

BKK-EL0043

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FMJ 13 108/30-05-57

PAR 1.12 (2000000-5)

Approved By:

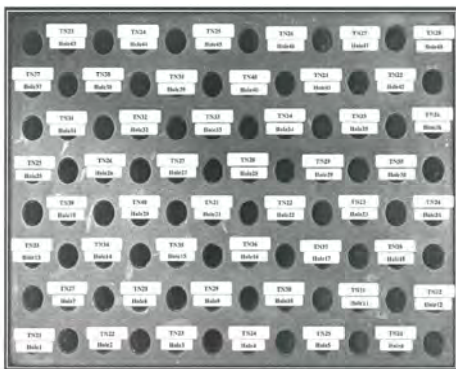
FM-L13 DR/30-05-5



Certificate No. T231676

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### Calibration Report



FRONT CONTROL

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

PM-L13 30630-05-07

Certificate No. T231676

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### Calibration Report

Measurement Results		Average Standard Reading at each position (°C)					
Calibration Point		TN21	TN22	TN23	TN24	TN25	TN26
R1 Hole1-Hole2	Max	93.01	94.41	93.28	93.41	94.51	95.17
	Min	92.75	93.01	94.25	94.02	94.04	94.75
	Average	92.78	94.16	93.99	93.77	94.26	94.96
R2 Hole3-Hole12	Max	93.58	95.43	94.19	93.14	93.25	94.07
	Min	93.04	94.35	93.72	93.71	94.90	94.91
	Average	93.31	94.89	93.96	93.94	94.15	94.77
R3 Hole13-Hole18	Max	93.37	93.39	93.22	93.21	93.33	93.21
	Min	93.09	93.09	94.79	94.42	94.88	94.96
	Average	93.18	93.39	94.06	94.02	94.11	94.13
R4 Hole19-Hole24	Max	93.39	94.42	94.32	94.28	94.43	94.67
	Min	93.21	94.29	94.12	93.88	94.29	94.27
	Average	93.40	94.36	94.33	94.06	94.43	94.47
R5 Hole25-Hole30	Max	93.19	93.33	93.93	93.20	93.14	93.03
	Min	94.03	93.01	93.36	94.05	94.79	94.79
	Average	94.00	94.70	94.12	94.96	94.97	94.97
R6 Hole31-Hole36	Max	94.03	94.90	94.71	94.21	94.24	94.87
	Min	94.24	94.25	94.44	93.69	93.92	93.96
	Average	94.42	94.72	94.60	94.16	94.08	94.41
R7 Hole37-Hole42	Max	94.00	94.00	94.00	94.00	94.00	94.00
	Min	94.00	94.00	94.00	94.00	94.00	94.00
	Average	94.00	94.00	94.00	94.00	94.00	94.00
R8 Hole43-Hole48	Max	93.99	93.93	93.28	93.29	93.45	94.03
	Min	93.47	93.12	94.42	94.68	94.69	94.49
	Average	93.79	93.50	94.40	94.01	94.02	94.48

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

PM-L13 30630-05-07

Certificate No. T231676

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### Calibration Report

Measurement Results		Average Standard Reading at each position (°C)					
Calibration Point		TN21	TN22	TN23	TN24	TN25	TN26
R1 Hole1-Hole2	Max	93.23	94.32	93.43	93.52	94.49	95.27
	Min	92.94	93.05	93.27	93.44	94.11	94.95
	Average	93.08	93.69	93.35	93.48	94.30	95.11
R2 Hole3-Hole12	Max	93.58	95.43	94.19	93.14	93.25	94.07
	Min	93.04	94.35	93.72	93.71	94.90	94.91
	Average	93.31	94.89	93.96	93.94	94.15	94.77
R3 Hole13-Hole18	Max	93.37	93.39	93.22	93.21	93.33	93.21
	Min	93.09	93.09	94.79	94.42	94.88	94.96
	Average	93.18	93.39	94.06	94.02	94.11	94.13
R4 Hole19-Hole24	Max	93.39	94.42	94.32	94.28	94.43	94.67
	Min	93.21	94.29	94.12	93.88	94.29	94.27
	Average	93.40	94.36	94.33	94.06	94.43	94.47
R5 Hole25-Hole30	Max	93.19	93.33	93.93	93.20	93.14	93.03
	Min	94.03	93.01	93.36	94.05	94.79	94.79
	Average	94.00	94.70	94.12	94.96	94.97	94.97
R6 Hole31-Hole36	Max	94.03	94.90	94.71	94.21	94.24	94.87
	Min	94.24	94.25	94.44	93.69	93.92	93.96
	Average	94.42	94.72	94.60	94.16	94.08	94.41
R7 Hole37-Hole42	Max	94.00	94.00	94.00	94.00	94.00	94.00
	Min	94.00	94.00	94.00	94.00	94.00	94.00
	Average	94.00	94.00	94.00	94.00	94.00	94.00
R8 Hole43-Hole48	Max	93.99	93.93	93.28	93.29	93.45	94.03
	Min	93.47	93.12	94.42	94.68	94.69	94.49
	Average	93.79	93.50	94.40	94.01	94.02	94.48

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

PM-L13 30630-05-07

Certificate No. T231676

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### Calibration Report

Measurement Results:

HEATING BLOCK		Temperature Distribution	
Setting (°C)	Reading (°C)	Stability (±°C)	Uniformity (±°C)
100.0	100.1, 100.5	0.20	0.10
107.0	107.5, 107.1	0.10	0.10

\* The quoted uncertainty exclude "uniformity"

The calibration results apply only to 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

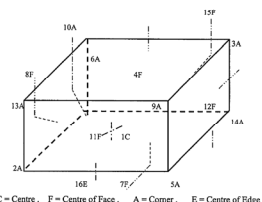
is level of confidence of approximately 95 %.

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

Certificate No. T221644

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### Calibration Report



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

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

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

PM-L15 11715-05-03

Certificate No. T221644

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.

REVIEW BY: Sujat P.  
APPROVED BY: YI AL  
NEXT CAL DATE: 30/12/23

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

Customer Location : Environmental Laboratory

Date of Receipt : 27 June 2022

Calibrated By : Sujat Nakkakred (Site Calibration Manager)

Approved By : Biosach Suriyawong (Site Calibration Manager)

Date of Issue : 04 JUL 2022

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

This Certificate is issued in accordance with the regulations 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.

PM-L14 117101-02-04

Certificate No. T221644

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### Calibration Report

Measurement Results:

Average Standard Reading at each position (°C)									
Calibration Point		TN161	TN162	TN163	TN164	TN165	TN166	TN167	TN168
3	2.71	2.82	2.75	2.81	2.93	3.00	3.02	2.99	3.00
	2.97	3.02	2.89	3.00	2.87	3.13			

Chamber ( Cold Room )		Temperature Distribution				
Setting (°C)	Reading (°C)	Average (°C)	Stability (±°C)	Uniformity (±°C)	Uncertainty (±°C)	Coverage
3.0	2.9, 4.0	3.2	2.99	1.05	1.30	1.60

\* The quoted uncertainty exclude "uniformity"

The calibration results apply only to 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 is a level of confidence of approximately 95 %.

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

PM-L15 11715-05-03

Certificate No. T221644

Page 2 of 4

### Calibration Report

Equipment : Chamber ( Cold Room )  
Date of Calibration : 30 June - 1 July 2022  
Environment : Temperature : 18.9-23.7 °C  
Line Voltage : 222.9-226.5 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 accordance with T220 (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	30 July 2022
TC	TYPE T	TN171-TN180	T210009	30 July 2022
DATA LOGGER	34999A	T149	T210009	30 July 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 : 3 Hour  
Fresh Air Damper : ☐ Open ☐ Min ☐ Medium ☐ Max  
Close ☒ Not Available

5. Adjustment :

( ) without adjustment ( X ) after adjustment

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

PM-L15 11715-05-03

## Maintenance Protocol

Atomic Fluorescence Spectrometer  
mercur DUO /  
mercur DUO plus

BKK\_EL0023

analytikjena

REVIEW BY: Sujat P.  
APPROVED BY: YI AL  
NEXT CAL DATE: 30/12/23



Serial-No.: K170A0143 Customer-No.:  
Date: 24 May 2023 Carried out by: Srchai Fak-on

Maintenance with following Operational Qualification (OQ)  
(requires a separate OQ protocol)

Company	บริษัท เอนเนคอส แอสเซมบลี จำกัด (ประเทศไทย) จำกัด
User	
Department	ห้องแล็บปฏิบัติการ
Street	104 หมู่ 40 ถนนพหลโยธิน แขวงจตุจักร เขตจตุจักร กรุงเทพฯ
Zip Code, City	กรุงเทพมหานคร 10250
Country	ประเทศไทย
Phone	
Fax	
E-mail	

Microscan Product name: S23 report (OQ) and update: 07.06.2019 version: 01.000  
Website: www.analytikjena.com (19770) Java Version:

## Maintenance works basic unit

lightness visual check inside the Marcur  
visual check if gold-traps are broken  
visual check if spectrometer is contaminated  
visual check of the fluorescence cell  
visual check of the absorption cell, incl. window/  
reactor cleaning  
check pump-hose, if necessary change it  
check valve drive (SEV)  
check drying-hose, output gas-liquid-separator  
test Bubble-Sensor  
check gas flows  
check volume flows, reagents  
recording stray light values  
measurement with 30 ng/L

## Maintenance works Autosampler

lubricate the dosing-winding (Teflon-grease-spray)  
clean the dosing cylinder, if necessary exchange it  
lubricate the winding system of the height drive with some drops of oil  
check the toolbed last  
check the position of the mechanical stopper (height: 13mm)  
check the pump rate of mixing pump (x144 AS52, typ. 75/4236 AS52S, typ. 10x)  
check the pump rate of washing cup  
check the mechanical hose connections for good contact  
check the connections of the magnetic valves  
check the dosing hose for building, if necessary exchange it

