

ภาคผนวก ง

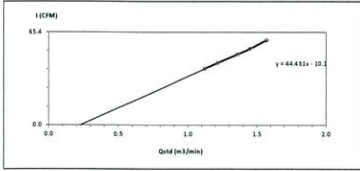
ใบรับรองการสอบเทียบเครื่องมือ

High Volume Air Sampler Calibration Worksheet

Project Site: WMA Saraburi Industrial Land Co., Ltd.
 Calibrate Location: 15 Saraburi Avenue, Saraburi 19000
 Calibrate Date: 19-Apr-23
 Calibration Sheet No.: C-190423-BKK-F30364
 Calibrator ID: BKK-F30624
 Calibrator Model: TE-5028A
 Calibrator S/N: 2584

Barometric Pressure (mm Hg): 754
 Temperature (°C): 33
 High Volume ID: BKK-F30364
 High Volume Model: TE-5009X
 High Volume S/N: 4154
 Calibrator Slope: 1.63932
 Calibrator Intercept: -0.01785

Test No.	Inlet H ₂ O (inch)	Q _{air} (m³/min)	1 Chart (CFM)	Linear Regression
1	3.4	1.1235	40	Slope: 44.4305
2	4.0	1.2170	44	Intercept: -10.0999
3	5.0	1.3366	50	Correlation Coefficient: 0.9994
4	5.7	1.4494	54	
5	6.7	1.5699	60	



Calibrated by: (Mr. Terarant Sudler) Field Scientist(2)
 Approved by: (Mr. Noppang Jantapan) Senior Field Coordinator Scientist (1)

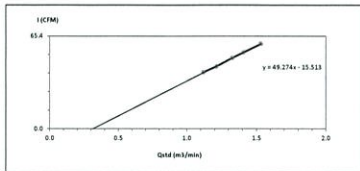
FORM No. F-04-073 REVISION No.: ISSUE DATE: 14/03/16

High Volume Air Sampler Calibration Worksheet

Project Site: WMA Saraburi Industrial Land Co., Ltd.
 Calibrate Location: 15 Saraburi Avenue, Saraburi 19000
 Calibrate Date: 19-Apr-23
 Calibration Sheet No.: C-190423-BKK-F30368
 Calibrator ID: BKK-F30624
 Calibrator Model: TE-5028A
 Calibrator S/N: 2584

Barometric Pressure (mm Hg): 754
 Temperature (°C): 34
 High Volume ID: BKK-F30368
 High Volume Model: TE-5009X
 High Volume S/N: 4165
 Calibrator Slope: 1.63932
 Calibrator Intercept: -0.01785

Test No.	Inlet H ₂ O (inch)	Q _{air} (m³/min)	1 Chart (CFM)	Linear Regression
1	3.4	1.2127	40	Slope: 49.2727
2	4.0	1.2153	44	Intercept: -15.5129
3	4.8	1.3294	50	Correlation Coefficient: 0.9996
4	5.4	1.4009	54	
5	6.4	1.5123	60	



Calibrated by: (Mr. Terarant Sudler) Field Scientist(2)
 Approved by: (Mr. Noppang Jantapan) Senior Field Coordinator Scientist (1)

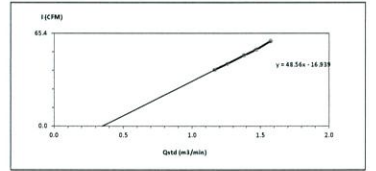
FORM No. F-04-073 REVISION No.: ISSUE DATE: 14/03/16

High Volume Air Sampler Calibration Worksheet

Project Site: WMA Saraburi Industrial Land Co., Ltd.
 Calibrate Location: 15 Saraburi Avenue, Saraburi 19000
 Calibrate Date: 19-Apr-23
 Calibration Sheet No.: C-190423-BKK-F30370
 Calibrator ID: BKK-F30624
 Calibrator Model: TE-5028A
 Calibrator S/N: 2584

Barometric Pressure (mm Hg): 754
 Temperature (°C): 35
 High Volume ID: BKK-F30370
 High Volume Model: TE-5009X
 High Volume S/N: 4708
 Calibrator Slope: 1.63732
 Calibrator Intercept: -0.01785

Test No.	Inlet H ₂ O (inch)	Q _{air} (m³/min)	1 Chart (CFM)	Linear Regression
1	3.7	1.1674	40	Slope: 46.5601
2	4.3	1.2572	44	Intercept: -16.9385
3	5.2	1.3807	50	Correlation Coefficient: 0.9992
4	5.9	1.4695	54	
5	6.8	1.5763	60	



Calibrated by: (Mr. Terarant Sudler) Field Scientist(2)
 Approved by: (Mr. Noppang Jantapan) Senior Field Coordinator Scientist (1)

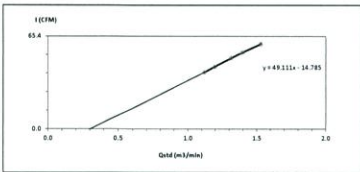
FORM No. F-04-073 REVISION No.: ISSUE DATE: 14/03/16

High Volume Air Sampler Calibration Worksheet

Project Site: WMA Saraburi Industrial Land Co., Ltd.
 Calibrate Location: 15 Saraburi Avenue, Saraburi 19000
 Calibrate Date: 19-Apr-23
 Calibration Sheet No.: C-190423-BKK-F30369
 Calibrator ID: BKK-F30624
 Calibrator Model: TE-5028A
 Calibrator S/N: 2584

Barometric Pressure (mm Hg): 754
 Temperature (°C): 35
 High Volume ID: BKK-F30369
 High Volume Model: TE-5009X
 High Volume S/N: 4166
 Calibrator Slope: 1.63932
 Calibrator Intercept: -0.01785

Test No.	Inlet H ₂ O (inch)	Q _{air} (m³/min)	1 Chart (CFM)	Linear Regression
1	3.4	1.1399	40	Slope: 49.1112
2	3.9	1.1983	44	Intercept: -14.7650
3	4.7	1.3135	50	Correlation Coefficient: 0.9993
4	5.3	1.3927	54	
5	6.4	1.5290	60	



Calibrated by: (Mr. Terarant Sudler) Field Scientist(2)
 Approved by: (Mr. Noppang Jantapan) Senior Field Coordinator Scientist (1)

FORM No. F-04-073 REVISION No.: ISSUE DATE: 14/03/16

Sartorius (Thailand) Co., Ltd.

120 Rama 9 Road, Bangkok, Thailand 10110
 Tel: +66 2643 881-4 Fax: +66 2643 881-7

Model Number: XP105DU
 Description: Semi-micro Balance
 Serial Number: 1123091884
 ID No: BKK_EN0004
 Manufacturer: Mettler Toledo

Customer Name: ALS Laboratory Group (Thailand) Co., Ltd.
 104 Phatthanaburi 40 Phatthanaburi Rd., Khwaeng Phatthanaburi, Khet Suan Luang, Bangkok 10250

Calibrated Place: Balance Room
 Calibrated By: Mr. Chonchai Inthana
 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

Environmental Conditions:
 Temperature: 21.0 °C ± 3.0 °C
 Humidity: 65.0 % RH ± 5.0 % RH
 Pressure: ☐ New Installation ☐ Service / Repair ☐ Re-calibration / Maintenance ☐ Equipment Condition ☐ Good (new) ☐ Fair

Reasons for calibration: ☐ New Installation ☐ Service / Repair ☐ Re-calibration / Maintenance ☐ Equipment Condition ☐ Good (new) ☐ Fair

Measurement Method: UKAS Publication Ref: Lab 14
 The measurement uncertainty stated in 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 includes the unit of measurement according to the International Standard System of Units (SI). Report of Tolerance came from lot of Sartorius Metrological Specifications

Traceability:
 Model Number: Description: Traceability: Certificate No.: Due Date:
 YC5011-522-00 Sartorius weight set 1mg - 1kg E2 km 37929119 SPC-RT C02212565 14-Sep-2023
 MMB-382SD Humidity/Balance/Temp. Lumar MMB-382SD OKSH C19220444 5-Sep-2023

This certificate states and applies the equipment only.
 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.

SOP FM 33 03 February 2022

Mr. Chonchai Inthana/Technical Manager

Sartorius (Thailand) Co., Ltd.

Calibration Results : Without Adjustment

Repeatability: The repeatability is the ability of a weighing instrument to display nearly identical results under constant test conditions when the same load within a measurement range is placed repeatedly on the weighing pan in the same manner. The standard deviation is used to express repeatability quantitatively.

Linearity: The linearity, also called linearity error, describes the deviation of the characteristic curve of a weighing instrument from the linear slope.

Standard Deviation: 0.00005 0.00007

Linearity: 0.00005 0.00007

Linearity: 0.00005 0.00007

Linearity: 0.00005 0.00007

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Linearity: 0.00005 0.00007

Sartorius (Thailand) Co., Ltd.

120 Rama 9 Road, Bangkok, Thailand 10110
 Tel: +66 2643 881-4 Fax: +66 2643 881-7

Model Number: XP105DU
 Description: Semi-micro Balance
 Serial Number: 1123091884
 ID No: BKK_EN0004
 Manufacturer: Mettler Toledo

Customer Name: ALS Laboratory Group (Thailand) Co., Ltd.
 104 Phatthanaburi 40 Phatthanaburi Rd., Khwaeng Phatthanaburi, Khet Suan Luang, Bangkok 10250

Calibrated Place: Balance Room
 Calibrated By: Mr. Chonchai Inthana
 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

Environmental Conditions:
 Temperature: 21.0 °C ± 3.0 °C
 Humidity: 65.0 % RH ± 5.0 % RH
 Pressure: ☐ New Installation ☐ Service / Repair ☐ Re-calibration / Maintenance ☐ Equipment Condition ☐ Good (new) ☐ Fair

Reasons for calibration: ☐ New Installation ☐ Service / Repair ☐ Re-calibration / Maintenance ☐ Equipment Condition ☐ Good (new) ☐ Fair

Measurement Method: UKAS Publication Ref: Lab 14
 The measurement uncertainty stated in 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 includes the unit of measurement according to the International Standard System of Units (SI). Report of Tolerance came from lot of Sartorius Metrological Specifications

Traceability:
 Model Number: Description: Traceability: Certificate No.: Due Date:
 YC5011-522-00 Sartorius weight set 1mg - 1kg E2 km 37929119 SPC-RT C02212565 14-Sep-2023
 MMB-382SD Humidity/Balance/Temp. Lumar MMB-382SD OKSH C19220444 5-Sep-2023

This certificate states and applies the equipment only.
 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.

SOP FM 33 03 February 2022

Mr. Chonchai Inthana/Technical Manager

Sartorius (Thailand) Co., Ltd.

Calibration Results : Without Adjustment

Repeatability: The repeatability is the ability of a weighing instrument to display nearly identical results under constant test conditions when the same load within a measurement range is placed repeatedly on the weighing pan in the same manner. The standard deviation is used to express repeatability quantitatively.

Linearity: The linearity, also called linearity error, describes the deviation of the characteristic curve of a weighing instrument from the linear slope.

Standard Deviation: 0.00005 0.00007

Linearity: 0.00005 0.00007

Linearity: 0.00005 0.00007

Linearity: 0.00005 0.00007

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Linearity: 0.00005 0.00007

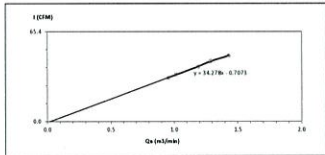
Linearity: 0.00005 0.00007



High Volume Air Sampler Calibration Worksheet

Project Site: WSP Tarapur Industrial and Co Ltd Barometric Pressure (mm Hg): 754
Calibration Location: WSP Tarapur Industrial and Co Ltd Temperature (°C): 35
Calibration Date: 17-Sep-23 High Volume ID: EXX F30376
Calibration Sheet No.: C-190423-BKN-F30376 High Volume Model: TE-5000V
Calibrator ID: EXX F30624 High Volume S/N: 4335
Calibrator Model: TE-5000V Calibrator Slope: 1.0000
Calibrator S/N: 2254 Calibrator Intercept: -0.0335

Test No.	Delta P ₂ (mmHg)	Q ₂ (m/min)	F ₁ Chart (CFM)	Linear Regression
1	2.3	0.955	32	Slope: 34.2777 Intercept: -0.7073 Correlation Coefficient: 0.9996
2	2.6	1.005	34	
3	3.6	1.192	40	
4	4.2	1.207	44	
5	5.2	1.435	48	



Calibrated by: [Signature]
(Mr. Jirawat Salom)
Field Scientist(2)

Approved by: [Signature]
(Mr. Noppong Jittrant)
Exem Field Coordinator Scientist (2)

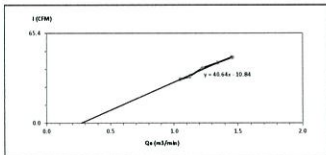
FORM NO: F-04-074 REVISION NO: ISSUE DATE: 14/01/16



High Volume Air Sampler Calibration Worksheet

Project Site: WSP Tarapur Industrial and Co Ltd Barometric Pressure (mm Hg): 754
Calibration Location: WSP Tarapur Industrial and Co Ltd Temperature (°C): 35
Calibration Date: 17-Sep-23 High Volume ID: EXX F30376
Calibration Sheet No.: C-190423-BKN-F30376 High Volume Model: TE-5000V
Calibrator ID: EXX F30624 High Volume S/N: 4335
Calibrator Model: TE-5000V Calibrator Slope: 1.0000
Calibrator S/N: 2254 Calibrator Intercept: -0.0335

Test No.	Delta P ₂ (mmHg)	Q ₂ (m/min)	F ₁ Chart (CFM)	Linear Regression
1	2.3	0.955	32	Slope: 34.2777 Intercept: -0.7073 Correlation Coefficient: 0.9996
2	2.6	1.005	34	
3	3.6	1.192	40	
4	4.2	1.207	44	
5	5.2	1.435	48	



Calibrated by: [Signature]
(Mr. Jirawat Salom)
Field Scientist(2)

Approved by: [Signature]
(Mr. Noppong Jittrant)
Exem Field Coordinator Scientist (2)

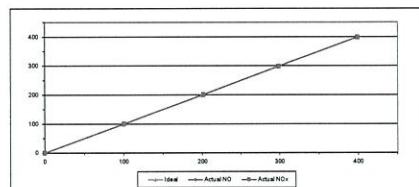
FORM NO: F-04-074 REVISION NO: ISSUE DATE: 14/01/16



MULTIPOINT CALIBRATION REPORT

Calibration Date: 8-Jan-23 Equipment Name: NOx Analyzer
Manufacturer: HORIBA Model: APNA-370
Serial No.: WY05JW02 Equipment ID: BKX_F80782
Calibrator Manufacturer: Teledyne API Model: 700
Serial No.: 847
Std. Gas Concentration (PPM): 85.86 Cylinder No.: QN0027222
Cylinder Pressure (ps): 1800 Certified By: Algas Inc.
Certified Date: 8-Feb-22 Expired Date: 8-Feb-30

CALIBRATION RESULTS							
Point	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	99.60	-0.40	-0.40	100.60	0.60	0.60
2	200.00	199.70	-0.30	-0.15	201.30	1.30	0.65
3	300.00	298.50	-1.50	-0.50	298.30	-1.70	-0.57
4	400.00	398.70	-1.30	-0.33	399.00	-1.00	-0.25
AVERAGE (%)				-0.28			0.11



Calibrated By: [Signature]

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

Approved By: [Signature]