Microscan Product name: S23 report (OQ) and update: 07.06.2019 version: 01.000  
Website: www.analytikjena.com (19770) Java Version:

Device parameter	nominal value	actual value
visual check general lightness inside the Marcur	o.k.	changed
visual check Goldtraps	o.k.	changed
visual check spectrometer	o.k.	changed
Fluorescence cell	o.k.	changed
Absorption cell, incl. window	o.k.	changed
Sealant drive (SEV)	o.k.	changed
check pump hose	o.k.	changed
check hoses and hose connectors	o.k.	changed
check and clean reactor	o.k.	changed
check drying hose output Gas-liquid-separator	o.k.	changed
check bubble-sensor	o.k.	not o.k.
Check gasflow		
Argon pressure valve 4	1.2 - 1.5 bar	1.5 bar
Valve 1	10 Nl/h or 0.168 Nl/min	0.163 Nl/min
Valve 2	10 Nl/h or 0.168 Nl/min	0.163 Nl/min
Valve 3	10 Nl/h or 0.168 Nl/min	0.163 Nl/min
Valve 4	10 Nl/h or 0.168 Nl/min	0.163 Nl/min
Check liquidflow		
Acid	2.5 ml/min ± 1 ml	2.5 ml/min
Red-agent	2.5 ml/min ± 1 ml	2.5 ml/min
Sample	10 ml/min ± 2 ml	10 ml/min
Adventitious light - values	(V)	from file
100	0	0
200	0	0
300	0	0
350	0	0
400	0	0
450	2	2
500	5	5
550	10	10
575	15	14
600	20	20

Microscan Product name: S23 report (OQ) and update: 07.06.2019 version: 01.000  
Website: www.analytikjena.com (19770) Java Version:

Device parameter	nominal value	actual value
Analytical parameters Fluorescence cell		
Conditions: max conc.: 10 µg/L, PMT-voltage: 350 V		
Blank-solution without enrichment / FBR 30 ng/L	Int: 0.00024 Ext: 0.00172 RSD: 0.48 %	Int: 0.00024 Ext: 0.00172 RSD: 0.48 %
Conditions: max conc.: 1.7 µg/L, PMT-voltage: 352 V		
Blank-solution with enrichment / FBR 30 ng/L	Int: 0.00070 Ext: 0.00549 RSD: 0.39 %	Int: 0.00070 Ext: 0.00549 RSD: 0.39 %
Factor: factor (Int / Ext)		6.19
Analytical parameters Absorption cell		
Blank-solution without enrichment / FBR 100 ng/L	Ext: 0.00093 Ext: 0.00449 RSD: 0.5 %	Ext: 0.00093 Ext: 0.00449 RSD: 0.5 %
Comments		

Srchai Fak-on  
Signature Technician  
24 May 2023  
Place, Date (DDMMYYYY)

Oranwan T.  
Signature Customer  
24 May 2023  
Place, Date (DDMMYYYY)

Microscan Product name: S23 report (OQ) and update: 07.06.2019 version: 01.000  
Website: www.analytikjena.com (19770) Java Version:

## analytikjena

## Service Report

Customer's address: Customer's Ref. No.:  
Job No.: 2023052403 Date: 24/05/2023 Service Engineer: Srchai Fak-on  
Job start/end time: 08:00 - 12:00  
Job location: Bangkok, Thailand  
Job description: Maintenance of the Marcur and Autosampler.  
Action taken: - Maintenance of the Marcur and Autosampler.  
- Check the dosing cylinder.  
- Check the pump rate of the mixing pump.  
- Check the pump rate of the washing cup.  
- Check the mechanical hose connections.  
- Check the connections of the magnetic valves.  
- Check the dosing hose for building.  
- Check the stray light values.  
- Check the bubble sensor.  
- Check the gas flows.  
- Check the volume flows.  
- Check the reagents.  
- Check the recording of the stray light values.  
- Check the measurement with 30 ng/L.  
Action Pending / Recommendation: none  
Date / Signature of Customer: 24/05/2023 Oranwan T.  
Date / Signature of Service Engineer: 24/05/2023 Srchai Fak-on  
Work completed? ☒ Yes ☐ No

Microscan Product name: S23 report (OQ) and update: 07.06.2019 version: 01.000  
Website: www.analytikjena.com (19770) Java Version:

## Mercur

Report file: C:\WinAS\TMP\2023\May\Fro\_032  
Program version: 4.7.10.0 Printed on: 5/24/2023 12:46  
Operator: PSU,OTA Recording started on: 5/24/2023 12:36 GMT+7.0  
Laboratory: ALS-BKK  
Code: I\_Hg095\_2023  
Remarks:  
Foot,water

## Method parameters

Without enrichment / FBR 30ng/L\_P042052023  
Created on: 5/24/2023 Time: 12:27

Parameters	Mercur Technique: Hg Fluorescence
Line	253.7 nm
Lamp type	Hg-LP
Integr. mode	Integr. time: 10 s
PMT	350 V
AZ time	5 s
Delay	5 s
Working mode	W/O enrich.
Pump speed	on
Sample load time	10 s
Reaction time	10 s
Waiting time AZ	5 s
Delay	0 s
Purge time1	25 s
Purge time2	15 s
Gas wash time2	10 Nl/h
System cleaning	Acid
Wash time acid	10 s
Soaking time	20 s
Gas load time	5 Nl/h
Autosampler	
Autosampler working mode	AS515F continuous
Tray type	871/39
Dilution	---

Mercur

## Calibration function: 1

5/24/2023 12:46 Calibration (Peak height)

Int=1.142\*conc

k1=0.000248 k2=0.000048

Recal factor: ---

Slope: 0.000008 (Int/1 ng/L)

Lower limit: 0 ng/L

Detection limit: 0 ng/L

Upper limit: 33.6 ng/L

Deter. limit: ---

Hg 253.7 nm Peak height

Intensity

Conc. [ng/L]

0.0000

0.0005

0.0010

0.0015

0.0020

0.0025

0.0030

0.0035

0.0040

0.0045

0.0050

0.0055

0.0060

0.0065

0.0070

0.0075

0.0080

0.0085

0.0090

0.0095

0.0099

0.0100

0.0105

0.0110

0.0115

0.0120

0.0125

0.0130

0.0135

0.0140

0.0145

0.0150

0.0155

0.0160

0.0165

0.0170

0.0175

0.0180

0.0185

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0.0240

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0.0875

0.0880

0.0885

0.0890

0.0895

0.0900

0.0905

0.0910

0.0915

0.0920

0.0925

0.0930

0.0935

0.0940

0.0945

0.0950

0.0955

0.0960

0.0965

0.0970

0.0975

0.0980

0.0985

0.0990

0.0995

0.1000

0.1005

0.1010

0.1015

0.1020





**Equipment :** Autoclave  
**Condition As-Received :** Used Item  
**Reference :** 2307-028500-3  
**Page :** 2 of 3

**Procedure Used :**  
Calibration was conducted using in-house calibration procedure CP-OT03 according to direct measurement method with Data Acquisition which connected with Thermocouple Type T.  
The temperature scale used was based on ITS-90.

**Condition of this result of calibration**  
1. Reference standard instrument :-  
Instrument Serial No. Cert. No. Traceable Due Date  
1) Data Acquisition MY5701323 23LM05 TPA 25 Mar 2024  
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.  
4. This result of calibration covers laboratory autoclaves for the sterilization of goods and material which could be infected with organisms categorized as Hazard Group 1, 2 and 3\*\*.  
5. \*\* = Calibration of pathogens according to hazard and categories of containment, second edition, 1999 )  
6. This does not cover autoclaves for use with material infected with organisms in Hazard Group 4, for which complete containment and sterilization of infected condensate is considered to be essential.  
7. This result of calibration does not apply to sterilizers or disinfectors used for medical, dental, pharmaceutical or veterinary purposes which are directly concerned with patient care, or those used for labors subjected to sterilization which are required to be dry at the end of cycle.  
**Remark :** TPA : Technology Promotion Association (Thailand - Japan)  
**Result of Calibration :** ( \* ) Without Adjustment  
**Function of UUC\* :** Temperature Source

Environmental	
Beginning of Calibration	Finished
Temp. ( °C )	53 220
REL.Humid. ( % )	54 220

Position	Description	Ref. Std. ID No.
1 =	Center of chamber	22-177C-01
2 =	Temperature sensor	23-177C-02
3 =	Exhaust port	19-177C-03

a 1159503

**Equipment :** Autoclave  
**Condition As-Received :** Used Item  
**Reference :** 2307-028500-3  
**Page :** 3 of 3

**Result of Calibration :** ( \* ) Without Adjustment  
**Function of UUC\* :** Temperature Source  
**Operating parameter Set :** Temperature = 121 °C  
**Sterilization period :** 5 minute

UUC* Setting ( °C )	UUC* Reading ( °C )	Position	Standard Reading ( °C )	Stability ( ± °C )	Pressure Fluctuation ( MPa )	Uncertainty ( ± °C )	Coverage Factor #
121	121	1	120.877	0.39	0.12	1.0	2
		2	120.879				
		3	120.868				

**Average\* :** The average of 30 values in each position.  
**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 1159504

**TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)**  
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES  
104 PHATHANAKAN RD., PHATHANAKAN, KHUET SUAN LUANG, BANGKOK 10250 THAILAND  
TEL. 0-2711-0800 FAX. 0-2711-0804