(Mr. Sarayuth Jittrant)
Assistant General Manager

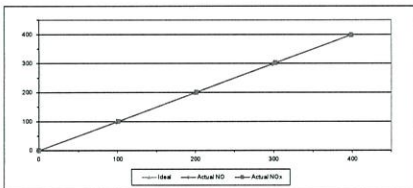
ALS Laboratory Group
FORM NO: F-04-056 REVISION NO: ISSUE DATE: 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date: 8-Jan-23 Equipment Name: NOx Analyzer
Manufacturer: HORIBA Model: APNA-370
Serial No.: WY05JW02 Equipment ID: BKX_F80803
Calibrator Manufacturer: Teledyne API Model: 700
Serial No.: 847
Std. Gas Concentration (PPM): 85.86 Cylinder No.: QN0027222
Cylinder Pressure (ps): 1800 Certified By: Algas Inc.
Certified Date: 8-Feb-22 Expired Date: 8-Feb-30

CALIBRATION RESULTS							
Point	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	99.60	-0.40	-0.40	100.60	0.60	0.60
2	200.00	199.70	-0.30	-0.15	201.30	1.30	0.65
3	300.00	298.50	-1.50	-0.50	298.30	-1.70	-0.57
4	400.00	398.70	-1.30	-0.33	399.00	-1.00	-0.25
AVERAGE (%)				-0.33			0.33



Calibrated By: [Signature]
(Mr. Jirawat Salom)
Field Environmental Scientist (2)

Approved By: [Signature]
(Mr. Sarayuth Jittrant)
Assistant General Manager

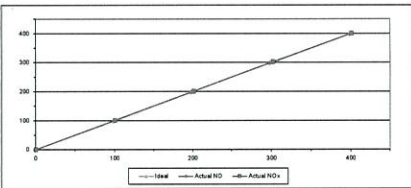
ALS Laboratory Group
FORM NO: F-04-056 REVISION NO: ISSUE DATE: 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date: 8-Jan-23 Equipment Name: NOx Analyzer
Manufacturer: HORIBA Model: APNA-370
Serial No.: WY05JW02 Equipment ID: BKX_F80803
Calibrator Manufacturer: Teledyne API Model: 700
Serial No.: 847
Std. Gas Concentration (PPM): 85.86 Cylinder No.: QN0027222
Cylinder Pressure (ps): 1800 Certified By: Algas Inc.
Certified Date: 8-Feb-22 Expired Date: 8-Feb-30

CALIBRATION RESULTS							
Point	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	99.60	-0.40	-0.40	100.60	0.60	0.60
2	200.00	199.70	-0.30	-0.15	201.30	1.30	0.65
3	300.00	298.50	-1.50	-0.50	298.30	-1.70	-0.57
4	400.00	398.70	-1.30	-0.33	399.00	-1.00	-0.25
AVERAGE (%)				-0.33			0.33



Calibrated By: [Signature]
(Mr. Jirawat Salom)
Field Environmental Scientist (2)

Approved By: [Signature]
(Mr. Sarayuth Jittrant)
Assistant General Manager

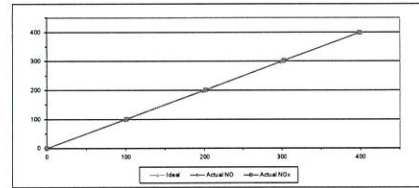
ALS Laboratory Group
FORM NO: F-04-056 REVISION NO: ISSUE DATE: 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date: 8-Jan-23 Equipment Name: NOx Analyzer
Manufacturer: HORIBA Model: APNA-370
Serial No.: WY05JW02 Equipment ID: BKX_F80786
Calibrator Manufacturer: Teledyne API Model: 700
Serial No.: 847
Std. Gas Concentration (PPM): 85.86 Cylinder No.: QN0027222
Cylinder Pressure (ps): 1800 Certified By: Algas Inc.
Certified Date: 8-Feb-22 Expired Date: 8-Feb-30

CALIBRATION RESULTS							
Point	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	99.60	-0.40	-0.40	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	398.70	-1.30	-0.33	398.90	-1.10	-0.28
AVERAGE (%)				-0.54			0.48



Calibrated By: [Signature]

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

Approved By: [Signature]

(Mr. Sarayuth Jittrant)
Assistant General Manager

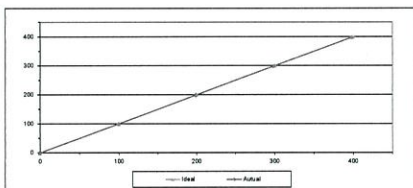
ALS Laboratory Group
FORM NO: F-04-056 REVISION NO: ISSUE DATE: 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date: 4-Jan-23 Equipment Name: SO2 Analyzer
Manufacturer: HORIBA Model: APNA-370
Serial No.: Y581878 Equipment ID: BKX_F80781
Calibrator Manufacturer: Teledyne API Model: 700
Serial No.: 847
Std. Gas Concentration (PPM): 86.3 Cylinder No.: QN0027222
Cylinder Pressure (ps): 1800 Certified By: Algas Inc.
Certified Date: 8-Feb-22 Expired Date: 8-Feb-30

CALIBRATION RESULTS				
Point	Ideal	Actual	Error	%Error
ZERO	0.00	0.10	0.10	0.10
1	100.00	99.70	-0.30	-0.30
2	200.00	199.20	-0.80	-0.40
3	300.00	298.50	-1.50	-0.50
4	400.00	397.40	-2.60	-0.65
AVERAGE (%)				-0.38



Calibrated By: [Signature]
(Mr. Jirawat Salom)
Field Environmental Scientist (2)

Approved By: [Signature]
(Mr. Sarayuth Jittrant)
Assistant General Manager

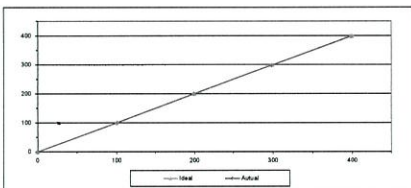
ALS Laboratory Group
FORM NO: F-04-056 REVISION NO: ISSUE DATE: 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date: 4-Jan-23 Equipment Name: SO2 Analyzer
Manufacturer: HORIBA Model: APNA-370
Serial No.: Y581878 Equipment ID: BKX_F80802
Calibrator Manufacturer: Teledyne API Model: 700
Serial No.: 847
Std. Gas Concentration (PPM): 86.3 Cylinder No.: QN0027222
Cylinder Pressure (ps): 1800 Certified By: Algas Inc.
Certified Date: 8-Feb-22 Expired Date: 8-Feb-30

CALIBRATION RESULTS				
Point	Ideal	Actual	Error	%Error
ZERO	0.00	0.10	0.10	0.10
1	100.00	101.00	1.00	1.00
2	200.00	199.50	-0.50	-0.25
3	300.00	298.30	-1.70	-0.57
4	400.00	398.00	-2.00	-0.50
AVERAGE (%)				-0.34



Calibrated By: [Signature]
(Mr. Jirawat Salom)
Field Environmental Scientist (2)

Approved By: [Signature]
(Mr. Sarayuth Jittrant)
Assistant General Manager

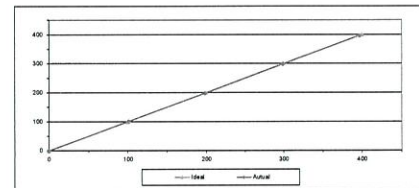
ALS Laboratory Group
FORM NO: F-04-056 REVISION NO: ISSUE DATE: 02/04/12



MULTIPOINT CALIBRATION REPORT

Calibration Date: 4-Jan-23 Equipment Name: SO2 Analyzer
Manufacturer: HORIBA Model: APNA-370
Serial No.: Y581878 Equipment ID: BKX_F80788
Calibrator Manufacturer: Teledyne API Model: 700
Serial No.: 847
Std. Gas Concentration (PPM): 86.3 Cylinder No.: QN0027222
Cylinder Pressure (ps): 1800 Certified By: Algas Inc.
Certified Date: 8-Feb-22 Expired Date: 8-Feb-30

CALIBRATION RESULTS				
Point	Ideal	Actual	Error	%Error
ZERO	0.00	0.10	0.10	0.10
1	100.00	101.30	1.30	1.30
2	200.00	198.10	-1.90	-0.95
3	300.00	298.50	-1.50	-0.50
4	400.00	397.00	-3.00	-0.75
AVERAGE (%)				-0.18



Calibrated By: [Signature]

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

Approved By: [Signature]

(Mr. Sarayuth Jittrant)
Assistant General Manager

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

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

421-451/15 Sathorn Rd, Bangkok, Bangkok 10700 THAILAND
Tel: 2-243-8822 Fax: 2-243-1679 e-mail: cal@www.sithiporn.com http://www.sithiporn.com



Cert. No.: ACL23001
Pages: 1 of 8

Calibration Certificate

Equipment: SOUND LEVEL METER
Manufacturer: RION
Model: NL-42 Microphone UC-52 / Pre-amplifier N1-24
Serial No.: 00572565 / 170402 / 72907
ID No.: BKK P30874

Condition As Found: GOOD

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

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

Received Date: 14 DECEMBER 2022
Calibration Date: 03-05 JANUARY 2023
Date of Issue: 06 JANUARY 2023

Calibrated by: Natchanon Pongpraporn

Approved by: T. Petchu
(Thanakul Petchu)

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

QF-TS12-04-04-02064

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate
Cert. No.: ACL23001
Job No.: VCM6AC0021
Pages: 2 of 8

Calibration Procedure: CP-AC-01

Calibration Method:
The equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Acoustic chamber and Reference Standard Instruments.
For test results of each item were made by observation of each instrument display and also with SLM display.

Condition of this result of calibration:

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0007-22	04-Feb-23
Waveform Generator	33511B	MY52302742	EF-0008-22	04-Feb-23
Digital Multimeter	33461A	MY5230104	EF-100-10-2020	09-Feb-23
Digital Multimeter	33461A	MY52302079	EF-100-10-2020	09-Feb-23
Digital Multimeter	34461A	MY6002473	EEL-100-05-2020	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EF-0009-22	07-Feb-23
Condenser Microphone	4180	2977600	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KAI	34360495	AA-1005-22	22-Feb-23

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

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

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

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate
Cert. No.: ACL23001
Job No.: VCM6AC0021
Pages: 3 of 8

Summary of Measurement Result:

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings	✓	-	0.3	0.8
1000 Hz	✓	-	0.2	0.6
8000 Hz	✓	-	0.4	0.7
4. Electrical signal tests of frequency weightings	✓	-	0.5	0.6
For 10 Hz to 4 kHz	✓	-	0.3	0.7
For > 4 kHz to 15 kHz	✓	-	0.3	1.0
For > 15 kHz to 20 kHz	✓	-	0.2	0.2
5. Frequency and time weightings at 1 kHz	✓	-	0.1	0.1
6. Long-term stability	✓	-	0.2	0.3
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

QF-TS12-04-04-02064

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate
Cert. No.: ACL23001
Job No.: VCM6AC0021
Pages: 4 of 8

Result of calibration:

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limits (dB)
93.9 (0.05)	93.9	0.0	±0.3

2. Self-generated noise

Measured Value (dB)
17.2

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

Frequency (Hz)	Measured value (dB)
Weighting	14.6
A-weight	21.1
C-weight	20.6

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
125	0.0	0.0	0.0	±1.5
1000	-0.1	-0.1	-0.1	±1.0
8000	-0.1	0.0	0.0	±5.0

QF-TS12-04-04-02064

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate
Cert. No.: ACL23001
Job No.: VCM6AC0021
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
63	0.0	0.0	0.0	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±2.0
4000	0.0	0.0	0.0	±2.0
8000	0.0	0.1	0.1	±2.0

5. Frequency and time weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long-term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.1	0.1	±0.2

QF-TS12-04-04-02064

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate
Cert. No.: ACL23001
Job No.: VCM6AC0021
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	±1.0
136.0	136.0	0.0	±1.0
135.0	135.0	0.0	±1.0
134.0	134.0	0.0	±1.0
133.0	133.0	0.0	±1.0
132.0	132.0	0.0	±1.0
131.0	131.0	0.0	±1.0
129.0	129.0	0.0	±1.0
124.0	124.0	0.0	±1.0
119.0	119.0	0.0	±1.0
114.0	114.0	0.0	±1.0
109.0	109.0	0.0	±1.0
104.0	104.0	0.0	±1.0
99.0	99.0	0.0	±1.0
94.0	94.0	0.0	±1.0
89.0	89.0	0.0	±1.0
84.0	84.0	0.0	±1.0
79.0	79.0	0.0	±0.3
74.0	74.0	0.0	±1.0
69.0	69.0	0.0	±1.0
64.0	64.0	0.0	±1.0
59.0	59.0	0.0	±1.0
54.0	54.0	0.0	±1.0
49.0	49.0	0.0	±1.0
44.0	44.0	0.0	±1.0
39.0	39.0	0.0	±1.0
34.0	34.0	0.0	±1.0
29.0	29.0	-0.1	±1.0
24.0	24.0	-0.1	±1.0
27.0	26.9	-0.1	±1.0
26.0	26.1	0.1	±1.0
25.0	24.9	-0.1	±1.0

QF-TS12-04-04-02064

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate
Cert. No.: ACL23001
Job No.: VCM6AC0021
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	Test burst duration, Td (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)	
Weighting	0.25	1	108.0	107.9	-0.1	±1.5/±0.0	
	2	8	117.0	117.0	0.0	±1.0/±0.5	
	200	800	134.0	134.1	0.1	±1.0	
	Fast	0.25	1	108.0	107.9	-0.1	±1.5/±0.0
		2	8	117.0	117.0	0.0	±1.0/±0.5
		200	800	134.0	134.1	0.1	±1.0
Slow	0.25	1	108.0	108.0	0.0	±1.5/±0.0	
	2	8	127.6	127.6	0.0	±1.0	
	200	800	134.0	134.0	0.0	±1.0	
	SEL	0.25	1	99.0	98.9	-0.1	±1.5/±0.0
		2	8	108.0	108.0	0.0	±1.0/±0.5
		200	800	128.0	128.0	0.0	±1.0

10. Peak C sound level

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

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

QF-TS12-04-04-02064

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate
Cert. No.: ACL23001
Job No.: VCM6AC0021
Pages: 8 of 8

11. Overload indication

Measured value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	99.5	±0.1
Negative one-half cycle	99.5	±0.1

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	136.0	137.0	±0.1	±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

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

451-451/15 Sathorn Rd, Bangkok, Bangkok 10700 THAILAND
Tel: 2-243-8822 Fax: 2-243-1679 e-mail: cal@www.sithiporn.com http://www.sithiporn.com



Cert. No.: ACL23204
Pages: 1 of 8

Calibration Certificate

Equipment: SOUND LEVEL METER
Manufacturer: RION
Model: NE-42 Microphone UC-52 / Pre-amplifier N1-24
Serial No.: 00572552 / 170384 / 72990
ID No.: BKK P30877

Condition As Found: GOOD

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

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

Received Date: 11 OCTOBER 2022
Calibration Date: 25-26 OCTOBER 2022
Date of Issue: 27 OCTOBER 2022

Calibrated by: Natchanon Pongpraporn

Approved by: T. Petchu
(Thanakul Petchu)

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QF-TS12-04-04-02064

Continuation of Calibration Certificate

Cert. No. : ACL22244
Job No. : VC65AC0090
Pages : 5 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

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

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

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Exp. Date
Waveform Generator	33210A	MY48017076	EE-0007-22	04-Feb-23
Waveform Generator	33511B	MY5232742	EE-0008-22	04-Feb-23
Digital Multimeter	33461A	MY5220104	EEL-HP-040265	09-Feb-23
Digital Multimeter	33461A	MY5220076	EEL-HP-050265	09-Feb-23
Digital Multimeter	34461A	MY6602473	EEL-HP-050265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EE-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KA1	34560495	AA-3008-22	22-Feb-23

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

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

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

QT-TS-2-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22244
Job No. : VC65AC0090
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

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

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long-term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.5

QT-TS-2-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22244
Job No. : VC65AC0090
Pages : 8 of 8

11. Overall indication

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

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	137.0	137.0	0.0	±0.5

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

Continuation of Calibration Certificate

Cert. No. : ACL22244
Job No. : VC65AC0090
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings	✓	-	0.3	0.6
125 Hz	✓	-	0.3	0.6
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	0.6
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. Tone burst response	✓	-	0.2	0.3
10. Peak C-weight level	✓	-	0.2	0.3
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

QT-TS-2-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22244
Job No. : VC65AC0090
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits
137.0	137.0	0.0	±1.1
136.0	136.0	0.0	±1.1
135.0	135.0	0.0	±1.1
134.0	134.0	0.0	±1.1
133.0	133.0	0.0	±1.1
132.0	132.0	0.0	±1.1
131.0	131.0	0.0	±1.1
129.0	129.0	0.0	±1.1
124.0	124.0	0.0	±1.1
119.0	119.0	0.0	±1.1
114.0	114.0	0.0	±1.1
109.0	109.0	0.0	±1.1
104.0	104.0	0.0	±1.1
99.0	99.0	0.0	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	39.0	0.0	±1.1
34.0	34.0	0.0	±1.1
30.0	30.0	0.0	±1.1
29.0	29.0	0.0	±1.1
26.0	26.0	0.1	±1.1
27.0	27.1	0.1	±1.1
26.0	26.1	0.1	±1.1
25.0	25.1	0.1	±1.1

QT-TS-2-04-04-020664

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42: Microphones UC-52 / Preamplifier NH-24
Serial No.: 00572560 / 17099 / 7290
ID No.: BICK P38079

Condition As Found :

GOOD

Customer :

ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATHANAKAN 40, PHATHANAKAN ROAD,
KHUAEANG PHATHANAKAN, KHUET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location :

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

Received Date :

14 NOVEMBER 2022

Calibration Date :

21 NOVEMBER 2022

Date of Issue :

24 NOVEMBER 2022

Calibrated by :

Natakon Pongpau

Approved by :

(Thaisak Petchara)

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.

QT-TS-2-04-04-020664

QT-TS-2-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22244
Job No. : VC65AC0090
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limits (dB)
93.9 (3.95)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
12.8

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	12.5
Flat	23.3

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	0.2	0.4	0.4	±1.5
1000	-0.1	-0.1	-0.1	±1.0
8000	-1.7	-1.6	-1.6	±5.0

QT-TS-2-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22244
Job No. : VC65AC0090
Pages : 7 of 8

8. Level linearity including the level range control

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

9. Tone burst response

Time Weighting	Tone burst duration, T _b (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ± 3.0
	2	3	117.0	117.0	0.0	1.0 ± 2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	0.25	1	108.0	108.0	0.0	1.5 ± 3.0
	2	3	127.6	127.6	0.0	±1.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.9	-0.1	1.5 ± 3.0
	2	3	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 _{peak} (dB)	Deviated Value (dB)	Acceptance Limits
Continuous	133.0	133.0	0.0	±1.0
One	136.4	136.7	+0.3	±1.0

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

QT-TS-2-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22276
Job No. : VC65AC0091
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

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

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

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Exp. Date
Waveform Generator	33210A	MY48017076	EE-0007-22	04-Feb-23
Waveform Generator	33511B	MY5232742	EE-0008-22	04-Feb-23
Digital Multimeter	33461A	MY5220104	EEL-HP-040265	09-Feb-23
Digital Multimeter	33461A	MY5220076	EEL-HP-050265	09-Feb-23
Digital Multimeter	34461A	MY6602473	EEL-HP-050265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EE-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KA1	34560495	AA-3008-22	22-Feb-23

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

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

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

QT-TS-2-04-04-020664

QT-TS-2-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22276
Job No. : VC66AC0011
Page : 3 of 8

Summary of Measurement Result:

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings	✓	-	-	-
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings	✓	-	-	-
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long-term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. 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-TS-2-04-04-020642

T. Reth...

Continuation of Calibration Certificate

Cert. No. : ACL22276
Job No. : VC66AC0011
Page : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	+1.1
136.0	136.0	0.0	+1.1
135.0	135.0	0.0	+1.1
134.0	134.0	0.0	+1.1
133.0	133.0	0.0	+1.1
132.0	132.0	0.0	+1.1
131.0	131.0	0.0	+1.1
129.0	129.0	0.0	+1.1
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	84.0	0.0	+1.1
79.0	79.0	0.0	+1.1
74.0	74.0	0.1	+1.1
69.0	69.0	0.0	+1.1
64.0	64.0	0.0	+1.1
59.0	59.0	0.0	+1.1
54.0	54.0	0.0	+1.1
49.0	49.0	0.0	+1.1
44.0	44.0	0.0	+1.1
39.0	39.0	0.0	+1.1
34.0	34.0	0.0	+1.1
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

QP-TS-2-04-04-020642

T. Reth...

43-143/11 Sathorn Rd, Bangkok, Bangkok 10120 THAILAND
Tel: 0-2433-8800 Fax: 0-2433-1679 e-mail: center@sithiporn.com http://www.sithiporn.comCert. No. : ACL22277
Page : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 Microphone UC-52 / Pre-amplifier NH-24
Serial No. : 0037264 / 170401 / 72002
ID No. : BKK-FS0880

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.
104 PHATHANAKAN 40 PHATHANAKAN ROAD,
KHAO ADONG PHATHANAKAN, KHUET SUAN LUANG,
BANGKOK, 10250 THAILAND.

Location :
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.5 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 14 NOVEMBER 2022
Calibration Date : 21 NOVEMBER 2022
Date of Issue : 24 NOVEMBER 2022

Calibrated by : Natchanon Poutpavan

Approved by :

(Thunakul Petchan)

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-TS-2-04-04-020642

Continuation of Calibration Certificate

Cert. No. : ACL22276
Job No. : VC66AC0011
Page : 4 of 8

Result of calibration:

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.0 (93.95)	93.9	0.0	±0.3

2. Self-generated noise

Frequency (Hz)	Measured value (dB)
125	15.6

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

Frequency (Hz)	Measured value (dB)
A-weight	9.0
C-weight	16.5
Flat	22.2

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)	Acceptance Limits (dB)
Flat	-	-
C-weight	-	-
A-weight	-	-
125	0.3	0.4
1000	-0.1	-0.1
8000	-2.7	-2.2

QP-TS-2-04-04-020642

T. Reth...

Continuation of Calibration Certificate

Cert. No. : ACL22276
Job No. : VC66AC0011
Page : 7 of 8

8. Level linearity including the level range control

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

9. Time burst response

Time Weighting	Time burst duration, T _B (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	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	1.2; -2.5
	200	800	128.0	128.0	0.0	±1.0

10. Peak C sound level

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

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

QP-TS-2-04-04-020642

T. Reth...

Continuation of Calibration Certificate

Cert. No. : ACL22277
Job No. : VC66AC0011
Page : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by based on IEC 61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Acoustic chamber and Reference
Standard Instruments.
For tests results of each item were made by observation of each instrument display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	NY48017076	E3-0007-22	04-Feb-23
Waveform Generator	33511B	MS5230252	E3-0008-22	04-Feb-23
Digital Multimeter	33461A	NY53220104	E31-BP-040265	09-Feb-23
Digital Multimeter	33461A	NY53220076	E31-BP-040265	09-Feb-23
Digital Multimeter	34461A	MY60024273	E31-BP-050265	09-Feb-23
Programmable Attenuator	MAT 1070	62100114	E3-0009-22	07-Feb-23
Condenser Microphone	4180	2977600	AA-1010-20	24-Feb-23
Measuring Amplifier	NA-42KA1	34560485	AA-3005-22	22-Feb-23

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

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

3.1 National Institute of Metrology (Thailand).

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

Continuation of Calibration Certificate

Cert. No. : ACL22276
Job No. : VC66AC0011
Page : 8 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)	Acceptance Limits (dB)
Flat	-	-
C-weight	-	-
A-weight	-	-
125	0.0	0.0
250	0.0	0.0
500	0.0	0.0
1000	0.0	0.0
2000	0.0	0.0
4000	0.0	0.0
8000	0.0	0.1

5. Frequency and time weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	0.0	-
Slow	94.0	0.0	±0.1
1sm	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-TS-2-04-04-020642

T. Reth...

Continuation of Calibration Certificate

Cert. No. : ACL22276
Job No. : VC66AC0011
Page : 8 of 8

11. Overload indication

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

12. High level stability

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

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

End of Calibration Certificate

QP-TS-2-04-04-020642

T. Reth...

Continuation of Calibration Certificate

Cert. No. : ACL22277
Job No. : VC66AC0011
Page : 3 of 8

Summary of Measurement Result:

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings	✓	-	-	-
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings	✓	-	-	-
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long-term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. 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-TS-2-04-04-020642

T. Reth...

Continuation of Calibration Certificate

Cert. No.: ACL22277
Job No.: VCM6AC0011
Pages: 4 of 8

Result of calibration:

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limits (dB)
93.9 (33.95)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
16.9

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

Frequency Weighting	Measured value (dB)
A-weight	14.2
C-weight	26.2
Flat	26.0

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)	Acceptance Limits (dB)
125	0.1	±1.5
1000	0.0	±1.0
8000	2.2	±5.0

QT 7512-04-04 (20644)

T. P. P.

Continuation of Calibration Certificate

Cert. No.: ACL22277
Job No.: VCM6AC0011
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)	Acceptance Limits (dB)
63	0.0	±2.0
125	0.1	±1.5
250	0.0	±1.5
500	0.0	±1.5
1000	0.0	±1.0
2000	0.0	±2.0
4000	0.0	±3.0
8000	0.0	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time 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
Log	94.0	0.0	±0.1

6. Long-term stability

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

QT 7512-04-04 (20644)

T. P. P.

Continuation of Calibration Certificate

Cert. No.: ACL22277
Job No.: VCM6AC0011
Pages: 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±1.1
136.0	136.0	0.0	±1.1
135.0	135.0	0.0	±1.1
134.0	134.0	0.0	±1.1
133.0	133.0	0.0	±1.1
132.0	132.0	0.0	±1.1
131.0	131.0	0.0	±1.1
129.0	129.0	0.0	±1.1
124.0	124.0	0.0	±1.1
119.0	119.0	0.0	±1.1
114.0	114.0	0.0	±1.1
109.0	109.0	0.0	±1.1
104.0	104.0	0.0	±1.1
99.0	99.0	0.0	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	39.0	0.0	±1.1
34.0	34.0	0.0	±1.1
30.0	30.0	0.0	±1.1
29.0	29.0	0.0	±1.1
28.0	28.0	0.0	±1.1
27.0	27.1	0.1	±1.1
26.0	26.1	0.1	±1.1
25.0	25.1	0.1	±1.1

QT 7512-04-04 (20644)

T. P. P.

Continuation of Calibration Certificate

Cert. No.: ACL22277
Job No.: VCM6AC0011
Pages: 7 of 8

8. Level linearity including the level range control

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

9. Time burst response

Time Weighting	Time burst duration, T _b (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	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
Slow	200	800	134.0	134.1	0.1	±1.0
	2	8	138.0	138.0	0.0	±1.5 / ±5.0
SEL	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	±1.5 / ±5.0
	2	8	108.0	108.0	0.0	±1.0 / ±2.5
	200	800	128.0	128.0	0.0	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	136.3	-0.1	±0.5

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

QT 7512-04-04 (20644)

T. P. P.

Continuation of Calibration Certificate

Cert. No.: ACL22277
Job No.: VCM6AC0011
Pages: 8 of 8

11. Overload indication

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

12. High level stability

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

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

End of Calibration Certificate

QT 7512-04-04 (20644)

T. P. P.

Bara Scientific Co., Ltd.
888 U-Chiang Building Floor 11th Floor
Siam Bangkok Bangkok Thailand 10500
Tel: 02-6243000 Fax: 02-6275467
www.barscientific.com

Certificate of Calibration

Certificate No.: BSCCV-30722
Equipment: UNWA Spectrophotometer
Model: UNW-1000
Manufacturer: Shimadzu
Serial No.: A114490833CD
ID No.: BKH-00018
Date of receipt: 16 September 2022
Date of calibration: 16 September 2022
Date of issue: 23 September 2022


Customer name: ALS Laboratory Group (Thailand) Co., Ltd.
Address: 104 Soi Phatthakanan 49, Phatthakanan Road, Phatthakanan, Suan Luang, Bangkok 10250

Temperature: (22 ± 2) °C (On site)
Humidity: (58 ± 3) % RH (On site)

Equipment condition: Good Operation
Calibration Location: Onsite Prep
Calibration Procedure: In-house method: WI-UV-702-01 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 95937
Spectral Light is traceable to certificate No. 95908
The above certificate are traceable to SI unit through NIST traceable calibration laboratory (NIST 1950)

Calibrated by: Mr. Wuthi Jangphum

Approved by: 
Wuthi Jangphum
Technician Manager

The above results are valid only for 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 or taken in full except with the prior written approval of the Bara Scientific Co., Ltd.

Rev 1.08-12 Rev 01 (2019/05)

Bara Scientific Co., Ltd.
888 U-Chiang Building Floor 11th Floor
Siam Bangkok Bangkok Thailand 10500
Tel: 02-6243000 Fax: 02-6275467
www.barscientific.com

Certificate of Calibration

Certificate No.: BSCCV-30722
Equipment: UNWA Spectrophotometer
Model: UNW-1000
Manufacturer: Shimadzu
Serial No.: A114490833CD
ID No.: BKH-00018
Date of receipt: 16 September 2022
Date of calibration: 16 September 2022
Date of issue: 23 September 2022


Customer name: ALS Laboratory Group (Thailand) Co., Ltd.
Address: 104 Soi Phatthakanan 49, Phatthakanan Road, Phatthakanan, Suan Luang, Bangkok 10250

Temperature: (22 ± 2) °C (On site)
Humidity: (58 ± 3) % RH (On site)

Equipment condition: Good Operation
Calibration Location: Onsite Prep
Calibration Procedure: In-house method: WI-UV-702-01 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 95937
Spectral Light is traceable to certificate No. 95908
The above certificate are traceable to SI unit through NIST traceable calibration laboratory (NIST 1950)

Calibrated by: Mr. Wuthi Jangphum

Approved by: 
Wuthi Jangphum
Technician Manager

The above results are valid only for 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 or taken in full except with the prior written approval of the Bara Scientific Co., Ltd.

Rev 1.08-12 Rev 01 (2019/05)

Bara Scientific Co., Ltd.
888 U-Chiang Building Floor 11th Floor
Siam Bangkok Bangkok Thailand 10500
Tel: 02-6243000 Fax: 02-6275467
www.barscientific.com

Certificate of Calibration

Certificate No.: BSCCV-30722
Equipment: UNWA Spectrophotometer
Model: UNW-1000
Manufacturer: Shimadzu
Serial No.: A114490833CD
ID No.: BKH-00018
Date of receipt: 16 September 2022
Date of calibration: 16 September 2022
Date of issue: 23 September 2022


Customer name: ALS Laboratory Group (Thailand) Co., Ltd.
Address: 104 Soi Phatthakanan 49, Phatthakanan Road, Phatthakanan, Suan Luang, Bangkok 10250

Temperature: (22 ± 2) °C (On site)
Humidity: (58 ± 3) % RH (On site)

Equipment condition: Good Operation
Calibration Location: Onsite Prep
Calibration Procedure: In-house method: WI-UV-702-01 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 95937
Spectral Light is traceable to certificate No. 95908
The above certificate are traceable to SI unit through NIST traceable calibration laboratory (NIST 1950)

Calibrated by: Mr. Wuthi Jangphum

Approved by: 
Wuthi Jangphum
Technician Manager

The above results are valid only for 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 or taken in full except with the prior written approval of the Bara Scientific Co., Ltd.