**Certificate of Calibration**  
Cert. No.: 227M1103  
Page: 1 of 3

**Equipment :** Incubator  
**Manufacturer :** SHEL-LAB  
**Model :** 1915A  
**Serial No. :** 0200590  
**ID No. :** BKK\_ML0010

**Submitted by :** ALS Laboratory Group (Thailand) Co., Ltd.  
104 Phathanakan Rd., Phathanakan Rd.,  
Khuang Phathanakan, Khuat Suai Luang,  
Bangkok 10250 Thailand

**Location :** Incubation & Micrological Reading

**Received Order :** 17 July 2023  
**Calibration Date :** 17 July 2023  
**Ambient Temperature :** ( 26 ± 1 ) °C  
**Relative Humidity :** ( 50 ± 30 ) %

**Calibrated by :** Man Pithanongpachon

**Approved by :**   
Approved Signatory

**Issue Date :** 24 July 2023

**The Uncertainties are for a confidence probability of approximately 95 %**  
This certificate may not be reproduced without the written permission of the Technology Promotion Association (Thailand-Japan).  
Approval of the Issued Certificate Services : Equipment Calibration and Testing Services

A 0055469

**Equipment :** Incubator  
**Condition As-Received :** Used Item  
**Reference :** 2307-028500-1  
**Page :** 2 of 3

**Procedure Used :**  
Calibration was conducted using calibration procedure CP-OT03 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 Serial No. Cert. No. Traceable Due Date  
1) Data Acquisition MY43001451 23LM27 TPA 25 Feb 2024  
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.  
**Remark :** TPA : Technology Promotion Association (Thailand - Japan)  
**Result of Calibration :** ( \* ) Without Adjustment  
**Function of UUC\* :** Temperature Source  
**Fresh air setting :** Close

Environment during calibration	
Beginning	Finished
Temp. ( °C )	24 24
REL.Humid. ( % )	54 56
AC Supply ( Vol. )	221 223

Position	Ref. Std. ID No.
1	19RTD-21
2	19RTD-22
3	19RTD-23
4	19RTD-24
5	19RTD-25
6	19RTD-26
7	19RTD-27
8	19RTD-28
9 (ref.)	19RTD-29

**Probe Installation Details :**  
a = 10 cm  
b = 10 cm  
c = 10 cm

**Dimension of Chamber :**  
D = 0.50 m  
W = 0.75 m  
H = 1.2 m  
Capacity = 0.45 m<sup>3</sup>

a 1172189

**Equipment :** Incubator  
**Condition As-Received :** Used Item  
**Reference :** 2307-028500-1  
**Page :** 3 of 3

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

Calibration Point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Temperature stability ( ± °C )	Temperature uniformity ( °C )	Overall Variation ( °C )	Coverage Factor #
35.0	35.0	35.0	0.05	0.30	0.44	2

Calibration Point ( °C )	Measured Temperature ( °C )									Uncertainty ( ± °C )
	1	2	3	4	5	6	7	8	9 (ref.)	
35.0	34.888	34.933	34.815	34.813	35.064	35.019	35.156	35.141	35.087	0.30

**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 1172188

**TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)**  
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES  
104 PHATHANAKAN RD., PHATHANAKAN, KHUET SUAN LUANG, BANGKOK 10250 THAILAND  
TEL. 0-2711-0800 FAX. 0-2711-0804

**Certificate of Calibration**  
Cert. No.: 227M1571  
Page: 1 of 3

**Equipment :** Hot Air Oven  
**Manufacturer :** Binder  
**Model :** ED 240/E2  
**Serial No. :** 80-15533  
**ID No. :** BKK\_ML0013

**Submitted by :** ALS Laboratory Group (Thailand) Co., Ltd.  
104 Phathanakan Rd., Phathanakan Rd.,  
Khuang Phathanakan, Khuat Suai Luang,  
Bangkok 10250 Thailand

**Location :** Media Preparation Room

**Received Order :** 21 November 2022  
**Calibration Date :** 21 November 2022  
**Ambient Temperature :** ( 26 ± 1 ) °C  
**Relative Humidity :** ( 50 ± 30 ) %

**Calibrated by :** Kinada Malas

**Approved by :**   
Approved Signatory

**Issue Date :** 29 November 2022

**The Uncertainties are for a confidence probability of approximately 95 %**  
This certificate may not be reproduced without the written permission of the Technology Promotion Association (Thailand-Japan).  
Approval of the Issued Certificate Services : Equipment Calibration and Testing Services

A 0048150

**Equipment :** Hot Air Oven  
**Condition As-Received :** Used Item  
**Reference :** 2211-062300-1  
**Page :** 2 of 3

**Procedure Used :**  
Calibration was conducted using calibration procedure CP-OT03 according to direct measurement method with Data Acquisition which connected with 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 34970A MY44067817 22LM121 22 Aug 2023  
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 :** ( \* ) After Adjustment  
**Function of UUC\* :** Temperature Source  
**Fresh air setting :** Not Available

Environment during calibration	
Beginning	Finished
Temp. ( °C )	26 26
REL.Humid. ( % )	53 55
AC Supply ( Vol. )	219 220

Position	Ref. Std. ID No.
1	21-157C-01
2	21-157C-02
3	21-157C-03
4	21-157C-04
5	21-157C-05
6	21-157C-06
7	21-157C-07
8	21-157C-08
9 (ref.)	21-157C-09

**Probe Installation Details :**  
a = 5.0 cm  
b = 5.0 cm  
c = 5.0 cm

**Dimension of Chamber :**  
D = 0.50 m  
W = 0.80 m  
H = 0.60 m  
Capacity = 0.24 m<sup>3</sup>

a 1138049

**Equipment :** Hot Air Oven  
**Condition As-Received :** Used Item  
**Reference :** 2211-062300-1  
**Page :** 3 of 3

**Result of Calibration :** ( \* ) After Adjustment  
**Function of UUC\* :** Temperature Source  
**Fresh air setting :** Not Available

Calibration Point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Temperature stability ( ± °C )	Temperature uniformity ( °C )	Overall Variation ( °C )	Uncertainty ( ± °C )	Coverage Factor #
180	180	180	0.70	1.5	2.9	1.4	2

Calibration Point ( °C )	Measured Temperature ( °C )									Uncertainty ( ± °C )
	1	2	3	4	5	6	7	8	9 (ref.)	
180	179.520	180.585	179.805	179.482	179.827	179.908	179.074	180.199	180.068	1.4

**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 1138053

**Agilent CrossLab Start Up Services**  
**Agilent 5100 5110 ICP-OES Preventive Maintenance**

**Agilent CrossLab**  
Preventive Maintenance

**Agilent 5100 5110 ICP-OES Preventive Maintenance**  
This checklist is used as a guide for completing the preventive maintenance tasks. A signed copy of this checklist is provided for your records.

**Agilent Preventive Maintenance** provides factory recommended service for your analytical instruments to assure reliable operation and the accuracy of your results.  
Delivered by highly trained and certified service engineers using genuine Agilent parts and supplies, Agilent Preventive Maintenance provides what you need to reduce unplanned downtime and keep your systems operating at their peak performance.

**Agilent**

BKK\_EL0037

## Introduction

### Customer Information

- Customers should provide all necessary operating supplies upon request of the engineer.
- A customer representative should be available to the engineer while performing the preventive maintenance procedures. Customers are responsible for any lab maintenance and are encouraged to observe the service representative.
- Any parts not included in the Parts Lists section of this document are not part of the recommended Preventive Maintenance service nor are they included in the price of this service.
- If a system requires the use of class or special products and/or parts for the maintenance service, then these must be ordered separately and charged as a repair, which may incur additional costs.
- For customers using HP applications, the instrument should be returned to its standard sample introduction system.

## Important Customer Web Links

- To access **Agilent University**, visit <http://www.agilent.com/crosslab/university/> to learn about training options, which include online, classroom and on-site delivery. A training specialist can work directly with you to help determine your best options.
- To access the **Agilent Resource Center** web page, visit <http://www.agilent.com/entry-us/AgilentResources>. The following information topics are available:
  - Sample Prep and Containment
  - Chemical Standards
  - Analysis
  - Service and Support
  - Application Workflows
- The **Agilent Community** is an excellent place to get answers, collaborate with others about applications and Agilent products, and find in-depth documents and videos relevant to Agilent technologies. Visit <http://community.agilent.com/ask/ask-us>.
- Videos about specific preparation requirements for your instrument can be found by searching the **Agilent YouTube** channel at <https://www.youtube.com/user/agilent>.
- Need to place a service call?** Enable Hespan Systems | Agilent

## Service Engineer's Responsibilities

- Contact the customer and ensure that all necessary supplies are available before the preventive maintenance visit.
- Only select those pages that relate to the system or module being serviced.
- Complete empty fields with the relevant information.
- Complete the relevant checkboxes in the checklist using either a "K" or tick mark "✓".
- Check "Service not applicable" checkboxes to indicate services/tasks not delivered, as appropriate.
- Complete the Preventive Maintenance services in the most logical order relevant to the individual system service in the order of the tasks listed.
- Complete the **Service Review** section together with the customer.
- Complete the fields for page numbers at the foot of each selected page.
- Add relevant page numbers to selected pages and complete the total number of pages field in the Service Completion section.
- Ask the customer to sign the Service Verification section including the customer's and your signature.

## Instrument Maintenance

### System Information

- ☐ Check this box if an instrument configuration report is attached instead of completing the table.

Instrument System Name and ID	8100A ; M1801005
Instrument System Site and Location	ALS C B&V
List System Component Product Numbers	List the Serial Numbers of each Component
1. 0510A	M115010005
2. 0510A	AU5407014
3. 07112	5000 00107
4. 0510B	AU10040115
5.	
6.	
7.	
8.	
9.	