Rev 1.08-12 Rev 01 (2019/05)

Metrological Center
SCI ECO Services Company Limited

332 Moo 3, T. Bangna, A. Klongkiet, Sarnaburi 10110, Thailand.
Sarnaburi Tel: +66 2627 3098 Fax: +66 2627 3100
Bangkok Tel: +666 9205 6851, +666 8247 2360
Website: www.sci.co.th E-Mail: calibrate@sci.co.th

Certificate No.: T221644
Page 1 of 4

Certificate of Calibration

Equipment: Chamber (Cold Room)
Manufacturer: KOLITECH
Model: KM 320
Serial No.: TBN-101261/05
Customer Code: BKK_EN0167
ID No.: T2463A3
Customer: ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthakanan 49, Phatthakanan Rd., Khwaeng Phatthakanan, Khet Suan Luang, Bangkok 10250

Customer Location: Environmental Laboratory
Date of Receipt: 27 June 2022
Calibrated By: Sujar Nakkakred (Site Calibration Manager)
Approved By:  / Boenchai Suriyawang (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 or taken in full except with the prior written approval of the Metrological Center.

Rev 1.14-1101-02-04

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

Certificate No. T221642 Page 5 of 5

Calibration Report

Equipment : Digestion Unit
Manufacturer : SCP Science
Model : DigIPRER HT
Serial No. : HTC1120480658
Customer Code : BKK_EN0366
ID No. : T2635A5
Customer : ALS Laboratory Group (Thailand) Co.,Ltd.
184 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,
Khet Suan Luang, Bangkok 10259
Customer Location : Wet Chemistry Lab 1
Date of Receipt : 10 May 2023
Calibrated By : Sujjar Nakkakred (Site Calibration Manager)
Approved By : / Boonchal Suriyawong (Site Calibration Manager)
Date of Issue : 29 MAY 2023

The expanded uncertainty of temperature measurement was $\pm 1.49^{\circ}\text{C}$
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: [Signature]

FM-L13 18070-05-57

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

Certificate No. T230992 Page 1 of 5

Certificate of Calibration

Equipment : Digestion Unit
Manufacturer : SCP Science
Model : DigIPRER HT
Serial No. : HTC1120480658
Customer Code : BKK_EN0366
ID No. : T2635A5
Customer : ALS Laboratory Group (Thailand) Co.,Ltd.
184 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,
Khet Suan Luang, Bangkok 10259
Customer Location : Wet Chemistry Lab 1
Date of Receipt : 10 May 2023
Calibrated By : Sujjar Nakkakred (Site Calibration Manager)
Approved By : / Boonchal Suriyawong (Site Calibration Manager)
Date of Issue : 29 MAY 2023

The expanded uncertainty of temperature measurement was $\pm 1.49^{\circ}\text{C}$
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: [Signature]

FM-L13 18070-05-57

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

Certificate No. T230992 Page 2 of 5

Calibration Report

Equipment : Digestion Unit
Date of Calibration : 17 May 2023
Environment : Temperature : $23.9 - 26.3^{\circ}\text{C}$
Line Voltage : $221.8 - 225.9\text{ V}$
Relative Humidity : $55 - 65\% \text{RH}$

Condition of this results of calibration :

1. This equipment was calibrated by insert four standard thermocouple 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.

2. Reference Standard Instrument :
Instrument Model Instrument No. Certificate No. Due Date
TC M20A1-CH17-CH20 T230547 18 April 2024
DATA LOGGER 34970A T149 T230547 18 April 2024

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

4. Condition of calibrated item : good
Equipment Description :
Time Constant : Hour 54 Minute At 380°C
Fresh Air Damper : ☐ Open ☐ Min ☐ Medium ☐ Max
☒ Not Available

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

Approved By: [Signature]

FM-L13 18070-05-57

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

Certificate No. T230992 Page 3 of 5

Calibration Report

Equipment : Digestion Unit
Manufacturer : SCP Science
Model : DigIPRER HT
Serial No. : HTC1120480658
Customer Code : BKK_EN0366
ID No. : T2635A5
Customer : ALS Laboratory Group (Thailand) Co.,Ltd.
184 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,
Khet Suan Luang, Bangkok 10259
Customer Location : Wet Chemistry Lab 1
Date of Receipt : 10 May 2023
Calibrated By : Sujjar Nakkakred (Site Calibration Manager)
Approved By : / Boonchal Suriyawong (Site Calibration Manager)
Date of Issue : 29 MAY 2023

The expanded uncertainty of temperature measurement was $\pm 1.49^{\circ}\text{C}$
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: [Signature]

FM-L13 18070-05-57

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

Certificate No. T230992 Page 4 of 5

Calibration Report

Equipment : Digestion Unit
Manufacturer : SCP Science
Model : DigIPRER HT
Serial No. : HTC1120480658
Customer Code : BKK_EN0366
ID No. : T2635A5
Customer : ALS Laboratory Group (Thailand) Co.,Ltd.
184 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,
Khet Suan Luang, Bangkok 10259
Customer Location : Wet Chemistry Lab 1
Date of Receipt : 10 May 2023
Calibrated By : Sujjar Nakkakred (Site Calibration Manager)
Approved By : / Boonchal Suriyawong (Site Calibration Manager)
Date of Issue : 29 MAY 2023

The expanded uncertainty of temperature measurement was $\pm 1.49^{\circ}\text{C}$
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: [Signature]

FM-L13 18070-05-57

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

Certificate No. T230992 Page 5 of 5

Calibration Report

Equipment : Digestion Unit
Manufacturer : SCP Science
Model : DigIPRER HT
Serial No. : HTC1120480658
Customer Code : BKK_EN0366
ID No. : T2635A5
Customer : ALS Laboratory Group (Thailand) Co.,Ltd.
184 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,
Khet Suan Luang, Bangkok 10259
Customer Location : Wet Chemistry Lab 1
Date of Receipt : 10 May 2023
Calibrated By : Sujjar Nakkakred (Site Calibration Manager)
Approved By : / Boonchal Suriyawong (Site Calibration Manager)
Date of Issue : 29 MAY 2023

The expanded uncertainty of temperature measurement was $\pm 1.85^{\circ}\text{C}$
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: [Signature]

FM-L13 18070-05-57

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

Certificate No. T221592 Page 1 of 4

Certificate of Calibration

Equipment : Chamber (Oven)
Manufacturer : Memmert
Model : UF 450
Serial No. : B7178531
Customer Code : BKK_EN0273
ID No. : TR042A4
Customer : ALS Laboratory Group (Thailand) Co.,Ltd.
184 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,
Khet Suan Luang, Bangkok 10259
Customer Location : Oven Room
Date of Receipt : 23 November 2022
Calibrated By : Sujjar Nakkakred (Site Calibration Manager)
Approved By : / Boonchal Suriyawong (Site Calibration Manager)
Date of Issue : 09 DEC 2022

The expanded uncertainty of temperature measurement was $\pm 1.85^{\circ}\text{C}$
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: [Signature]

FM-L13 18070-05-57

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

Certificate No. T221592 Page 2 of 4

Calibration Report

Equipment : Chamber (Oven)
Date of Calibration : 29 November 2022
Environment : Temperature : $29.1 - 29.6^{\circ}\text{C}$
Line Voltage : $221.3 - 223.2\text{ V}$
Relative Humidity : $55 - 65\% \text{RH}$

Condition of this results of calibration :

1. This equipment was calibrated by insert nine resistance thermometer detectors and nine standard thermocouples type T into its chamber, the other one resistance thermometer detector use for ambient temperature measurement.
The calibration was done in according to WI-T201 based on ASTM E114-94 (Reapproved 2003) and ASSE43-1985).
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
RTD 100 ohm T21CH1-10 T210004 30 December 2022
TC TYPE T T21CH2-10 T210010 30 December 2022
DATA LOGGER 34970A T149 T210004 30 December 2022

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

4. Condition of calibrated item : good
Equipment Description :
Time Constant : Hour 49 Minute At 104°C
Fresh Air Damper : ☒ Open ☐ Min ☐ Medium ☒ Max
☐ Close
☐ Not Available

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

Approved By: [Signature]

FM-L13 18070-05-57

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

Certificate No. T221592 Page 3 of 4

Calibration Report

Equipment : Chamber (Oven)
Manufacturer : Memmert
Model : UF 450
Serial No. : B7178531
Customer Code : BKK_EN0273
ID No. : TR042A4
Customer : ALS Laboratory Group (Thailand) Co.,Ltd.
184 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,
Khet Suan Luang, Bangkok 10259
Customer Location : Oven Room
Date of Receipt : 23 November 2022
Calibrated By : Sujjar Nakkakred (Site Calibration Manager)
Approved By : / Boonchal Suriyawong (Site Calibration Manager)
Date of Issue : 09 DEC 2022

The expanded uncertainty of temperature measurement was $\pm 1.85^{\circ}\text{C}$
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: [Signature]

FM-L13 18070-05-57



Certificate No.: C24230001 Page: 2 of 2

Calibration Results:

Before Adjustment

Standard Conductivity Solution	Unit Under Calibration Reading	Correction	Coverage Factor (k)	Uncertainty (±)
84.000 µS/cm	102.4 µS/cm	-18.400 µS/cm	2.00	0.69 µS/cm
1413.0 µS/cm	1089 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	0.096 mS/cm

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

Standard	Unit Under Calibration	Correction	Coverage Factor	Uncertainty (±)
Conductivity Solution	Reading		(k)	
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	12.89 mS/cm	-0.0090 mS/cm	2.00	0.096 mS/cm

The End of Certificate

YSL Instrument Calibration
1000 Technology Center
200 Sukhumvit Road, Bangkok, Thailand 10110
Phone: +66 285 7800 Email: ysl@ysl.com
Delivering Growth - In Asia and Beyond.

CAL-FM-C24-08: 12 Sep 2022



ใบตรวจสอบสภาพเครื่องวัดค่าการนำไฟฟ้า

CONDUCTIVITY METER No. ORION STAR A215

วันที่ตรวจ: 03 Jan 2023

สถานที่: KSPR2216358

ผู้ตรวจ: KX00031

การตรวจ (No.)	ผลการตรวจ (Yes/No)	การตรวจ (No.)	ผลการตรวจ (Yes/No)
1. การสอบเทียบ	Yes	11. การสอบเทียบ	Yes
2. การสอบเทียบ	Yes	12. การสอบเทียบ	Yes
3. การสอบเทียบ	Yes	13. การสอบเทียบ	Yes
4. การสอบเทียบ	Yes	14. การสอบเทียบ	Yes
5. การสอบเทียบ	Yes	15. การสอบเทียบ	Yes
6. การสอบเทียบ	Yes	16. การสอบเทียบ	Yes
7. การสอบเทียบ	Yes	17. การสอบเทียบ	Yes
8. การสอบเทียบ	Yes	18. การสอบเทียบ	Yes
9. การสอบเทียบ	Yes	19. การสอบเทียบ	Yes
10. การสอบเทียบ	Yes	20. การสอบเทียบ	Yes

YSL Instrument Calibration
1000 Technology Center
200 Sukhumvit Road, Bangkok, Thailand 10110
Phone: +66 285 7800 Email: ysl@ysl.com
Delivering Growth - In Asia and Beyond.

Mr. Netipat Rungwong
Service Engineer

CAL-FM-C24-03: 20 Jul 2022



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES
3344 PATTANAKARN ROAD SOI 11, SUANLILANG, SUANLILANG BANGKOK 10250
TEL: 0-2117-3000 FAX: 0-2117-4848

Cert. No.: 22TW122
Page: 1 of 2

Certificate of Testing

Equipment: DO Meter

Manufacturer: YSI

Model: 5000-230V

Serial No.: 09101147

ID No.: BKK_EN0017

Received Date: 20 May 2022

Test Date: 24 May 2022

Reference: 2205-063805C-8

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

Laboratory Condition: Temperature (25 ± 5) °C
Humidity (50 ± 20) %
In-house method: GP-C49

Test Procedure: by Comparison Technique with Azide Modification Method

Tested by: Watsorn Lemgatrakul

Approved by:

Issue Date: 31 May 2022

0285244



Cert. No.: 22TW122
Page: 2 of 2

Condition of this result of calibration

- 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	21CG1389	25 Mar 2023	
2) Balance	1126143764	140RC004	21 May 2022	

Material	Manufacturer	Lot No.	Assay
Sodium Thiosulfate pentahydrate	Merck	AM1763316	100.2%

Result: Dissolved Oxygen Meter Adjustment With Air 100 %

Titration Method (Azide Modification Method)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.12	8.13	0.015

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.

000-

u 1110482

A 0039957



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES
3344 PATTANAKARN ROAD SOI 11, SUANLILANG, SUANLILANG BANGKOK 10250
TEL: 0-2117-3000 FAX: 0-2117-4848



Cert. No.: 22LM3
Page: 1 of 2

Certificate of Calibration

Equipment: DO Meter with Sensor

Manufacturer: YSI

Model: 5000-230V

Serial No.: 091 101147

ID No.: BKK_EN0017

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

Location: TPA On Site Calibration Laboratory

Received Order: 20 May 2022

Calibrated Date: 30 May 2022

Ambient Temperature: (20 ± 1) °C

Relative Humidity: (50 ± 30) %

AC Line Voltage: (220 ± 22) V

Calibrated by: Tawatchai Pansa

Approved by:

Issue Date: 31 May 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

u 1090806



Metrological Center
SCI ECO Services Company Limited
332 Moo 3, T. Bangpa, A. Kaengkhro, Saraburi 18110, Thailand
Saraburi Tel: +66 3627 2096 Fax: +66 3627 3100
Bangkok Tel: +662 8205 6951 +662 8247 2360
Website: www.sci-eco.co.th E-Mail: calibrate@scg.co.th



Certificate No. T221081

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 Phatthanakan 40, Phatthanakan Rd., Khuang Phatthanakan,
Khet Suan Luang, Bangkok 10250

Customer Location: Wet Chemistry Lab 2

Date of Receipt: 12 May 2022

Calibrated By: Watcharapong Sangseng (Technician)

Approved By:

Date of Issue: 20 May 2022

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

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

FM-L15 11701-02-64



Metrological Center
SCI ECO Services Company Limited
332 Moo 3, T. Bangpa, A. Kaengkhro, Saraburi 18110, Thailand.



Certificate No. T221081

Calibration Report

Page 2 of 4

Equipment: Chamber (Incubator)

Date of Calibration: 17 May 2022 (Finished Time 3:30 PM)

Environment: Temperature 24.8-24.9 °C
Line Voltage 221.7-224.9 V

Condition of this result of test:

- The instrument was calibrated by insert 12 standard resistance thermometer into its chamber and test according to NIST 720 (based on ASTM E145-94 (Reapproved 2001) and ASTM E198.)
- 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.
- Reference Standard Instrument:

Instrument	Model	Certificate No.	Due Date
RTD	100 ohm	29-CH1-10	T220274 28 February 2023
RTD	100 ohm	30-CH1-10	T220274 28 February 2023
DATA LOGGER	34970A	T47	T220274 28 February 2023
- This certificate is traceable to: National Institute of Metrology (Thailand) through Metrological Center (NSC-TIS-TIS 17025 CALIBRATION 6244.)
- Condition of calibrated item: good
- UUC Description:

Time Constant	2 Hour	9 Minute	At 20 °C	
Fresh Air Damper	Open	Min	Medium	Max
	Close			
	Not Available			
- Result of test:

() without adjustment	(X) after adjustment
------------------------	------------------------

Approved By:

FM-L15 11715-01-63



Metrological Center
SCI ECO Services Company Limited
332 Moo 3, T. Bangpa, A. Kaengkhro, Saraburi 18110, Thailand.



Certificate No. T221081

Calibration Report

Page 3 of 4

Diagram showing the calibration points (1A, 2A, 3A, 4A, 5A, 6A, 7A, 8A, 9A, 10A, 11A, 12A) and the corresponding UUC values.

1C = 29-CH1	11F = 29-CH1
2A = 29-CH2	12F = 29-CH2
3A = 29-CH3	
4F = 29-CH4	
5A = 29-CH5	
6A = 29-CH6	
7F = 29-CH7	
8F = 29-CH8	
9A = 29-CH9	
10A = 29-CH10	

Approved By:

FM-L15 11715-01-63



Certificate No. T221081

Calibration Report

Page 4 of 4

Measurement Results

Calibration Point	Average Standard Reading at each position (°C)									
	29-CH1	29-CH2	29-CH3	29-CH4	29-CH5	29-CH6	29-CH7	29-CH8	29-CH9	29-CH10
20.0	19.77	20.10	19.53	20.48	20.24	20.46	19.97	19.49	20.14	19.62
	30-CH1	30-CH2								
	19.73	19.56								

Chamber (Incubator)		Temperature Distribution					Coverage
Setting (°C)	Reading (°C)	Average (°C)	Stability (°C)	Uniformity (°C)	Uncertainty (°C)	Factor k	
	Min, Max						
20.0	20.20, 20.1	19.98	0.05	0.36	0.38	2.00	

* The quoted uncertainty exclude "randomness"

The calibration result apply only the above calibrated item.

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

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

Approved By:

FM-L15 0715-05-43



Certificate No. T239683

Page 1 of 4

Certificate of Calibration

Equipment : Chamber (Incubator)

Manufacturer : MEMMERT

Model : ICP 750

Serial No. : F818.0075

Customer Code : BKK_EN0305

ID No. : T9571A4

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

104 Phatthanakan 49, Phatthanakan Rd., Khwaeng Phatthanakan,
Khet Suan Luang, Bangkok 10250

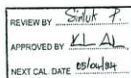
Customer Location : Wet Chemistry Lab 2

Date of Receipt : 30 March 2023

Calibrated By : Sujjar Naknakred (Site Calibration Manager)

Approved By : / Boonchai Suriyayong (Assistant Calibration Manager)

Date of Issue : 10 APR 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 traceability to recognized national standards and to the units of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Metrological Center.

FM-L15 0715-06-44



Certificate No. T239683

Calibration Report

Page 2 of 4

Equipment : Chamber (Incubator)
Date of Calibration : 5 April 2023 (Finished Time 4:30 PM)
Environment : Temperature 22.9-28.6 °C
Line Voltage 221.7-225.5 V

Condition of this results of test :

1. This instrument was calibrated by insert 12 standard resistance thermometer into its chamber and test according to W9720 (based on ASTM E145-94 (Reapproved 2001) and ASSESS-1986.)
All data shown below were final values and the actual 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	100 ohm	374CH110	T22493	28 November 2023
RTD	100 ohm	36-CH110	T22493	28 November 2023
DATA LOGGER	34970A	T193	T22493	28 November 2023

3. This certificate is traceable to :

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

4. Condition of calibrated item : good

UUC Description :

Time Constant : 2 Hour 24 Minute At 20 °C
Fresh Air Damper : ☒ Open ☐ Min ☐ Medium ☐ Max
☒ Close
☐ Not Available

5. Result of test : () without adjustment (X) after adjustment

Approved By:

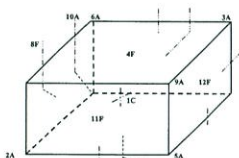
FM-L15 0715-05-43



Certificate No. T239683

Calibration Report

Page 3 of 4



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

1C = 37CH1	11F = 36CH1
2A = 37CH2	12F = 36CH2
3A = 37CH3	
4F = 37CH4	
5A = 37CH5	
6A = 37CH6	
7F = 37CH7	
8F = 37CH8	
9A = 37CH9	
10A = 37CH10	

Approved By:

FM-L15 0715-05-43



Certificate No. T239683

Calibration Report

Page 4 of 4

Measurement Results

Calibration Point	Average Standard Reading at each position (°C)									
	37CH1	37CH2	37CH3	37CH4	37CH5	37CH6	37CH7	37CH8	37CH9	37CH10
20.0	20.32	20.28	20.17	20.22	20.22	20.04	20.17	19.74	20.31	19.93
	36CH1	36CH2								
	20.14	20.20								

Calibration Point	37CH1	37CH2	37CH3	37CH4	37CH5	37CH6	37CH7	37CH8	37CH9	37CH10
25	25.38	25.15	25.13	25.13	25.20	25.02	25.11	24.79	25.20	25.26
	36CH1	36CH2								
	25.13	24.94								

Chamber (Incubator)		Temperature Distribution					Coverage
Setting (°C)	Reading (°C)	Average (°C)	Stability (°C)	Uniformity (°C)	Uncertainty (°C)	Factor k	
	Min, Max						
20.0	19.9, 20.1	20.02	0.09	0.54	0.58	2.00	
25.0	24.9, 25.1	25.0	0.03	0.51	0.58	2.00	

* The quoted uncertainty exclude "randomness"

The calibration result apply only the above calibrated item.

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

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

Approved By:

FM-L15 0715-05-43



Certificate No. T220630

Page 1 of 5

Certificate of Calibration

Equipment : HOT BLOCK

Manufacturer : Environmental Express

Model : B3000-240

Serial No. : 2017COW116

Customer Code : BKK_EN0222

ID No. : T6769A4

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

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

Customer Location : Wet Chemistry Lab2

Date of Receipt : 21 March 2022

Calibrated By : Watcharapong Sangtong (Technician)

Approved By : / Sujjar Naknakred (Site Calibration Manager)

Date of Issue : 8 APR 2022

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

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

FM-L15 0815-06-57



Certificate No. T220630

Calibration Report

Page 2 of 5

Equipment : HOT BLOCK
Date of Calibration : 21 March 2022
Environment : Temperature : 21.8-23.1 °C
Line Voltage : 221.6-226.3 V
Relative Humidity : 85-65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert nine standard thermocouples type T into its chamber. For the other one standard thermocouples type T use for ambient temperature measurement. The calibration was done in accordance to W9720.

All data shown below were final values and the actual 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	TN51-TN60	T22075	28 February 2023
TC	TYPE T	TN61-TN70	T22075	28 February 2023
DATA LOGGER	34970A	T193	T22075	28 February 2023

3. This certificate is traceable to :

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

4. Condition of calibrated item : good

UUC Description :

Time Constant : 1 Hour 1 Minute At 150 °C

Fresh Air Damper : ☒ Open ☐ Min ☐ Medium ☐ Max

☒ Close

☐ Not Available

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

Approved By:

FM-L15 0815-05-57



Certificate No. T220630

Page 3 of 5

Calibration Report

RT	1A	2A	3A	4A	5A	6A	7A	8A	9A	10A
81	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
82	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
83	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
84	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
85	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
86	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
87	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
88	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
89	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
90	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
91	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
92	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
93	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
94	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
95	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
96	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
97	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
98	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
99	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
100	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0

STANDARD THERMOCOUPLES TYPE T

No.1	=	TN51	No.13	=	TN63	No.25	=	TN75	No.37	=	TN87	No.49	=	TN99
No.2	=	TN62	No.14	=	TN64	No.26	=	TN76	No.38	=	TN88	No.50	=	TN100
No.3	=	TN63	No.15	=	TN65	No.27	=	TN77	No.39	=	TN89	No.51	=	TN101
No.4	=	TN64	No.16	=	TN66	No.28	=	TN78	No.40	=	TN90	No.52	=	TN102
No.5	=	TN65	No.17	=	TN67	No.29	=	TN79	No.41	=	TN91	No.53	=	TN103
No.6	=	TN66	No.18	=	TN68	No.30	=	TN80	No.42	=	TN92	No.54	=	TN104
No.7	=	TN67	No.19	=	TN69	No.31	=	TN81	No.43	=	TN93	No.55	=	TN105
No.8	=	TN68	No.20	=	TN70	No.32	=	TN82	No.44	=	TN94	No.56	=	TN106
No.9	=	TN69	No.21	=	TN71	No.33	=	TN83	No.45	=	TN95			
No.10	=	TN70	No.22	=	TN72	No.34	=	TN84	No.46	=	TN96			
No.11	=	TN71	No.23	=	TN73	No.35	=	TN85	No.47	=	TN97			
No.12	=	TN72	No.24	=	TN74	No.36	=	TN86	No.48	=	TN98			

Certificate No. T230352

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Calibration Report

Measurement Results:

HOT BLOCK			Temperature Distribution	
Setting (°C)	Reading (°C)		Stability (°C)	Uncertainty (°C)
	Min, Max	Average		
150.0	149.9 150.1	150.0	1.66	1.44

* The quoted uncertainty includes "a" uncertainty

The calibration result 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=2, which for a normal distribution, provides a level of confidence of approximately 95 %.

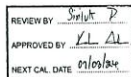
Approved By:

Certificate No. T230352

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Certificate of Calibration

Equipment : HOT BLOCK
Manufacturer : Environmental Express
Model : B3000-240
Serial No. : 2017COW116
Customer Code : BKK_EN0222
ID No. : T6769A4
Customer : ALS Laboratory Group (Thailand) Co., Ltd.
104 Phatthanakan 40, Phatthanakan Rd., Khwaeng Phatthanakan,
Khet Suan Luang, Bangkok 10250
Customer Location : Wet Chemistry Lab2
Date of Receipt : 21 February 2023
Calibrated By : Watcharak Puttarat (Technician)
Approved By : / Boonchal Suriyawong (Site Calibration Manager)
Date of Issue : 20 MAR 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 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-L13 08/30-05-37

PM-L13 08/30-05-37

Certificate N° T230352

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Calibration Report

Row	Hole															
R7	R49	R50	R51	R52	R53	R54	R55	R56	R57	R58	R59	R60	R61	R62	R63	R64
R6	R41	R42	R43	R44	R45	R46	R47	R48	R49	R50	R51	R52	R53	R54	R55	R56
R5	R33	R34	R35	R36	R37	R38	R39	R40	R41	R42	R43	R44	R45	R46	R47	R48
R4	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40
R3	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32
R2	R9	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24
R1	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16

H: STANDARD THERMOCOUPLE TYPE T

R1	=	TN121	R9	=	TN128	R17	=	TN137	R25	=	TN146	R33	=	TN155	R41	=	TN164	R49	=	TN173	R57	=	TN182	R65	=	TN191
R2	=	TN132	R10	=	TN139	R18	=	TN148	R26	=	TN157	R34	=	TN166	R42	=	TN175	R50	=	TN184	R58	=	TN193	R66	=	TN202
R3	=	TN143	R11	=	TN150	R19	=	TN159	R27	=	TN168	R35	=	TN177	R43	=	TN186	R51	=	TN195	R59	=	TN204	R67	=	TN213
R4	=	TN154	R12	=	TN161	R20	=	TN170	R28	=	TN179	R36	=	TN188	R44	=	TN197	R52	=	TN206	R60	=	TN215	R68	=	TN224
R5	=	TN165	R13	=	TN172	R21	=	TN181	R29	=	TN190	R37	=	TN199	R45	=	TN208	R53	=	TN217	R61	=	TN226	R69	=	TN235
R6	=	TN176	R14	=	TN183	R22	=	TN192	R30	=	TN201	R38	=	TN210	R46	=	TN219	R54	=	TN228	R62	=	TN237	R70	=	TN246
R7	=	TN187	R15	=	TN194	R23	=	TN203	R31	=	TN212	R39	=	TN221	R47	=	TN230	R55	=	TN239	R63	=	TN248	R71	=	TN257
R8	=	TN198	R16	=	TN205	R24	=	TN214	R32	=	TN223	R40	=	TN232	R48	=	TN241	R56	=	TN250	R64	=	TN259	R72	=	TN268

Approved By:

PM-L13 08/30-05-37

Certificate No. T230352

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Calibration Report

Measurement Results

		Average Standard Reading at each position (°C)											
Calibration Point		TN121	TN122	TN123	TN124	TN125	TN126	TN127	TN128	TN129	TN130	TN131	TN132
Point Setting	Max	152.61	150.49	150.10	148.27	149.83	151.18	149.99	149.29	149.87	150.03	150.03	150.03
150 150.0	Min	152.10	149.87	149.73	147.73	149.26	150.78	149.49	148.36	149.31	149.13	149.13	149.13
	Average	152.47	150.23	149.90	147.99	149.54	150.98	149.74	148.82	149.59	149.58	149.58	149.58
	Max	149.84	148.34	148.34	149.88	152.39	149.73	149.66	149.16	149.16	151.18	151.18	151.18
	Min	149.23	147.83	147.83	149.54	152.39	149.18	148.83	148.88	149.23	150.03	150.03	150.03
	Average	149.67	148.09	148.09	149.53	152.19	149.36	149.21	148.94	149.44	150.69	150.69	150.69
	Max	152.91	150.56	149.30	148.63	149.78	151.28	150.09	148.83	148.13	149.33	149.33	149.33
	Min	152.73	150.08	148.26	147.96	149.42	150.96	149.63	148.26	147.92	149.29	149.29	149.29
	Average	152.80	150.29	148.79	148.30	149.60	151.08	149.87	148.52	147.96	149.36	149.36	149.36
	Max	148.13	148.04	148.36	148.31	149.07	149.66	148.56	149.35	149.87	150.89	150.89	150.89
	Min	148.08	147.63	148.07	147.63	148.31	148.62	148.13	149.08	149.86	150.89	150.89	150.89
	Average	148.42	147.84	148.36	147.81	148.94	149.14	148.77	149.74	149.76	150.78	150.78	150.78
	Max	150.78	152.40	150.69	150.71	150.71	150.71	150.71	150.71	150.71	150.71	150.71	150.71
	Min	150.78	152.40	150.69	150.71	150.71	150.71	150.71	150.71	150.71	150.71	150.71	150.71
	Average	150.69	152.40	150.69	150.71	150.71	150.71	150.71	150.71	150.71	150.71	150.71	150.71
	Max	150.78	152.40	150.69	150.71	150.71	150.71	150.71	150.71	150.71	150.71	150.71	150.71
	Min	150.78	152.40	150.69	150.71	150.71	150.71	150.71	150.71	150.71	150.71	150.71	150.71
	Average	150.69	152.40	150.69	150.71	150.71	150.71	150.71	150.71	150.71	150.71	150.71	150.71

Approved By:

PM-L13 08/30-05-37

Certificate No. T230352

Page 2 of 5

Calibration Report

Equipment : HOT BLOCK
Date of Calibration : 1 March 2023
Environment : Temperature : 22.9-24.4 °C
Line Voltage : 222.7-227.8 V
Relative Humidity : 55 - 65 %RH

Condition of this results of calibration :

1. This equipment was calibrated by insert 20 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 NIST 170.2. All data show below were final values and the initial data from customer request.
2. Reference Standard Instrument :
Instrument Model Instrument No. Certificate No. Due Date
TC TYPE T TN121-TN130 T222122 5 October 2023
TC TYPE T TN131-TN140 T222122 5 October 2023
DATA LOGGER 34970A T150 T222122 5 October 2023
3. This certificate is traceable to :
National Institute of Metrology (Thailand) through Metrological Center (NIST-TIS-TIS 17025 CALIBRATION 62443)
4. Condition of calibrated item : good
Equipment Description :
Time Constant : 2 Hour 22 Minute At 150 °C
Fresh Air Damper : ☐ Open ☐ Min ☐ Medium ☐ Max
☒ Close ☐ Not Available
5. Adjustment :
(X) without adjustment () after adjustment

Approved By:

PM-L13 08/30-05-37

Certificate of Calibration

Certificate No. : 2211064
Page : 1 of 2

Cert. No. : 2211064
Page : 2 of 2

Equipment : Digital Thermometer With Sensor
Manufacturer : Testo
Model : 106
Serial No. : 626376050122
ID No. : BKK_L02054
Condition As Received : New Item
Received Date : 21 August 2022
Calibration Date : 12 September 2022
Reference : 2208-09182BC
Ambient Temperature : 21.1 ± 0.1 °C
Relative Humidity : 50 ± 20 %

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

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

Procedure used: Calibration was conducted using in-house calibration procedure (CP-71) according to comparison with Industrial Platinum Resistance Thermometer (IPRT) and liquid bath temperature control. The temperature scale used was based on ITS-90.