ICP-OES Configuration Table	Circle the type or write in the type if other
Reduction Type	Sample / Dilute / Control / Other
Spray Chamber	Cyclonic Single Pass / Cyclonic Double Pass / Other
Torch	Radial / Dual Stage / Other
Torch Type	Zero Flame / Semi-Demountable / Fully Demountable / Other
Inserter Diameter	2.4mm / 1.8mm / 1.4mm / 0.8mm / Other
Injector Material	Quartz / Ceramic / Other

## Preparation

- Discuss any specific issues with the customer before starting.
- Review the instrument logbook for recorded problems and comments.
- Save instrument control settings before starting the procedure.
- Perform a general inspection of the system for cleanliness.
- Check for proper installation of parts, assemblies, sensors, etc.
- Check system for equivalent installation of components and implementation of Service Notes.
- Check for required firmware/software updates and verify with customers if they would like them installed.
- For HP application systems, if standard sample introduction systems was not installed, ask the customer to install it.
- Ask the customer to remove any samples from the ICP-OES sample introduction area, such samples as around the ICP-OES.

## Preventive Maintenance Procedures

### Record Pre-PM Instrument performance

- Run Instrument Performance Test.
- Record results in Instrument Performance Test Results Table – Pre-PM.

### Clean and inspect ICP-OES system

- Look for any obvious external damage or problems.
- Inspect water cooling hoses, gas lines and power cord for excessive wear or damage.
- Perform a general internal inspection of the system for excessive dust accumulation, clean if necessary.
- Inspect sample introduction components and record any required maintenance in the Service Engineer Comments and notify the customer as the required actions required.
- Recall the instrument operating conditions in the ICP-OES Status Results Table.
- Replace the polychromator purge filter.
- Replace the radial pre-optics window.
- Replace the axial pre-optics window for STDV and VDV instruments.
- Check exhaust flow for the correct positive extraction at the exhaust duct to insure they meet minimum specifications.
- Replace air filter dust filter.
- Replace high capacity air inlet dust filter element if installed.
- Remove and clean instrument water inlet filter.

### Agilent Water Recirculator

- Service not applicable.
- Drain cooling fluid and remove any particles from the chiller reservoir.
- Remove, clean and reinstall water inlet metal mesh filter if present.
- Re fill with Agilent Cool Clear cooling fluid.
- Clean the cooling system Air filter and the condenser.

## SPS 3 Auto Sampler

- Service not applicable.
- Power on the autosampler and verify successful initialization.
- Inspect X and Z axis belts for wear. Replace as necessary.
- Clean X and Z axis slide shafts.
- Using customer's racks and the Agilent software move the sample probe to the 4 outmost corners and raise port, ensure that the probe is approximately centered in the vial.

## SPS 4 Auto sampler

- Service not applicable.
- Clean the split tray, rack location mat and frames and check with a damp soft cloth and diluted mild detergent.
- Clean the auto sampler cover panels, if cover kit is installed with domestic window cleaner.
- Check the X-axis and Z-axis drive belts for cracks, splits, damaged teeth, excessive fraying, color changes or degradation from fumes.
- Check the X-axis, Theta axis and Z-axis PFC cables for cracks, incorrect positioning, damaged edges or damaged connectors.
- Pump Tubing Replacement. Replace peristaltic pump tubing. Replace all tubing that goes from the inlet station to the pump and from the pump to the waste/flush bottles.
- Feel using customer's tray and move the sample probe to the sample vial, wash vial and rinse port and ensure that the probe is centered in the vial. If not use calibration wizard and calibrate the position.

## AVS 4, 6, 7 Advanced Valve System

- Service not applicable.
- Replace valve rotor seal – Sample.
- Check fittings for signs of leaks.
- Check tubing including autosampler tubing for kinks or excessive wear.
- Check high flow pump for signs of leaks.

## ICP-OES adjustment

- Check position of Zn peak, adjust if required.
- Check Argon Ratio, adjust to specified value if required.
- Perform Detector Calibration.
- Perform Instrument Calibration.

## Record Post-PM Instrument performance

- Run Instrument Performance Test.
- Record results in Instrument Performance Test Results Table – Post PM.
- For systems using ICP Expert version 7.5 and above, run the following instrument tests:
  - Subsystem Communications Test
  - Air Flow
  - Water Flow
  - Gas Flow
  - RF Generator
  - Camera Test
  - Optics Test
  - Relaxation Test
- Record the results in the Instrument Test Results Table.

## Restore Instrument

- For HP applications, ask the customer to reinstall their sample introduction system.
- Leave system in an idle state on and purging.
- Guidance: If the PM service is performed prior to a qualification service, then use the qualification procedure as a guide for final instrument set up and checkout.

## Service Review

- Attach available reports/printouts of all tests to this documentation.
- Record the Preventive Maintenance service activity in the customer's records/logbook.
- Record the PM event in the Smart Alerts logbook, if applicable.
- Understand instrument maintenance customer as appropriate.
- After the PM event to the system or instrument logbook based on the customer's request.
- Complete the Service Engineer Comments section if there are additional comments.
- Review this service, parts replaced, and test results obtained with the customer.
- If the instrument firmware was updated, record the details of the change in the Service Engineer's Comments box. Systems in a compliant environment may need additional documentation.
- Complete the Signature Page with both Service Engineer and Customer signatures.



## Test Results

## Instrument Performance Test Results Table

Note: These measurements do not form part of any specification and are for reference only.

	Pre-PM Sensitivity Check		Post-PM Sensitivity Check	
	Result	Unit	Result	Unit
Zn 21.187 nm (SBR)	14245.5	1	14344.1	1
Mn 257.610 nm (SBR)	19395.2	0.0000003	19439.0	0.0000003
As 261.102 nm (SBR)	14595.5	0.0000005	14616.5	0.0000005
C 764.491 nm (SBR)	943.19	2	943.44	2

\* Axial result is not applicable for G8016AA, G8012AA Radial View instruments.

## Instrument Test Results Table

Note: The Instrument Test results are for systems using ICP Expert version 7.3 and above only.

Instrument Test	Result
Subsystem Communications Test	Pass
Air Flow	Pass
Water Flow	Pass
Gas Flow	Pass
60 Conductor	Pass
Optics Test	Pass
Optics Test	Pass
Modulation Test	Pass

## ICP-OES Status Results Table

Note: These measurements do not form part of any specification and are for reference only.

Measurement	Standby Mode	Plasma On
Main Voltage	219.119 VAC	216.116 VAC
Main Current	0.271 A	0.116 A
Instrument Temperature	24.4 °C	24.5 °C
RF Air Flow (sensor speed)	18.0 l/min	20.0 l/min
Plasma Outflow Temperature	No measurement	4.9.5 °C
Water Flow Oscillator	No measurement	1.20 L/min
Water Flow Detector	1.12 L/min	1.85 L/min
Water Inlet Temperature	19.0 °C	23.6 °C
Polycondenser Temperature	55.0 °C	55.0 °C
CO2 Temperature	-40.4 °C	-40.0 °C
Thermal Shielding	54.1 °C	35.0 °C
Argon Supply Pressure	610.13 kPa	561.92 kPa
Purge Gas Supply Pressure <sup>1</sup>	609.55 kPa	561.72 kPa
Oxygen Gas Supply Pressure <sup>1</sup>	— kPa	— kPa
Nebulator Flow	No measurement	0.30 L/min
Nebulator Back Pressure	No measurement	0.55 kPa
Plasma Gas Flow	No measurement	11.96 L/min
Auxiliary Gas Flow	No measurement	1.0 L/min
RF Power	No measurement	419.9 W
RF Supply Current	No measurement	4.528 A
RF Supply Voltage	No measurement	44.422 V

<sup>1</sup> If option installed

## Consumed PM Parts

Part Description	Part Number	Product or Model where used	Quantity consumed
Aspiral Pre-Optic Window	G8010-00014	G8010A, G8011A, G8014A, G8015A	1
Radial Pre-Optic Window	G8010-00015	AS	1
Agilent Cool-Dry Condenser Field	0799-00037	Agilent Neos Recirculator	—
Purge Gas Filter	G8010-00195	AS	1
Air Filter (40)	G8010-00202	AS	1
High Capacity Air Filter	G8010-00189	Optional	—
Holder and for 4 port valve for AS/207	G8010-00002	G8010A, G8011A, G8014A, G8015A	—
Holder and for 4 port valve for AS/204	G8010-00002	G8010A, G8011A, G8014A, G8015A	—
Recessed solution to flow station 2.5mm ID x 1m	G8010-00122	SP4	1
Tube connector 2.5mm ID 1.5mm ID	G8010-00124	SP4	1
2-22 inside tubing, 1/8" ID, 1/4" OD, 1/4" ID	G8010-00122	SP4	1

Additional Parts may be required from engineer's stock:

4 way drive belt	5410047000	SP3	—
2 way drive belt	5410047000	SP3	—
Peristaltic pump tubing PVC Solid 1/8" ID 3' long	3710040000	SP4	—

Consumed Parts Reference  
(Purchased by customer, not included as part of PM)

Section Not Applicable

Part Description	Part Number	Product or Model where used	Quantity consumed
------------------	-------------	-----------------------------	-------------------

## Signature Page

## Service Engineer Comments (optional)

If there are any specific points you wish to note as part of performing the installation or other items of interest for the customer, please write in this box.

- During PM found water during in instrument broken then water leaking inside instrument.
- Replace all water tube inside instrument, after replace found water flow sensor water leak also.
- Replace water module and continue pm without deviation.

## Service Verification

Service Request Number: 1605933434 Date Service Completed: 2 May 2023  
 Service Engineer Name: Ben Nijmawijit Customer Name: Thirak Sanyas  
 Service Engineer Signature: Ben Nijmawijit Customer Signature: Thirak S.  
 Total number of pages in this document: 1

TECHNOLOGY PRESENTATION ASSOCIATION (THAILAND-JAPAN)  
 (THAILAND-JAPAN) PRESENTATION ASSOCIATION (THAILAND-JAPAN)  
 104 Phatthanasak Rd., Phatthanasak Rd., Bangkok 10250 Thailand  
 TEL: 0-2311-8881 FAX: 0-2311-8882

Cert. No.: 2271U1571  
 Page: 1 of 3

### Certificate of Calibration

Equipment: Hot Air Oven

Manufacturer: Binder

Model: ED 240/2

Serial No.: 00-15533

ID No.: BKK\_ML0013

Submitted by: ALS Laboratory Group (Thailand) Co., Ltd.  
 104 Phatthanasak Rd., Phatthanasak Rd.,  
 Khwaeng Phatthanasak, Khet Suan Luang,  
 Bangkok 10250 Thailand

Location: Media Preparation Room

Received Order: 21 November 2022  
 Calibration Date: 21 November 2022  
 Ambient Temperature: (20 ± 1) °C  
 Relative Humidity: (50 ± 30) %

Calibrated by: Krisda Malee

Approved by:

Issue Date: 29 November 2022

The Uncertainty is for a confidence probability of approximately 95%  
(This certificate has not been issued after the full, except with the full version)  
(Special of the form of Certificate of Calibration, Equipment Calibration and Testing Services)

A 0048150

Cert. No.: 2271U1571  
 Page: 2 of 3

Equipment: Hot Air Oven  
 Condition As-Received: Used Item  
 Reference: 2211-00230C-1

Procedure Used:  
 Calibration was conducted using calibration procedure CP-Q702 according to direct measurement method with Data Acquisition which connected with Thermocouple Type T.

The temperature scale used was based on (15-40).  
 Condition of this result of calibration:  
 1. Reference standard instrument:  
 Instrument: Model: Serial No.: Cert. No.: Due Date:  
 1) Data Acquisition: 34970A MY40057817 22LM121 22 Aug 2023  
 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 Units.

Result of Calibration: (°C) After Adjustment  
 Function of UUC\*: Temperature Source  
 Fresh air setting: Not Available

Environment during calibration		
	Beginning	Finished
Temp. (°C)	20	20
REL. Humid. (%)	53	55
AC Supply (V)	219	220

Position	Ref. Std. ID No.
1	21-15TC-01
2	21-15TC-02
3	21-15TC-03
4	21-15TC-04
5	21-15TC-05
6	21-15TC-06
7	21-15TC-07
8	21-15TC-08
9 (ref.)	21-15TC-09

Probe installation Details: Dimension of Chamber:  
 a = 5.0 cm D = 0.50 m  
 b = 5.0 cm W = 0.80 m  
 c = 5.0 cm H = 0.80 m  
 Capacity = 0.24 m³

a 1138049

Cert. No.: 2271U1571  
 Page: 3 of 3

Equipment: Hot Air Oven  
 Condition As-Received: Used Item  
 Reference: 2211-00230C-1

Result of Calibration:  
 (°C) After Adjustment  
 Function of UUC\*: Temperature Source  
 Fresh air setting: Not Available

Calibration Point (°C)	UUC Setting (°C)	UUC Reading (°C)	Temperature stability (°C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (°C)	Coverage Factor
180	180	180	0.70	1.5	2.9	1.4	2

Calibration Point (°C)	Measured Temperature (°C)								
	1	2	3	4	5	6	7	8	9 (ref.)
180	179.50	180.00	179.80	179.80	179.80	179.80	179.80	180.10	180.00

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 1138053

Cert. No.: 2271U1571  
 Page: 3 of 3

Equipment: Hot Air Oven  
 Condition As-Received: Used Item  
 Reference: 2211-00230C-1

Result of Calibration:  
 (°C) After Adjustment  
 Function of UUC\*: Temperature Source  
 Fresh air setting: Not Available

### Performance Verification Certificate

Product ID: Quicktrace 38-0000, Technology Learning Lab

Equipment ID: BKK\_EL0128 Mercury Analyzer  
 S/N: 1502133002

BKK\_EL0129 Autosampler  
 S/N: 1922233601

Customer Name: ALS Laboratory Group (Thailand) Co., Ltd.  
 Address: 104 Phatthanasak Rd., Phatthanasak Rd.,  
 Khwaeng Phatthanasak, Khet Suan Luang,  
 Bangkok 10250 Thailand

Date of Qualified: November 30, 2022  
 Next Due date: November 30, 2023

This certificate is for products which was performed to acceptable criteria specifications

Autosampler & Sample Introduction	PASSED
Analyzer	PASSED
Gas Liquid Separator & Dryer	PASSED
CVPS Detector	PASSED
Electronics/Mechanical	PASSED
Data Station/PC	PASSED
Analytical test	PASSED

Provided by: Scientist Instrument Co., Ltd.  
 112 Soi Thaniat 44, Thaniat Road  
 Khlong Bang Phua, Bangkok  
 Bangkok 10130 Thailand

Certified by:

Thanasak Sakdajay  
 Service Engineer

ภาคผนวก จ

สำเนาหนังสืออนุญาตขึ้นทะเบียน

ห้องปฏิบัติการวิเคราะห์เอกชน



ที่ อก ๐๓๑๐(๑)/ ๑๐๖๙



กรมโรงงานอุตสาหกรรม  
ถนนพระรามที่ ๖ เขตราชเทวี  
กรุงเทพมหานคร ๑๐๔๐๐

๒๘ มกราคม ๒๕๖๕

เรื่อง ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน  
ลงวันที่ ๓๐ กรกฎาคม ๒๕๖๓

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

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

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย)  
จำกัด ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน โดยมีองค์ประกอบดังนี้

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

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

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายศิริะ จันทรเจต)

นักวิทยาศาสตร์ชำนาญการพิเศษ รักษาการแทน  
ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน  
ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

กองวิจัยและเตือนภัยมลพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๒๐๒ ๔๑๔๖ ๐ ๒๒๐๒ ๔๐๐๒

โทรสาร ๐ ๒๓๕๔ ๓๒๐๘ ๐ ๒๓๕๔ ๓๔๑๕

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

เลขทะเบียน ว-๒๐๔

ที่ อก ๐๓๑๐(๑)/

ลงวันที่ ๒๘ มกราคม ๒๕๖๕

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๖ ราย

๑) นางสาวยุพาพร จันทร์เปล่ง

ทะเบียนเลขที่ ว-๒๐๔-ค-๔๗๐๐

๒) นางสาวชัชชัย โกมารกุล ณ นคร

ทะเบียนเลขที่ ว-๒๐๔-ค-๔๗๐๑

๓) นายศรายุทธ จิตรานนท์

ทะเบียนเลขที่ ว-๒๐๔-ค-๔๗๐๒

๔) นางสาวกนกกร เอนก

ทะเบียนเลขที่ ว-๒๐๔-ค-๖๑๑๑

๕) นายสุริยา สอนแก้ว

ทะเบียนเลขที่ ว-๒๐๔-ค-๖๑๑๒

๖) นายวิชาญ ชูณหะวัณ

ทะเบียนเลขที่ ว-๒๐๔-ค-๖๑๑๓



(นายศิริระ จันทร์เจิด)

นักวิทยาศาสตร์ชำนาญการพิเศษ รักษาการแทน

ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน

ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม



เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

เลขทะเบียน ว-๒๐๔

ที่ อก ๐๓๑๐(๑)/ ๑๐๖๙

ลงวันที่ ๒๘ มกราคม ๒๕๖๕

ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๖๒ ราย

๑) นางสาวจินดา ไชจุลธรรม	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๐๘
๒) นางสาวสาวิตรี น้อยเสงี่ยม	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๐๙
๓) นางสาวชนัญญาญจน์ อัมขม	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๑๐
๔) นางสาวนรินทร์ สายเส็ง	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๑๕
๕) นางสาวนันทวดี สมบูรณ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๑๖
๖) นางสาวศรัณยา เฉลิมธำรงค์	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๑๗
๗) นางสาวสรารักษ์ มงคลจิรวุฒิ	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๑๙
๘) นางสาวศิริลักษณ์ พึ่งแพง	ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๒๐
๙) นายณพพงศ์ จันทรพันธุ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๐๘
๑๐) นายนรเศรษฐ์ โกมาลย์	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๑๑
๑๑) นายธันวา จริยา	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๑๔
๑๒) นางสาวเกศรินทร์ แก้วมัน	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๑๖
๑๓) นางสาวสุวิมล ชัยเรืองวุฒิ	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๑๗
๑๔) นางสาวสุชาดา ธรรมถาวร	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๒๑
๑๕) นางสาวเบมิกา ชัยเดชธนกุล	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๒๓
๑๖) นางสาวศศิธร หมูสวัสดิ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๒๔
๑๗) นางสาวเสาวลักษณ์ ภู่นภาอำพร	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๒๕
๑๘) นายอภิสิทธิ์ สิงหา	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๒๖
๑๙) นายศักดิ์สิทธิ์ ไพศาลพิสุทธ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๒๗
๒๐) ว่าที่ร้อยตรีหญิง พรรณิภา ขำเจริญ	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๒๘
๒๑) นางจิตตา คำภูแก้ว	ทะเบียนเลขที่ ว-๒๐๔-จ-๕๔๓๑
๒๒) นางสาวอรรพรรณ รักยง	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๑๕
๒๓) นางสาวนพรัตน์ แยมกรานต์	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๑๙
๒๔) นายจุลเดช วารินทร์	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๐
๒๕) นางสาวดาญรัตน์ ร้องคำ	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๑
๒๖) นายนคร สุขเจริญ	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๒
๒๗) นายบัญชา นามเขตต์	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๓
๒๘) นายพรมมี ศรีปัตเนตร	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๕
๒๙) นายอุทิศ อุ่นสีม	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๖
๓๐) ว่าที่ร้อยตรี เฉลิมเกียรติ อมรศรีเสริม	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๘
๓๑) นางสาววริยา สร้างนา	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๙
๓๒) นายอนุพงศ์ รัตนศรีประเสริฐ	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๓๐
๓๓) นางสาวจุฑารัตน์ โอนสันเทียะ	ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๔๒
๓๔) นางสาวจรรววรรณ พิมพ์อริกฤติยา	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๗๖

(นายศิระ จันทรเจ็ด)

๓๕) นางสาวปรารค์ทิพย์...