Condition of this result of calibration :

* Reference standards instruments

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Digital Thermometer	106	626376050122	2211064	14 Oct 2023
2) Industrial Platinum Resistance Thermometer	5627	624534	2211064	14 Oct 2023

2) The certificate is valid only to the item calibrated on date and place of calibration

3) The certificate is traceable to the International System of Unit maintained at :

National Institute of Metrology (NIMT)

REVIEW BY:
APPROVED BY:
NEXT CAL. DATE: 14/09/24

Calibrated by: Watcharak Puttarat
Issue Date: 22 September 2022

Approved Signature

1) Phatthan Puttarat
1) Watcharak Puttarat
1) Watcharak Puttarat

0256895

01127706



EQUIPMENT QUALIFICATION REPORT (EQR)

Agilent CrossLab Compliance

Qualification Type : ICPMS-00
System ID : JF12091612
EQR Name : AgilentRecommended
EQR Revision : ICPMS 02.50
EQR Publish Date : March 2020
Date : June 14, 2022 15:32:15 AM
Report Type : Report
Org Name : ALS Laboratory Group (Thailand) Co. Ltd.
Org Location : 104 Phatthanakan 40, Suan Luang, Bangkok 10250 Thailand

REVIEW BY:
APPROVED BY:
NEXT CAL. DATE: 14/09/24

Date: July 14, 2022 15:32:15 AM
System ID: JF12091612

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Date: June 14, 2022 10:32:16 AM
System ID: JPT2001612

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Test Summary

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

Details	Status	Runs
Test		
Autosampler Check - ASX-620	Pass	1
Integrated Sample Introduction System (ISIS) Check - ISIS2	Pass	1
Autotune - G3281A	Pass	1
Background (No Gas Mode) - G3281A	Pass	1
Background (Gas Mode) - G3281A	Pass	1
20-Minute Stability (No Gas Mode) - G3281A	Pass	1
Overall Qualification Status		
Pass		

Date: June 14, 2022 10:32:16 AM
System ID: JPT2001612

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Service Details

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

General Details	
Service Order No./Request	605218484
EQP Name	Agilent/Recommended
EQP Revision	ICPMS 62.50
Report Type	Report
Organization Details	
Name	ALJ Laboratory Group (Thailand) Co., Ltd.
Location	104 Phatthanasarn 40, Suan Luang, Bangkok 10250 Thailand.
Local Contact Details	
Name	Khon Chatchanal
Job Title	Lab Manager
Qualification Location	Spectro Room
Operator Details	
Name	Pattayee Kussanhai
Job Title	Field Service Engineer
Data Acquisition Details	
Acquisition Software Name	MassHunter
Acquisition Software Revision	D.01.01
Customer Data System (CDS)	Agilent/MassHunter

Date: June 14, 2022 10:32:16 AM
System ID: JPT2001612

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Instrument Details

Purpose
This section describes the as found system configuration.

Details	
ICP-MS 1	
Manufacturer	Agilent Technologies
Name	7700x
Model Number	G3281A
Detector Type	SQ
Nebulizer	Mira Mist (G2161)
Spray Chamber	Quartz
Torch	Quartz
Sampling Cone	Ni
Skinner Cone	Ni
Serial Number	JPT2001612
Firmware Revision	D.61.01
ISIS 1	
Manufacturer	Agilent Technologies
Name	ISIS2
Model Number	G4311A
Installed Options	MS2: 2 pumps, 1 valve, auto dilution and discrete sampling
Type	Peristaltic pump system
Autosampler 1	
Manufacturer	Agilent Technologies
Name	ASX-620
Model Number	G3286A
Serial Number	G31493A020
Chiller 1	
Manufacturer	Agilent Technologies
Name	Chiller
Model Number	G3202A
Serial Number	AN12270705

Date: June 14, 2022 10:32:16 AM
System ID: JPT2001612

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Calculation Formulas

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

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

Date: June 14, 2022 10:32:16 AM
System ID: JPT2001612

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Protocol Details

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

Test Revision	Test
ICPMS 62.50	20-Minute Stability (No Gas Mode)
ICPMS 62.50	Autosampler Check
ICPMS 62.50	Autotune
ICPMS 62.50	Background (Gas Mode)
ICPMS 62.50	Background (No Gas Mode)
ICPMS 62.50	Integrated Sample Introduction System (ISIS) Check

Date: June 14, 2022 10:32:16 AM
System ID: JPT2001612

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Autosampler Check

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

Setuppoint			
Results			
Criteria	Observed Result	Expected Result	Status
After the self test, is probe in the home position?	Yes	Yes	Pass
As commanded, is the probe positioned at val 2?	Yes	Yes	Pass
Setuppoint Status:	Pass		Runs: 1
Overall Autosampler Check Test Status			
Pass			

Date: June 14, 2022 10:32:16 AM
System ID: JPT2001612

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Integrated Sample Introduction System (ISIS) Check

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

Setuppoint				
Results		Observed Result	Expected Result	Status
	Criteria			
As commanded, does the pump prime?		Yes	Yes	Pass
As commanded, do the valves load and inject?		Yes	Yes	Pass
Setuppoint Status: Pass				Runs: 1
Overall Integrated Sample Introduction System (ISIS) Check Test Status				
Pass				

Date: June 14, 2022 10:32:16 AM
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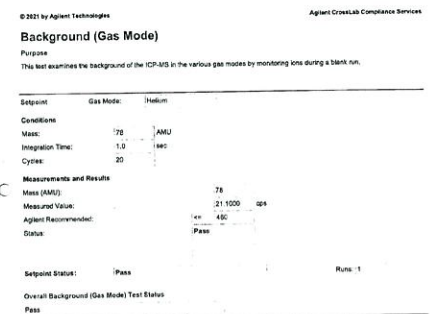
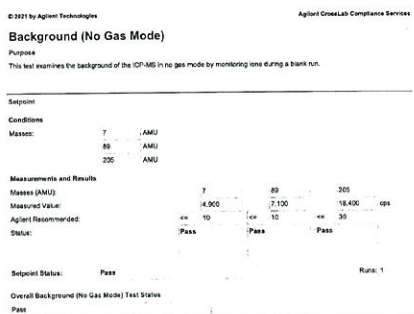
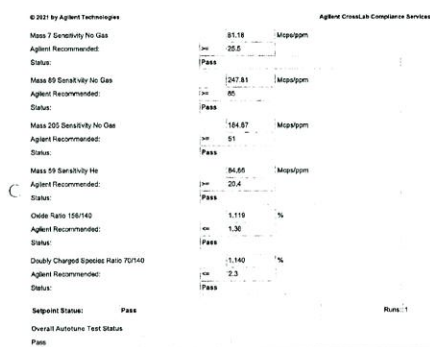
Autotune

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

Results	
Peakwidth Mass 7	0.730 AMU
Agilent Recommended:	0.65
Status:	Pass
Peakwidth Mass 89	0.732 AMU
Agilent Recommended:	0.65
Status:	Pass
Peakwidth Mass 205	0.746 AMU
Agilent Recommended:	0.65
Status:	Pass
Mass Axis 7	7.00 AMU
Agilent Recommended:	6.9
Status:	Pass
Mass Axis 89	89.00 AMU
Agilent Recommended:	88.9
Status:	Pass
Mass Axis 205	205.00 AMU
Agilent Recommended:	204.9
Status:	Pass

Date: June 14, 2022 10:32:16 AM
System ID: JPT2001612

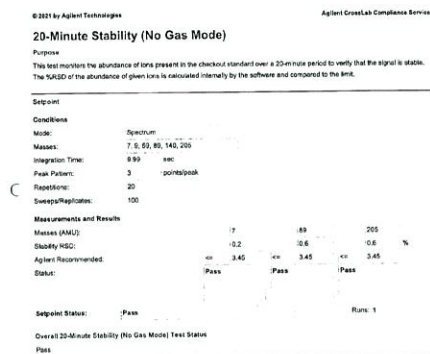
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Date: June 14, 2022 10:32:16 AM
System ID: JP12051612

Date: June 14, 2022 10:32:16 AM
System ID: JP12051612

Date: June 14, 2022 10:32:16 AM
System ID: JP12051612



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Declaration of Change Control

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

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Attachments

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

Location	Category	Document Name	Page
EQR	General	Certificate of System Qualification	17
EQR	General	Operator's training certificate and qualifications	18
EQR	General	Certificate of Qualification for ACE	19
EQR	General	Certificate of Qualification for ACE	20
EQR	General	Training reports	21
EQR	General	Test Report	24
EQR	General	Test Report	25

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Date: June 14, 2022 10:32:16 AM
System ID: JP12051612

Date: June 14, 2022 10:32:16 AM
System ID: JP12051612

Date: June 14, 2022 10:32:16 AM
System ID: JP12051612

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General

Document Name: Certificate of System Qualification

Technique Type	Tests Completed	Result
Alarm Assessment	7	Complies
Calibration Performance	10	Complies
Stability	9	Complies
Detector Spectrometry	3	Complies
Gas Chromatography - GCMS	17	Complies
Gas Chromatography	20	Complies
Gas Permeation Chromatography	9	Complies
ICP-MS	6	Complies
Infrared Spectrometry	7	Complies
Liquid Chromatography	17	Complies
Liquid Chromatography - LCMS	6	Complies
Microfluidics	18	Complies
Sample Preparation - Gas Chromatography	9	Complies
Sample Preparation - Liquid Chromatography	9	Complies
Supercritical Fluid Chromatography	10	Complies
Software	9	Complies
Vibrating Spectrophotometer	13	Complies
Overall Qualification Status		Complies

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General

Document Name: Operator's training certificate and qualifications

Technique Type	Tests Completed	Result
Alarm Assessment	7	Complies
Calibration Performance	10	Complies
Stability	9	Complies
Detector Spectrometry	3	Complies
Gas Chromatography - GCMS	17	Complies
Gas Chromatography	20	Complies
Gas Permeation Chromatography	9	Complies
ICP-MS	6	Complies
Infrared Spectrometry	7	Complies
Liquid Chromatography	17	Complies
Liquid Chromatography - LCMS	6	Complies
Microfluidics	18	Complies
Sample Preparation - Gas Chromatography	9	Complies
Sample Preparation - Liquid Chromatography	9	Complies
Supercritical Fluid Chromatography	10	Complies
Software	9	Complies
Vibrating Spectrophotometer	13	Complies
Overall Qualification Status		Complies

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General

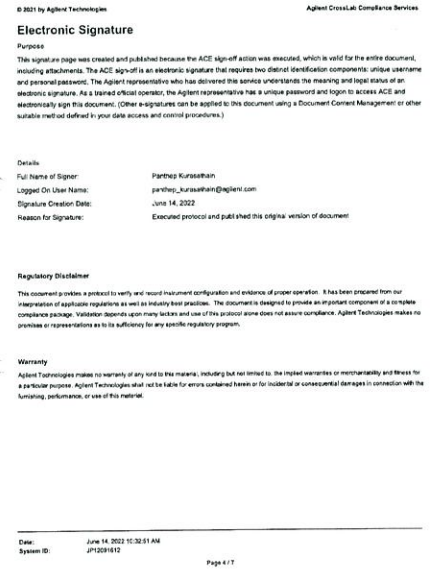
Document Name: Certificate of Qualification for ACE

Technique Type	Tests Completed	Result
Alarm Assessment	7	Complies
Calibration Performance	10	Complies
Stability	9	Complies
Detector Spectrometry	3	Complies
Gas Chromatography - GCMS	17	Complies
Gas Chromatography	20	Complies
Gas Permeation Chromatography	9	Complies
ICP-MS	6	Complies
Infrared Spectrometry	7	Complies
Liquid Chromatography	17	Complies
Liquid Chromatography - LCMS	6	Complies
Microfluidics	18	Complies
Sample Preparation - Gas Chromatography	9	Complies
Sample Preparation - Liquid Chromatography	9	Complies
Supercritical Fluid Chromatography	10	Complies
Software	9	Complies
Vibrating Spectrophotometer	13	Complies
Overall Qualification Status		Complies

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Date: June 14, 2022 10:32:11 AM
System ID: JP12001612

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User Name: posttest_knowledge			System ID: 39118152	
Hostname: A999439137			Print Date: June 16, 2011 10:22:52 AM	
ALZ GSGM T100 14-Jun-2012 Transaction Log				
Time	Transaction Date	Activity Performed	Type of Transaction	Optional Information
June 14, 2012 13:32:25 AM	Auto	Deleting	Session	Report Signed: Report RPT Name: ALZ-02001 Title: 14-Jun2012_20120614_02 Report: 1461 User Name: posttest_knowledge@gsa- gov Print Name of Signer: Posttest User Name: Reason for Signature: Escalated process and published in report version of document

Device parameter		nominal value	actual value
visual check general tightness inside the Mercury	O.k.	✓	changed
visual check Goldtraps	O.k.	✓	changed
visual check spectrometer			
Fluorescence cell	O.k.	✓	changed
Absorption cell, incl. window	O.k.	✓	changed
lens	O.k.	✓	changed
Suivel drive (SEV)	O.k.	✓	changed
check pump hoses	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		32 Nm ³ h ⁻¹ 0.186 Nm ³ min ⁻¹	0.166
Valve 2		50 Nm ³ h ⁻¹ 0.833 Nm ³ min ⁻¹	0.851
Valve 3		2 Nm ³ h ⁻¹ 0.083 Nm ³ min ⁻¹	0.089
Valve 4		32 Nm ³ h ⁻¹ 0.186 Nm ³ min ⁻¹	0.189
Check liquidflow			
Acid		2.6 ml/min ± 1 ml	1.6 ml / min
Red agent		2.5 ml/min ± 1 ml	1.5 ml / min
Sample		10 ml/min ± 2 ml	10 ml / min
Adventitious light - values			
(V)		from file	
160		0	0
200		0	0
300		0	0
350		0	1
400		1	3
450		3	7
500		3	17
550		16	66
575		19	91
600		16	91