นักวิทยาศาสตร์ชำนาญการพิเศษ รักษาการแทน

ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน

สำนักงานสิ่งแวดล้อมและเฝ้าระวังมลพิษ

๓๕) นางสาวปรางค์ทิพย์ กิจไพศาลศักดิ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๗๙
๓๖) นางสาวเดือนใจ ทางกลาง	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๐
๓๗) นางสาวจิราพร ศิริเวช	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๑
๓๘) นายวรกร ผูกרך	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๒
๓๙) นายทง วิริยะสทกิจ	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๓
๔๐) นายธนิต เจนจบ	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๔
๔๑) นายคณิศร ขำเพชร	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๕
๔๒) นายอรรคพล นิยมวิทยาพันธ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๖
๔๓) นายภูวิช พรหมสะอาด	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๗
๔๔) นายธนเดช โภคาพิพัฒน์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๘
๔๕) นายชวฤทธิ์ วงษ์จันทร์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๙
๔๖) นายอาทิตย์ ศรีแสน	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๙๐
๔๗) นายเจษฎินทร์ คงศักดิ์ไทย	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๙๑
๔๘) นายจรัส บุญยิ่ง	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๙๒
๔๙) นายธนาณัติ เอนก	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๙๓
๕๐) นายอภิวัฒน์ ทุมหนู	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๙๔
๕๑) นางสาวสุภาขวัญ มาก	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๙๕
๕๒) นางสาวทัตพร ขวาลสมบูรณ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๐
๕๓) นางสาวธิดิมา บุญเพ็ง	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๑
๕๔) นางสาวกนกอร เข้มเพ็ชร	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๒
๕๕) นางสาวพัชรียา หงษ์สมดี	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๓
๕๖) นางสาวภาวนิดา สุรวงศ์ตระกูล	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๔
๕๗) นางสาวภาณุมาศ นามวัฒน์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๕
๕๘) นางสาวอุไรรัตน์ ทิงสร้างแป้น	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๖
๕๙) นายธีรวัฒน์ ปวงสุข	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๗
๖๐) นายอิทธิพล ยะโส	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๘
๖๑) นายประพจน์ วรรณชูชัย	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๙
๖๒) นายชยธร พวงทิพย์	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๑๐
๖๓) นางสาวกนกวรรณ จันทบาล	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๑๑
๖๔) นางสาวเกษร หลักบุญ	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๑๒
๖๕) นายสิทธิโชค ธงเงิน	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๑๓
๖๖) นางศิวาวรรณ ใจบุญ	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๕๐๕
๖๗) นางสาวพรรณธิดา พุ่มคง	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๕๐๘
๖๘) นางสาวศรณีย์ ยิ่งดี	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๕๐๙
๖๙) นายนวกัทร ศรีวิริยะ	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๕๑๐
๗๐) นายสุวิชา ทองอ่อน	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๕๑๑
๗๑) นายวิญญู บุญตะนัย	ทะเบียนเลขที่ ว-๒๐๔-จ-๗๕๑๓

(นายศิริระ จันทรเจ็ด)

นักวิทยาศาสตร์ชำนาญการพิเศษ รักษาการแทน

ผู้อำนวยการกองวิจัยและพัฒนากัญชารักษาโรค

มหาวิทยาลัยราชภัฏวไลยอลงกรณ์

๗๒) นายสมบูรณ์...



๑๐๙) นายนนทชัย...

๑๐๙) นายพนนพชัย อุปถัมภ์	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๕๙๔
๑๑๐) นายนิรุฬพล คุณสุทธิ	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๕๙๕
๑๑๑) นายนิพนธ์วัฒน์ สาริน	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๕๙๖
๑๑๒) นายปิยะนัฐ พลมะศรี	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๕๙๗
๑๑๓) นายพงศ์สิริ โสมเขียว	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๕๙๘
๑๑๔) นายพีรพัฒน์ กำคำ	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๕๙๙
๑๑๕) นายภาณุพงศ์ มานิตย์	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๐
๑๑๖) นายมงคล ผลาทิพย์	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๑
๑๑๗) นายมนูรินทร์ พูลศิริ	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๒
๑๑๘) นายสิรินันท์ ทองอ้น	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๓
๑๑๙) นายอเนชา ทันสมัย	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๔
๑๒๐) นายอดิศักดิ์ ผมไผ	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๕
๑๒๑) นายอนันตชัย วิสุม	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๖
๑๒๒) นายณัฐดนัย เจือละออง	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๗
๑๒๓) นายวรวิธ ดินัก	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๘
๑๒๔) นายแสงตะวัน นະตะສັດ	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๙
๑๒๕) นายยุทธพงศ์ รัตนะ	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๑๐
๑๒๖) นายชัยวุฒิ ไชยชนะ	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๑๑
๑๒๗) นายวิศรุต ศรีธรรมมา	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๑๒
๑๒๘) นายพนนทกร เผือกผ่อง	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๑๓
๑๒๙) นายกำชัย สุทธะ	ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๑๔
๑๓๐) นางสาวณัฐภรณ์ รักทะเล	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๑๙
๑๓๑) นางสาวประภาภรณ์ บุตรพรม	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๐
๑๓๒) นางสาวนิลาวัลย์ นามพรม	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๑
๑๓๓) นางสาวพัชรินทร์ แสนสร้อย	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๒
๑๓๔) นายไพโรจน์ เปี่ยมพิมาย	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๓
๑๓๕) นางสาวศุภมาศ ทองมาก	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๔
๑๓๖) นางสาวลลิตา จิตรสว่าง	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๕
๑๓๗) นางสาวชไมพร เสิกภูเขียว	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๖
๑๓๘) นางสาวกฤติมาพร คำมีแก่น	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๗
๑๓๙) นางสาวสกลรัตน์ ภาควุฒิ	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๘
๑๔๐) นางสาวกาญจนา คงคุณ	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๙
๑๔๑) นางสาวไพรินทร์ ศรีรูปี	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๐
๑๔๒) นางสาวทิพนันดา ฝูญปัญญา	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๑
๑๔๓) นางสาวสาธิตา ปานทอง	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๒
๑๔๔) นางสาวอริสา ทองนวล	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๓
๑๔๕) นางสาวอริยา คำคลอง	ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๔

(นายศิริ จันทรเจ็ด)

นักวิทยาศาสตร์ชำนาญการพิเศษ รักษาการแทน

ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน

๑๔๖) นางสาวบุษดาภรณ์...



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



(นายศิริระ จันทรเจติ)

นักวิทยาศาสตร์ชำนาญการพิเศษ รักษาการแทน

ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน

ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

เลขทะเบียน ว-๒๐๔

ที่ อก ๐๓๑๐(๑)/ ๑๐๖๕

ลงวันที่ ๒๘ มกราคม ๒๕๖๕

ขอขยายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๓๖๑ รายการ

น้ำเสีย จำนวน 59 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Aldicarb	High-Performance Liquid Chromatographic Method <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	$\alpha$ -BHC	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[4]</sup>
8	$\beta$ -BHC	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[4]</sup>
9	$\delta$ -BHC	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[4]</sup>
10	$\gamma$ -BHC	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[4]</sup>
11	Biochemical Oxygen Demand	1) 5-Day BOD Test, Azide Modification Method <sup>[4]</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

(นางริกาญจน์ จันทรกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

และทะเบียนห้องปฏิบัติการ

19 Copper...



ลำดับที่	สารมลพิษ	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>[3]</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

44 Methomyl...

(นางริกาญจน์ อัครสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

กรมส่งเสริมการค้าระหว่างประเทศ

ลำดับที่	สารมลพิษ	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>

น้ำใต้ดิน จำนวน 126 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
2	Acetone	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>

วิมล

3 Aldrin...

(นางริภาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ  
และทะเบียนห้องปฏิบัติการ



ลำดับที่	สารมลพิษ	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>

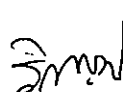
วิธีทาง)

18 Bis(2-ethylhexyl)phthalate...

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ  
และทะเบียนห้องปฏิบัติการ

ลำดับที่	สารมลพิษ	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>
		Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
22	Butyl Benzyl Phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
23	Cadmium	1) Digestion, Inductively Coupled Plasma Method <sup>[4]</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>[4]</sup>
24	Carbazole	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
25	Carbon Disulfide	Purge and Trap, 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>



34 Chromium (III)...

(นางริกาญจน์ จิตรสกุลไธ)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

ลำดับที่	สารมลพิษ	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>

Handwritten:  $\frac{d}{dt} \ln \rho$

51 cis-1,2-Dichloroethylene...

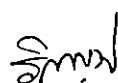
(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิชาการวิเคราะห์ทดสอบผลิตภัณฑ์

และทบทวนนโยบายปฏิบัติการ



ลำดับที่	สารมลพิษ	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>



(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ  
และทะเบียนห้องปฏิบัติการ

68 Fluorene...

ลำดับที่	สารมลพิษ	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	$\alpha$ -HCH	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
75	$\beta$ -HCH	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[4]</sup>
76	$\gamma$ -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>

ร.พ.ว.

84 Methanol...

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

แบบฟอร์มแจ้งผลการวิเคราะห์

ลำดับที่	สารมลพิษ	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>

วิมล

97 Pentachlorophenol...

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

และทะเบียนห้องปฏิบัติการ



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>5</sub> -C <sub>9</sub> )	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method <sup>[13,24]</sup>
110	TPH (C <sub>8</sub> -C <sub>16</sub> )	Solvent Extraction, Gas Chromatographic Method <sup>[9,21]</sup>
111	TPH (C <sub>16</sub> -C <sub>35</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>

วิมล

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>

**อากาศเสีย (ปล่อยระบาย) 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>

*วิฑูรย์*

3 Carbon Monoxide...

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

และหน่วยงานที่เกี่ยวข้อง

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	Adsorption Sampling, Gas Chromatographic Method <sup>[5]</sup>

วิมล

สิ่งปลูก...

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิชาการวิเคราะห์ทดสอบมลพิษ

กรมควบคุมมลพิษ



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>



6 Cadmium...

(นางริกาญจน์ จิตรสกุลใจ)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

และทะเบียนห้องปฏิบัติการ

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>[1,19,25]</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>[7,8,15,17]</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation Method <sup>[7,8, 16,17]</sup>
10	Chromium (VI)	1) Waste Extraction, Colorimetric Method <sup>[1,6,17]</sup> 2) Alkaline Digestion, Colorimetric Method <sup>[8,17]</sup>



(นางริกาญจน์ จิตรสกุลวิไล)

11 Cobalt...

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

.....เรียน...../.....

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	DDE	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>

จิราพร

2) Soxhlet...

(นางริกาญจน์ จัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

และทะเบียนห้องปฏิบัติการ



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> 1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[1,9,25]</sup>
18	Endrin	2) Soxhlet Extraction, Gas Chromatographic Method <sup>[10,22]</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic Method <sup>[22,31]</sup> 1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[1,9,25]</sup>
19	Heptachlor	2) Soxhlet Extraction, Gas Chromatographic Method <sup>[10,22]</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic Method <sup>[22,31]</sup> 1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[1,9,25]</sup>
20	Lead	2) Soxhlet Extraction, Gas Chromatographic Method <sup>[10,22]</sup> 3) Automated Soxhlet Extraction, Gas Chromatographic Method <sup>[22,31]</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>[1,6,16]</sup>
21	Lindane	3) Digestion, Inductively Coupled Plasma Method <sup>[7,15]</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>[7,16]</sup> 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>
22	Mercury	3) Automated Soxhlet Extraction, Gas Chromatographic Method <sup>[22,31]</sup> 1) Waste Extraction, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>[1,6,18]</sup>

วิมล

2) Waste Extraction...

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

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, 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>
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>
		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>

วิภากร

27 Polychlorinated...

(นางริภาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
27	<p>Polychlorinated biphenyls (PCBs)</p> <ul style="list-style-type: none"> <li>- Aroclor 1016</li> <li>- Aroclor 1221</li> <li>- Aroclor 1232</li> <li>- Aroclor 1242</li> <li>- Aroclor 1248</li> <li>- Aroclor 1254</li> <li>- Aroclor 1260</li> <li>- 2-Chlorobiphenyl</li> <li>- 2,3-Dichlorobiphenyl</li> <li>- 2,2',5-Trichlorobiphenyl</li> <li>- 2,4',5-Trichlorobiphenyl</li> <li>- 2,2',3,5'-Tetrachlorobiphenyl</li> <li>- 2,2',5,5'-Tetrachlorobiphenyl</li> <li>- 2,3',4,4'-Tetrachlorobiphenyl</li> <li>- 2,2',3,4,5'-Pentachlorobiphenyl</li> <li>- 2,2',4,5,5'-Pentachlorobiphenyl</li> <li>- 2,3,3',4',6-Pentachlorobiphenyl</li> <li>- 2,2',3,4,4',5'-Hexachlorobiphenyl</li> <li>- 2,2',3,4,5,5'-Hexachlorobiphenyl</li> <li>- 2,2',3,5,5',6-Hexachlorobiphenyl</li> <li>- 2,2',4,4',5,5'-Hexachlorobiphenyl</li> <li>- 2,2',3,3',4,4',5-Heptachlorobiphenyl</li> <li>- 2,2',3,4,4',5,5'-Heptachlorobiphenyl</li> <li>- 2,2',3,4,4',5',6-Heptachlorobiphenyl</li> <li>- 2,2',3,4',5,5',6-Heptachlorobiphenyl</li> <li>- 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl</li> </ul>	<p>1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method<sup>[1,9,23]</sup></p> <p>2) Soxhlet Extraction, Gas Chromatographic Method<sup>[10,23]</sup></p> <p>3) Automated Soxhlet Extraction, Gas Chromatographic Method<sup>[22,31]</sup></p>

วิมล

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

28 Pentachlorophenol...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
28	Pentachlorophenol	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>
29	pH	Electrometric Method <sup>[29,30]</sup>
30	Selenium	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>
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>[1,6,16]</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>[1,6,16]</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>[7,15]</sup> 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>[7,16]</sup>
33	Toxaphene	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>
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>[1,6,16]</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>[7,15]</sup>

วิมล

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิชาการวิเคราะห์ทดสอบมลพิษ

4) Digestion...



ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
35	Zinc	4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>[7,16]</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>[1,6,16]</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>[7,15]</sup> 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>[7,16]</sup>

ดิน 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>[7,16]</sup>
6	Arsenic	1) Digestion, Inductively Coupled Plasma Method <sup>[7,15]</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>[7,16]</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>[7,16]</sup>

วิมล

(นางริกาณจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

9 Benz(a)anthracene...

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>[7,16]</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>[7,16]</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>

วิกรม

26 Carbon tetrachloride...

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

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 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>[7,16]</sup>
34	Chromium (III)	1) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation Method <sup>[7,8,15,17]</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation Method <sup>[7,8,16,17]</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 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 Method <sup>[10,22]</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>[25,31]</sup>

วิฑูรย์

(นางวิภาณูจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

40 DDE...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
40	DDE	1) Soxhlet Extraction, Gas Chromatographic 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 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>

วิภาณี

57 Dieldrin...

(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
57	Dieldrin	1) Soxhlet Extraction, Gas Chromatographic 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 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 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 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 Method <sup>[10,22]</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[25,31]</sup>



ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
71	Hexachlorobenzene	1) Soxhlet Extraction, Gas Chromatographic 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	$\alpha$ -HCH	1) Soxhlet Extraction, Gas Chromatographic Method <sup>[10,22]</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[25,31]</sup>
75	$\beta$ -HCH	1) Soxhlet Extraction, Gas Chromatographic Method <sup>[10,22]</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[25,31]</sup>
76	$\gamma$ -HCH	1) Soxhlet Extraction, Gas Chromatographic 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>[7,16]</sup>
82	Manganese	1) Digestion, Inductively Coupled Plasma Method <sup>[7,15]</sup> 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method <sup>[7,16]</sup>
83	Mercury	1) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>[18]</sup>



(นางริกาญจน์ จัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

และทะเบียนห้องปฏิบัติการ

2) Thermal...

ลำดับที่	สารมลพิษ	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>[7,16]</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>[10,23]</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic Method <sup>[23,32]</sup>

วิฑูรย์

(นางริกาญจน์ ฉัตรสกุลวิไล)

- Aroclor 1242...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
	<ul style="list-style-type: none"> <li>- Aroclor 1242</li> <li>- Aroclor 1248</li> <li>- Aroclor 1254</li> <li>- Aroclor 1260</li> <li>- 2-Chlorobiphenyl</li> <li>- 2,2',3,5'-Tetrachlorobiphenyl</li> <li>- 2,2',5,5'-Tetrachlorobiphenyl</li> <li>- 2,3',4,4'-Tetrachlorobiphenyl</li> <li>- 2,2',3,4,5'-Pentachlorobiphenyl</li> <li>- 2,2',4,5,5'-Pentachlorobiphenyl</li> <li>- 2,3,3',4',6-Pentachlorobiphenyl</li> <li>- 2,2',3,4,4',5'-Hexachlorobiphenyl</li> <li>- 2,2',3,4,5,5'-Hexachlorobiphenyl</li> <li>- 2,2',3,5,5',6-Hexachlorobiphenyl</li> <li>- 2,2',4,4',5,5'-Hexachlorobiphenyl</li> <li>- 2,2',3,3',4,4',5-Heptachlorobiphenyl</li> <li>- 2,2',3,4,4',5,5'-Heptachlorobiphenyl</li> <li>- 2,2',3,4,4',5',6-Heptachlorobiphenyl</li> <li>- 2,2',3,4',5,5',6-Heptachlorobiphenyl</li> <li>- 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl</li> </ul>	
97	Pentachlorophenol	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[25,31]</sup>
98	Phenanthrene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[25,31]</sup>
99	Phenol	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[25,31]</sup>
100	Pyrene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[25,31]</sup>

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
101	Selenium	1) Digestion, Inductively Coupled Plasma Method <sup>[7,15]</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>[7,16]</sup>
102	Silver	1) Digestion, Inductively Coupled Plasma Method <sup>[7,15]</sup> 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method <sup>[7,16]</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>[11,21]</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic Method <sup>[21,31]</sup>
110	TPH (C <sub>16</sub> - C <sub>35</sub> )	1) Solvent Extraction, Gas Chromatographic Method <sup>[11,21]</sup> 2) Automated Soxhlet Extraction, Gas Chromatographic Method <sup>[21,31]</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

116 2,4,6-Trichlorophenol...