Device parameter	nominal value	actual value
Analytical parameters Fluorescence cell		
Conditions: max conc. 10 µg/L, PMT-voltage: 369 V		Int.: 6.0005 Ext.: 0.9959
Blank-solution without enrichment / FBR 30 ng/L	Int > 0.0015 RSD < 3 %	RSD: 1.07 %
Conditions: max conc. 1 µg/L, PMT-voltage: 352 V		Int.: 0.0040 Ext.: 0.0249
Blank-solution with enrichment / FBR 30 ng/L	Int > 0.008 RSD < 3 %	RSD: 0.87 %
Folk.-factor (Int./Ext.)	> 3.5	4.166
Analytical parameters Absorption cell		
Blank-solution		Ext.: 0.0016
without enrichment / FBR 100 ng/L	Ext. > 0.0012 RSD < 5 %	Ext.: 0.0042 RSD: 3.32 %
Comments		
-		

M. Siskani *PS*
Signature Technician

Bangalore, 5/06/2012

Place, Date (DDMMYYYY)

signature *signature*
Signature Customer

signature

Place, Date (DDMMYYYY)

REVIEW BY: 015-011 T
APPROVED BY: Smith
NEXT CAL. DATE: 24/05/2009

Maintenance Protocol

Atomic Fluorescence Spectrometer
mercur DUO /
mercur DUO plus

Serial-No.	K170A0143	Customer-No.	
Date	24 May 2023	Carried out By	Sinchei Fax-on
Maintenance with following Operational Qualification (OQ) (requires a separate OQ protocol)			
Company	บริษัท แอมเมค แอสเซมบลี จำกัด (มหาชน) จำกัด		
User			
Department	ห้องควบคุมการผลิต		
Street	104 หมู่ 40 ถนนพัฒนาการ แขวงสวนหลวง เขตสวนหลวง กรุงเทพมหานคร		
Zip Code, City	กรุงเทพมหานคร 10250		
Country	ประเทศไทย		
Phone			
Fax			
E-mail			

- **Maintenance works basic unit**
- tightness visual check inside the Mercor
- visual check if gold-braids 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-flow if necessary change it
- check swivel drive (SEV)
- check drying flow, output gas liquid separator
- test Bubble-Sensor
- check gas flows
- check volume flows, reagents
- recording dry light values
- re-adjustment with 30 ng/l

Maintenance works Autosampler	Serial no.: 701 739
--------------------------------------	----------------------------

- locate the dosing window (Teflon-glass-rod-spray)
- close the dosing cylinder if necessary exchange it
- locate the winding system of the height drive with some drops of oil
- check the booted belt
- check the position of the mechanical stopper (height 139mm)
- check the pump rate of mixing pump (=14: AS52, typ 7u+20c: AS52s, typ 70c)
- check the pump rate of washing cup
- check the electrical hose connections for good contact
- check the connections of the magnetic valves
- check the dosing hose for buckling, if necessary exchange it

Device parameter	nominat value	actual value
visual check general tightness inside the Mercury	o.k.	changed
visual check Goldpans	o.k.	changed
visual check spectrometer		
Fluorescence cell	o.k.	changed
Absorption cell, incl. window	o.k.	changed
lens	o.k.	changed
Sealed drive (SEV)	o.k.	changed
check pump hoses	o.k.	changed
check hoses and hose connectors	o.k.	changed
check and clean reactor	o.k.	changed
check drying, hose output Gas-liq.-id-separator	o.k.	changed
check bubble-sensor	o.k.	not o.k.
Check gasflow		
Argon pressure valve 4	1.2 - 1.5 bar 10 N/m ² or 9.182 N/m ²	1.5 bar 0.183 N/m ²
Valve 1	10 N/m ² or 9.182 N/m ²	0.403 N/m ²
Valve 2	5 N/m ² or 9.082 N/m ²	0.140 N/m ²
Valve 3	10 N/m ² or 9.182 N/m ²	0.108 N/m ²
Valve 4	10 N/m ² or 9.182 N/m ²	
Check liquidflow		
Abd	2 l/min 1 ml	2.5 ml/min
Red agent	2.5 ml/min 1 ml/min	2.5 ml/min
Sample	10 ml/min ~ 2 ml	10 ml/min
Adventitious light - values		
(Y)	from file	
100	0	0
200	0	0
300	0	0
360	0	0
400	0	0
450	2	2
500	5	5
560	10	10
575	15	15
600	20	20

Device parameter	nominal value	actual value
Analytical parameters Fluorescence cell		
Conditions: max conc: 10 µg/l PMT-voltage: 360 V		
Blank solution		
without enrichment: FBR 30 ng/L	1st > 0.010 RSD < 3 %	Int.: 0.00094 Int.: 0.00772 RSD 5.49 %
Conditions: max conc: 1 µg/L PMT-voltage: 352 V		
Blank solution		
with enrichment: FBR 30 ng/L	1st > 0.006 RSD < 3 %	Int.: 0.00070 Int.: 0.01280 RSD 7.38 %
Fok. factor (Int./Int.)	> 3.5	6.16
Analytical parameters Absorption cell		
Blank solution		
without enrichment: FBR 100 ng/L	Ext. > 0.012 RSD < 5 %	Ext.: 0.0093 Ext.: 0.02049 RSD 7.58 %
Comments		

[illegible]

Method		C:\MSAS\TMP2003\May10*_C32	
Report file	4.7.10.0	Printed on	5/24/2023 12:46
Program version		Recording started on	5/24/2023 12:35 GMT-7:00
Operator	PSU GTA		
Laboratory	ALS BIOC		
Code	IL_Hg055_2023		
Remarks			
Food water			
Method parameters			
Method	Without enrichment 1 FBR 30vol%_FM24052023		
Created on	5/24/2023	Time	12:27
Program	---		
Parameters Mercury Technique: Hg fluorescence			
Line			
Lamp type	Hg LP		
Intergr. mode	Peak height	Intergr. time	30 s
PMT	360 V		
AZ time	0 s	Peak smoothing	dfr
Delay	0 s		
w/o enrich			
Working mode		System cleaning	Acid
FR technique	on	Wash time acid	10 s
Pump speed	3	Soak up time	20 s
Sample load time	10 s	Gas load time	5 NL/h
Reaction time	10 s		
Waiting time AZ	5 s		
Delay	0 s		
Purge time1	28 s		
Purge time2	15 s	Gas wash time2	10 NL/h
Autosampler			
Autosampler	AS51Cif	Tray type	97/136
Working mode	continuous		
Disluter	---		

QC parameters

QC type	QC check	QC check samp. 2	---
Conc.	---	Conc.	---
Error limit	off	Error limit	---
Rep. measurement	off	Reaction	flag + continue
QC std 1 no	1(30 000 ng/L)	QC std 2 no	1(30 000 ng/L)
QC std 1 limit	± 50.00%	QC std 2 limit	± 50.00%
QC std act	flag + continue	Reaction	flag + continue
Expected blank abs	0.0100± 0.0100	Reaction	flag + continue
QC precision	off	Reaction	off
		QC Recal factor	Off

Calibration settings

Calib. meth.	Standard calib.	Calib. unit	ng/L
No standards	1	Conversion fac.	1000000
Type of standards	---	Standard prep.	Premixed
		Blank correct.	---
Output unit	µg/L	Recalib. std. no.	---
Calib. stat.	Mean	Conversion fac.	1000
		Mean cycles	3
		Blank cycles	1
Stock sol. 1	---	Stock sol. 2	---
Stock sol. 3	---	Stock sol. 4	---
Type of cal. curve	linear	Intercept	calculated
Weighted cal.	off	Grubbs stat.	off
Check of cal. curve	no outlier test		

Sample statistics

Stat. mode	Mean	Mean cycles	2
Confd. level	95.4 %	Blank cycles	1
Grubbs stat.	---		

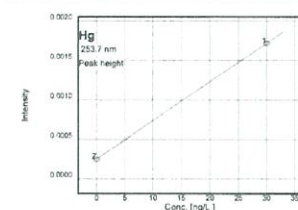
Calibration standards

No	Name	State	Pos	Conc./ng/L	Ints	SD	RSD/%
1	Cal-Zero	(-)	79	0.000	H 0.000248 A 0.002754	0.009132 0.301692	63.13 39.72
2	Cal-Std1	(-)	80	30.000	H 0.001720 A 0.02172	0.009007 0.000023	0.498 0.107

Mercur

Calibration function

Ints=1+142*Conc			
k1=0.000249	k2=0.000949	Recal. factor	---
Slope	0.00025 Ints(ng/L)	R2-adjusted	1.0000
Std	1.00000 ng/L	Upper limit	33.0 ng/L
Lower limit	0 ng/L	Deter. limit	---
Detection limit	---		

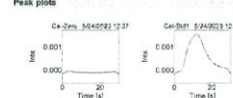


Measurements and events (sorted by time)

Hg	Without enrichment / FBR 30ng/L PM 24052023	5/24/2023	12:35
ID	Conc.	Ints	Time
Cal-Zero	0.000143	0.000397	12:37
	0.000207	0.000507	12:38
	0.000249	0.0007324	12:40
Cal-Std1	0.001720	0.001720	12:42
	0.001712	0.001712	12:43
	0.001728	0.001728	12:44
	30.00ng/L	0.00007887	0.459
Calibration	Calibration function: 01		12:44

Mercur

Peak plots



Hg

Mercur

Report file	C:\WinAA-SITMP\2023\May\Pho_C33
Program version	4.7.10.0
Operator	PSU-GTA
Laboratory	ALS-BNk
Code	IL-Hg095_2023
Remarks	
Food water	

Method parameters

Method	Enrichment / FER 30ng/L PM 24052023
Created on	5/24/2023
Time	13:35
Program	---
Parameters Mercur Technique: Hg fluorescence	
Line	253.7 nm
Lamp type	Hg LP
Integr. mode	Peak height
PMT	352 V
AZ time	5 s
Delay	0 s
Working mode	Enr. w/o reload
FBR technique	off
Pump speed	3
Sample load time	10 s
Reaction time	10 s
Waiting time AZ	10 s
Purge time1	30 s
Purge time2	15 s
Purge time3	20 s
Heat time coil 1	20 s
System cleaning	Off
Wash time acid	10 s
Soaking time	20 s
Gas load time	10 NL/h
Gas AZ wait	10 NL/h
Gas wash time2	5 NL/h
Cool time coil 1	30 s

Mercur

QC parameters

QC type	QC check	QC check samp. 2	---
Conc.	---	Conc.	---
Error limit	off	Error limit	---
Rep. measurement	off	Reaction	flag + continue
QC std 1 no	1(30 000 ng/L)	QC std 2 no	1(30 000 ng/L)
QC std 1 limit	± 50.00%	QC std 2 limit	± 50.00%
QC std act	flag + continue	Reaction	flag + continue
Expected blank abs	0.0100± 0.0100	Reaction	flag + continue
QC precision	off	Reaction	off
		QC Recal factor	Off

Calibration settings

Calib. meth.	Standard calib.	Calib. unit	ng/L
No standards	1	Conversion fac.	1000000
Type of standards	---	Standard prep.	Premixed
		Blank correct.	---
Output unit	µg/L	Recalib. std. no.	---
Calib. stat.	Mean	Conversion fac.	1000
		Mean cycles	3
		Blank cycles	1
Stock sol. 1	---	Stock sol. 2	---
Stock sol. 3	---	Stock sol. 4	---
Type of cal. curve	linear	Intercept	calculated
Weighted cal.	off	Grubbs stat.	off
Check of cal. curve	no outlier test		

Sample statistics

Stat. mode	off	Mean cycles	1
Confd. level	95.4 %	Blank cycles	1
Grubbs stat.	---		

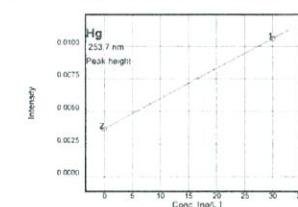
Calibration standards

No	Name	State	Pos	Conc./ng/L	Ints	SD	RSD/%
1	Cal-Zero	(-)	88	0.000	H 0.003760 A 0.02351	0.006081 0.309153	2.182 0.857
2	Cal-Std1	(-)	89	30.000	H 0.01080 A 0.06659	0.002262 0.002766	2.258 4.136

Mercur

Calibration function

Ints=1+142*Conc			
k1=0.003700	k2=0.000230	Recal. factor	---
Slope	0.00023 Ints(ng/L)	R2-adjusted	1.0000
Std	1.00000 ng/L	Upper limit	33.0 ng/L
Lower limit	0 ng/L	Deter. limit	---
Detection limit	---		

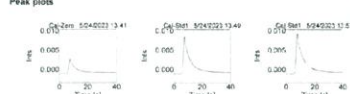


Measurements and events (sorted by time)

Hg	Enrichment / FER 30ng/L PM 24052023	5/24/2023	13:37
ID	Conc.	Ints	Time
Cal-Zero	0.003760	0.003760	13:41
	0.003680	0.003680	13:43
	0.003600	0.003600	13:44
Cal-Std1	0.003700	0.00009 090	2.162
	0.006553	0.006553	13:46
	0.008631	0.008631	13:52
Cal-Std1	0.01081	0.0059530	6.528
	0.01074	0.01074	13:57
	0.01078	0.01078	14:00
30.00ng/L	0.01080	0.002530	2.388
Calibration	Calibration function: 01		14:00

Mercur

Peak plots



Hg

Mercur

Report file	C:\WinAA-SITMP\2023\May\Pho_C34
Program version	4.7.10.0
Operator	PSU-GTA
Laboratory	ALS-BNk
Code	IL-Hg095_2023
Remarks	
Food water	

Method parameters

Method	Without enrichment / Abs / FER 100ng/L PM 24052023
Created on	5/24/2023
Time	14:18
Program	---
Parameters Mercur Technique: Hg absorption	
Line	253.7 nm
Lamp type	Hg LP
Integr. mode	Peak height
PMT	225 V
AZ time	5 s
Delay	8 s
Working mode	w/o enrich.
FBR technique	on
Pump speed	4
Sample load time	8 s
Reaction time	12 s
Waiting time AZ	15 s
Purge time1	10 s
Purge time2	10 s
System cleaning	Acid
Wash time acid	15 s
Soaking time	20 s
Gas load time	5 NL/h
Gas wash time2	10 NL/h

Mercur

QC parameters

QC type	QC check	QC check samp. 2	---
Conc.	---	Conc.	---
Error limit	off	Error limit	---
Rep. measurement	off	Reaction	flag + continue
QC std 1 no	1(100 00 ng/L)	QC std 2 no	1(100 00 ng/L)
QC std 1 limit	± 50.00%	QC std 2 limit	± 50.00%
QC std act	flag + continue	Reaction	flag + continue
Expected blank abs	0.0100± 0.0100	Reaction	flag + continue
QC precision	off	Reaction	off
		QC Recal factor	Off

Calibration settings

Calib. meth.	Standard calib.	Calib. unit	ng/L
No standards	1	Conversion fac.	1000000
Type of standards	---	Standard prep.	Premixed
		Blank correct.	---
Output unit	µg/L	Recalib. std. no.	---
Calib. stat.	Mean	Conversion fac.	1000
		Mean cycles	3
		Blank cycles	1
Stock sol. 1	---	Stock sol. 2	---
Stock sol. 3	---	Stock sol. 4	---
Type of cal. curve	linear	Intercept	calculated
Weighted cal.	off	Grubbs stat.	off
Check of cal. curve	no outlier test		

Sample statistics

Stat. mode	Mean	Mean cycles	2
Confd. level	95.4 %	Blank cycles	1
Grubbs stat.	---		