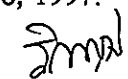
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ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ

ลำดับที่	สารมลพิษ	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>[7,16]</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>[7,16]</sup>

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(นางริกาญจน์ ฉัตรสกุลวิไล)

ผู้อำนวยการกลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษ  
และทะเบียนห้องปฏิบัติการ



ที่ อก ๐๓๑๐(๑)/ ๕ ๓ ๗ ๙

กรมโรงงานอุตสาหกรรม  
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท  
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๐ ๙ มีนาคม ๒๕๖๖

เรื่อง เปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน  
ลงวันที่ ๔ กุมภาพันธ์ ๒๕๖๖

ตามหนังสือที่อ้างถึง บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ว-๒๐๔ สถานที่ตั้งเลขที่ ๑๐๔ ซอยพัฒนาการ ๔๐ ถนนพัฒนาการ แขวงพัฒนาการ เขตสวนหลวง กรุงเทพมหานคร ขอเปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์ ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว มีความเห็นดังนี้

๑. ให้ยกเลิกเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๙ ราย

- |                                 |                            |
|---------------------------------|----------------------------|
| ๑) นายนคร สุขเจริญ              | ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๒ |
| ๒) นายบัญชา นามเขตต์            | ทะเบียนเลขที่ ว-๒๐๔-จ-๖๑๒๓ |
| ๓) นายอรรคพล นิยมวิทย์          | ทะเบียนเลขที่ ว-๒๐๔-จ-๗๐๘๗ |
| ๔) นางสาวพัชรียา หงษ์สมดี       | ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๓ |
| ๕) นางสาวภาณิดา สุรวงศ์ตระกูล   | ทะเบียนเลขที่ ว-๒๐๔-จ-๗๑๐๔ |
| ๖) นางสาวศรณีย์ ยิงดี           | ทะเบียนเลขที่ ว-๒๐๔-จ-๗๕๐๙ |
| ๗) นายสมโภช วันสา               | ทะเบียนเลขที่ ว-๒๐๔-จ-๗๕๑๙ |
| ๘) นายณัฐนันท์ ปานประเสริฐ      | ทะเบียนเลขที่ ว-๒๐๔-จ-๗๘๑๙ |
| ๙) ว่าที่ร้อยตรีภาณุพงศ์ แสนศรี | ทะเบียนเลขที่ ว-๒๐๔-จ-๗๘๓๖ |
| ๑๐) นายมนินทร์ พูลศิริ          | ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๒ |
| ๑๑) นายณัฐดนัย เจือละออง        | ทะเบียนเลขที่ ว-๒๐๔-จ-๘๖๐๗ |
| ๑๒) นางสาวกาญจนา คงคุณ          | ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๒๙ |
| ๑๓) นางสาวรัชนิกร เนียมกลาง     | ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๗ |
| ๑๔) นางสาวกัญญารัตน์ ศรีนิลทา   | ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๓๘ |
| ๑๕) นายศิริวัฒน์ พานิชย์        | ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๑ |
| ๑๖) นางสาวกนกภรณ์ อูระ          | ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๕ |
| ๑๗) นางสาวจิตสุภา ประเทืองสุข   | ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๗ |
| ๑๘) นางสาวอริสา วิริยขันติธรรม  | ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๔๘ |
| ๑๙) นางสาวพนิดา ยอดอินทร์       | ทะเบียนเลขที่ ว-๒๐๔-จ-๙๒๕๐ |

๒. ให้เพิ่มเจ้าหน้าที่...

๒. ให้เพิ่มเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๕ ราย

- |                                 |                            |
|---------------------------------|----------------------------|
| ๑) นายกาจบัณฑิต กิตติสุขภวณิชย์ | ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๐๑ |
| ๒) นายภัทรพล สว่างใจธรรม์       | ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๐๒ |
| ๓) นายนราธิป เทือกชัยคำ         | ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๐๓ |
| ๔) นายศิริโชค พงษ์ประสม         | ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๐๔ |
| ๕) นายณัฐวุฒิ ดั่งแพง           | ทะเบียนเลขที่ ว-๒๐๔-จ-๐๐๐๕ |

อนึ่ง หนังสือฉบับนี้จะหมดอายุพร้อมหนังสือต่ออายุรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ที่ อก ๐๓๑๐(๑)/๑๐๖๔ ลงวันที่ ๒๘ มกราคม ๒๕๖๔ คือในวันที่ ๒ กันยายน ๒๕๖๖ ทั้งนี้ สามารถยื่นคำขอผ่านระบบอิเล็กทรอนิกส์ได้ที่หน้าเว็บไซต์กรมโรงงานอุตสาหกรรม ตาม QR Code ทำหนังสือฉบับนี้

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ



(นางริกาญจน์ นัตรสกุลวิไล)

นักวิทยาศาสตร์ชำนาญการพิเศษ รักษาการแทน

ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน

ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

กองวิจัยและเตือนภัยมลพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕

โทรสาร ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๔๙

ไปรษณีย์อิเล็กทรอนิกส์ saraban@diw.mail.go.th





ที่ อก ๐๓๑๐(๑)/ ๖ ๑ ๒ ๕



กรมโรงงานอุตสาหกรรม  
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท  
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๒ ๓ มีนาคม ๒๕๖๖

เรื่อง เปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน  
ลงวันที่ ๑๐ มีนาคม ๒๕๖๖

ตามหนังสือที่อ้างถึง บริษัท เอแอลเอส แลบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด  
ห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ว-๒๐๔ สถานที่ตั้งเลขที่ ๑๐๔ ซอยพัฒนาการ ๔๐  
ถนนพัฒนาการ แขวงพัฒนาการ เขตสวนหลวง กรุงเทพมหานคร ขอเปลี่ยนแปลงบุคลากรของห้องปฏิบัติการ  
วิเคราะห์ ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้เปลี่ยนแปลงชื่อเจ้าหน้าที่ประจำห้องปฏิบัติการ  
วิเคราะห์ จากเดิม นางสาวสรารค์มี มงคลจิรวุฒิ ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๑๙ เป็น นางสาวธัญญธร มงคลจิรวุฒิ  
ทะเบียนเลขที่ ว-๒๐๔-จ-๔๗๑๙

ทั้งนี้ หากท่านมีความประสงค์จะยื่นคำขอใดๆ สามารถยื่นคำขอผ่านระบบอิเล็กทรอนิกส์  
ได้ที่หน้าเว็บไซต์กรมโรงงานอุตสาหกรรม ตาม QR Code ท้ายหนังสือฉบับนี้

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

✓ (นายประสม ดำรงพงษ์)

ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน  
ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

กองวิจัยและเตือนภัยมลพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕

โทรสาร ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๙๙

ไปรษณีย์อิเล็กทรอนิกส์ saraban@diw.mail.go.th



ยื่นคำขอผ่านระบบอิเล็กทรอนิกส์



“อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว”





## คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน

วันที่ 4 เดือน สิงหาคม พ.ศ. 2566

ข้าพเจ้า ( ) ผู้รับใบอนุญาตประกอบกิจการโรงงาน

( ✓ ) บริษัท/ห้างหุ้นส่วนจำกัด เอแอลเอส แลбораторี กรุป (ประเทศไทย) จำกัด

ตั้งอยู่ที่เลขที่ 104 หมู่ที่ - ตรอก/ซอย พัฒนาการ 40

ถนน พัฒนาการ ตำบล/แขวง พัฒนาการ

อำเภอ/เขต สวนหลวง จังหวัด กรุงเทพมหานคร รหัสไปรษณีย์ 10250

โทรศัพท์ 02 760-3040 โทรสาร 0 2 760-3197

ได้รับทราบระเบียบกรมโรงงานอุตสาหกรรมว่าด้วยการขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน พ.ศ. 2560 โดยตลอดแล้วและยินยอม

ปฏิบัติตามระเบียบฯทุกประการ และได้แนบเอกสารต่างๆ ตามรายการเอกสารประกอบการพิจารณา (แบบ ปอ.1-1) มาพร้อมนี้

## รายการขอดำเนินการ

การดำเนินการ	รายละเอียด (รายการ)				
	น้ำเสีย/น้ำทิ้ง	น้ำใต้ดิน	อากาศเสีย	สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว	ดิน
[ ] ขอขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน					
[ ✓ ] ต่ออายุห้องปฏิบัติการวิเคราะห์เอกชน	59	126	16	35	125
[ ✓ ] เปลี่ยนแปลงสารมลพิษที่วิเคราะห์ ( ✓ ) เพิ่มสารมลพิษ ( ) ยกเลิกสารมลพิษ	-	-	12	-	-
[ ✓ ] เปลี่ยนแปลงบุคลากร ( ✓ ) เพิ่มบุคลากร ( ✓ ) ยกเลิกบุคลากร	จำนวน 38 ราย (รายละเอียดตาม แบบ ปว.1) จำนวน 2 ราย (รายละเอียดตาม แบบ ปว.1)				
[ ] ยกเลิกห้องปฏิบัติการวิเคราะห์เอกชน					
[ ] อื่นๆ ..โปรดระบุ.....					

จึงเรียนมาเพื่อโปรดพิจารณา

กวกท.  
.....  
เพื่อโปรดพิจารณา

ลงชื่อ .....

( นางทัศนีย์ เลขากุลพร )

ผู้มีอำนาจลงนามแทนนิติบุคคล  
ประทับตรา (ถ้ามี)

(นายประสม ดำรงพงษ์)  
ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน

ALS Laboratory Group  
(Thailand) Co., Ltd.