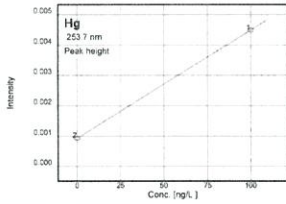
Calibration standards

No	Name	State	Pos	Conc./ng/L	Abs	SD	RSD/%
1	Cal-Zero	(-)	88	0.00	H 0.000632 A 0.030624	0.000138 0.000359	14.88 17.28
2	Cal-Std1	(-)	89	100.00	H 0.004494 A 0.001286	0.000116 0.001275	2.588 2.682

Mercur

Calibration function 1 5/24/2023 14:33 Calibration (Peak height)

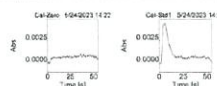
Abs=k1+k2*conc					
k1=0.000932	k2=0.000036	Recal factor	---		
Slope	0.00094 Abs(ng/L)	R2-adjusted	1.0000		
sd	1.00000 ng/L	Character. conc	122.411 (ng/L) (1/16)		
Lower limit	0 ng/L	Upper limit	110 ng/L		
Detection limit	---	Deter. limit	---		



Measurements and events (sorted by time)

IO	Conc.	Abs	SD	RSD%	Int. type	Time
Cal-Zero	0.001059	0.000932	0.000036	14.22	PUH	14.22
	0.000775	0.000681	0.000023	14.23		
	0.000681	0.000592	0.000023	14.25		
Cal-Sta1	0.000932	0.000847	0.000023	14.28	PUH	14.28
	0.004528	0.004128	0.000023	14.29		
	0.004364	0.003964	0.000023	14.31		
	0.004588	0.004188	0.000023	14.33		
100 ng/L	0.004494	0.004094	0.000023	14.33		
Calibration	Calibration function 01			14.33		

Peak plots



Hg



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BANGKOK 10250 THAILAND
TEL: 0-2-717-980-27 FAX: 0-2-717-980-28



Certificate of Calibration

Cert. No.: 22T14576
Page: 1 of 3

Equipment:	Autoclave
Manufacturer:	TOMY
Model:	SK-700
Serial No.:	48134190
ID No.:	BKK_ML0041
Submitted by:	ALS Laboratory Group (Thailand) Co. Ltd. 104 Phathanakan Rd. Phathanakan Rd. Bangkok 10250 Thailand Media Preparation Room
Location:	
Received Order:	20 May 2022
Calibration Date:	20 May 2022
Ambient Temperature:	(26 ± 10) °C
Relative Humidity:	(50 ± 30) %
Calibrated by:	Preecha Hainb
Approved by:	 Approved Signature
	() Pornthipha Tameyakul () Malee Butnane () Suwit Injai
Issue Date:	24 May 2022

The Uncertainties are for a confidence probability of approximately 95 %

Approved by the Board of Corporate Services & Equipment Calibration and Testing Services

A 0041435



Equipment:	Autoclave			
Condition As-Received:	Used Item			
Reference:	2205-0400C-2			
Procedure Used:				
Calibration was conducted using in-house calibration procedure CP-0703 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	34972A	MY57013823	22L124	20 Feb 2022
2 This certificate is valid only to the item calibrated on date and place of calibration				
3 This certification is traceable to the International System of Unit				
4 This result of calibration covers laboratory autoclaves for the sterilization of goods and materials which could be infected with organisms categorized as Hazard Group 1, 2 and 3 (*)				
(*) = Categorization of pathogens according to hazard and category of containment, second edition, 1990				
It does not cover autoclaves for use with material infested with organisms in Hazard Group 4, for which complete containment and sterilization of collected condensate is considered to be essential				
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 fabrics subjected to sterilization which are required to be dry at the end of cycle				
Result of Calibration: () Without Adjustment				
Temperature Source				



	Environmental		
	(°C)	(°F)	(°C)
Beginning of Calibration	24	56	220
Finished of Calibration	26	57	221
Position	Description	Ref. Std.	ID No.
1 =	Center of chamber	19-17TC-11	
2 =	Temperature sensor	19-17TC-12	
3 =	Exhaust port	19-17TC-13	

H 1109670



Equipment:	Autoclave						
Condition As-Received:	Used Item						
Reference:	2205-0400C-2						
Result of Calibration:	() Without Adjustment						
Operating parameter Set:	Temperature = 108 °C						
Sterilization period =	10 minute						
UUC [*] Setting (°C)	UUC [*] Reading (°C)	Position	Average [*] Standard Reading (°C)	Stability (± °C)	Pressure Reading (MPa)	Uncertainty (± °C)	Coverage Factor
108	108	1	107.536	0.10	0.04	0.91	2
		2	107.542				
		3	107.471				
Operating parameter Set:	Temperature = 115 °C						
Sterilization period =	20 minute						
UUC [*] Setting (°C)	UUC [*] Reading (°C)	Position	Average [*] Standard Reading (°C)	Stability (± °C)	Pressure Reading (MPa)	Uncertainty (± °C)	Coverage Factor
115	115	1	114.502	0.15	0.08	0.89	2
		2	114.502				
		3	114.539				
Operating parameter Set:	Temperature = 118 °C						
Sterilization period =	30 minute						
UUC [*] Setting (°C)	UUC [*] Reading (°C)	Position	Average [*] Standard Reading (°C)	Stability (± °C)	Pressure Reading (MPa)	Uncertainty (± °C)	Coverage Factor
118	118	1	117.617	0.084	0.08	0.88	2
		2	117.616				
		3	117.530				
Result of Calibration:	() Without Adjustment						
Operating parameter Set:	Temperature = 121 °C						
Sterilization period =	30 minute						
UUC [*] Setting (°C)	UUC [*] Reading (°C)	Position	Average [*] Standard Reading (°C)	Stability (± °C)	Pressure Reading (MPa)	Uncertainty (± °C)	Coverage Factor
121	121	1	120.430	0.18	1.1	0.90	2
		2	120.511				
		3	120.485				

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.
This 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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H 1109669



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BANGKOK 10250 THAILAND
TEL: 0-2-717-980-27 FAX: 0-2-717-980-28



Certificate of Calibration

Cert. No.: 22T14102
Page: 1 of 3

Equipment:	Incubator
Manufacturer:	SHEL-LAB
Model:	1915A
Serial No.:	020059
ID No.:	BKK_M0010
Submitted by:	ALS Laboratory Group (Thailand) Co. Ltd. 104 Phathanakan Rd. Phathanakan Rd. Bangkok 10250 Thailand Isolation & Micrological Reading
Location:	
Received Order:	21 January 2022
Calibration Date:	21 January 2022
Ambient Temperature:	(26 ± 10) °C
Relative Humidity:	(50 ± 30) %
Calibrated by:	Krisda Mose
Approved by:	 Approved Signature
	() Pornthipha Tameyakul () Malee Butnane () Suwit Injai
Issue Date:	3 February 2022

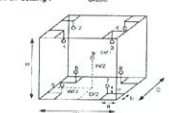
The Uncertainties are for a confidence probability of approximately 95 %

Approved by the Board of Corporate Services & Equipment Calibration and Testing Services

A 0037377



Equipment:	Incubator			
Condition As-Received:	Used Item			
Reference:	2201-0610C-1			
Procedure Used:				
Calibration was conducted using calibration procedure CP-0702 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD)				
The temperature scale used was based on ITS-90				
Condition of this result of calibration				
1. Reference standard instrument:				
Instrument	Model	Serial No.	Cert. No.	Due Date
1 Data Acquisition	34972A	MY57013711	21LM7	16 Jan 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				
4 This result of calibration covers laboratory incubators for the sterilization of goods and materials which could be infected with organisms categorized as Hazard Group 1, 2 and 3 (*)				
(*) = Categorization of pathogens according to hazard and category of containment, second edition, 1990				
It does not cover incubators for use with material infested with organisms in Hazard Group 4, for which complete containment and sterilization of collected condensate is considered to be essential				
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 fabrics subjected to sterilization which are required to be dry at the end of cycle				
Result of Calibration: () Without Adjustment				
Function of UUC [*] : Temperature Source				
Fresh air setting: Close				



	Environment during calibration	
	Beginning	Finished
Temp. (°C)	26	25
REL. Humid. (%)	53	54
AC Supply (VGR)	220	221

Position	Description	Ref. Std.	ID No.
1	19-18RTD-01		
2	19-18RTD-02		
3	19-18RTD-03		
4	19-18RTD-04		
5	19-18RTD-05		
6	19-18RTD-06		
7	19-18RTD-07		
8	19-18RTD-08		
9	19-18RTD-09		



Equipment:	Incubator									
Condition As-Received:	Used Item									
Reference:	2201-0610C-1									
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)	Uncertainty (± °C)	Coverage Factor			
35.0	35.0	35.0	0.043	0.41	0.42	0.30	2			
Measured Temperature (°C)										
Calibration Point (°C)	1	2	3	4	5	6	7	8	9	10
35.0	34.801	34.868	34.862	35.012	35.040	35.010	35.004	35.040	35.176	
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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BANGKOK 10250 THAILAND
TEL: 0-2-717-980-27 FAX: 0-2-717-980-28



Certificate of Calibration

Cert. No.: 22T141571
Page: 1 of 3

Equipment:	Hot Air Oven
Manufacturer:	Baker
Model:	ED 245E2
Serial No.:	00-15533
ID No.:	BKK_ML0013
Submitted by:	ALS Laboratory Group (Thailand) Co. Ltd. 104 Phathanakan Rd. Phathanakan Rd. Bangkok 10250 Thailand Media Preparation Room
Location:	
Received Order:	21 November 2022
Calibration Date:	21 November 2022
Ambient Temperature:	(26 ± 10) °C
Relative Humidity:	(50 ± 30) %
Calibrated by:	Krisda Mose
Approved by:	 Approved Signature
	() Pornthipha Tameyakul () Malee Butnane () Suwit Injai
Issue Date:	29 November 2022

The Uncertainties are for a confidence probability of approximately 95 %

Approved by the Board of Corporate Services & Equipment Calibration and Testing Services

A 0048150



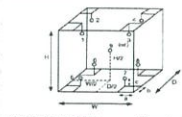
Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2211-05230C-1
Page : 2 of 3
Cert. No.: 22TM1571

Procedure Used :- Calibration was conducted using calibration procedure CP-0702 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. Date Date
1) Data Acquisition 34970A MY44267817 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 Unit.

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



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 = 0.60 m
Capacity = 0.24 m³

Environment during calibration	
Beginning	Finished
Temp. (°C)	26 26
REL Humid. (%)	55 55
AC Supply (Volt)	210 230

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

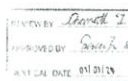
a 1138049

BKK_EL0037



Agilent CrossLab Start Up Services

Agilent 5100 5110 ICP-OES Preventive Maintenance



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.

This checklist is used as a guide for completing the preventive maintenance tasks. A signed copy of this checklist is provided for your records.

Revision A.02, issued 21 January 2022
Document Number: G8516-90071
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Page 1 of 1



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2211-05230C-1
Page : 3 of 3
Cert. No.: 22TM1571

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)	Accuracy (°C)	Coverage Factor
150	150	150	0.70	1.5	2.5	1.4	2

Calibration Position
150 179.520 180.280 179.805 179.482 179.837 179.806 179.674 180.199 180.058

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 its 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 %.

a 1138053



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 regular 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 extra or special procedures 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 ICP applications, the instrument should be returned to its standard sample introduction system.

Revision A.02, issued 21 January 2022
Document Number: G8516-90071
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Agilent CrossLab Compliance Service

Certificate of System Qualification

ES-02

System ID: MY1501006
Organization Name: ALS Laboratory Group (Thailand) Co., Ltd.
Organization Location: 104 Phatthanaburi 42 Phatthanaburi Rd., Bangkok 10250

Date: September 13, 2021 5:40:11 PM
EQP Name: Agilent Recommended
EQP Revision: ES.02.50
Overall Qualification Status: Pass

Preparation
Pass
Instrument Tests
Pass
Accessories Operation
Pass

REVIEW BY: Th. S. S.
APPROVED BY: Savitri N.
NEXT CAL DATE: 12/11/23

Date: September 13, 2021 5:40:11 PM
System ID: MY1501006

Page 1 of 1

Agilent 5100 5110 Preventive Maintenance Checklist
From Agilent to Customer



Important Customer Web Links

- To access **Agilent University**, visit <http://www.agilent.com/chem/education/university> to learn about training options, web or in-person 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**, visit <http://www.agilent.com/chem/education/university>. 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 <https://community.agilent.com/home>.
- 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?** Review Repair Options (Agilent)

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Agilent 5100 5110 Preventive Maintenance Checklist



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 check list using either a "X" 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.

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Agilent 5100 5110 Preventive Maintenance Checklist



Instrument Maintenance

System Information

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

Instrument System Name and ID: 05010A MY1501006
Instrument System Site and Location: ALS (BKK)

List System Component Product Numbers	List the Serial Numbers of each Component
1. <u>05010A</u>	<u>MY1501006</u>
2. <u>05010A</u>	<u>AU18409046</u>
3. <u>05111L</u>	<u>8895-001874</u>
4. <u>05111L</u>	<u>AU16060115</u>
5.	
6.	
7.	
8.	
9.	

ICP-OES Configuration Table	Circle the type or write in the type if other
Injector Type	<u>Self-priming</u> (Others) <u>Conical</u> (Other)
Spray Chamber	<u>Conical</u> (Single Pass) <u>Conical</u> (Double Pass) (Other)
Torch	<u>Radial</u> (Dual View) (Other)
Torch Type	<u>One-Pass</u> (Semi-Demonstrable) <u>Full-Demonstrable</u> (Other)
Injector Gas/Carrier	<u>Air</u> (Other) <u>Argon</u> (Other) <u>Other</u>
Injector Material	<u>Quartz</u> (Ceramic) (Other)

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Agilent 5100 5110 Preventive Maintenance Checklist



Preparation

- ☒ Discuss any specific issues with the customer before start up.
- ☒ Review the instrument logbook for recorded problems and comments.
- ☒ Save instrument control settings before starting this procedure.
- ☒ Perform a general inspection of the system for cleanliness.
- ☒ Check for proper installation of parts, assemblies, sensors, etc.
- ☒ Check system for required 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 ICP applications systems, if standard sample introduction system was not installed, ask the customer to install it.
- ☐ Ask the customer to remove any samples from the ICP-OES sample introduction area, auto sampler or around the ICP-OES.

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Page 1 of 1



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 to the required actions required.
- Record the instrument operating conditions in the ICP-OES Status Results Table.
- Replace the psychrometer purge filter.
- Replace the radia pre-optics window.
- Replace the axial pre-optics window for SVDV and VDV instruments.
- Check exhaust flow for the correct position and action at this exhaust dust to insure they meet minimum specifications.
- Replace an inlet 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 mesh filter if present.
- He fill with Agilent Cool Clear cooling fluid.
- Clean the cooling system Air filter and the condenser.

SPS 3 Auto Sampler

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

SPS 4 Auto sampler

- Service not applicable.
- Clean the spill tray, rack location mat, end frames and chassis 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 FFC cables for cracks, incorrect positioning, damaged edges or damaged connectors.
- Pump 1 Lubing Replacement. Replace peristaltic pump tubing. Replace all tubing that goes from the line station to the pump and from the pump to the waste/wash bottles.
- Test using customer's tray and move the sample probe to the sample vial 1, wash vial and retest 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 color seal.
- 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 7.3 and above, run the following Instrument Tests:

- Subsystem Communications Test
- Air Flow
- Water Flow
- Gas Flow
- RF Generator
- Camera Test
- Optics Test
- Nebulizer Test

- Record the result in the Instrument Test Results Table.

Restore Instrument

- For HPLC applications, ask the customer to reinstall their sample introduction system.
- Leave system in an idle state or 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.
- Update/insert instrument maintenance counters as appropriate.
- Advise the PM technician 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 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	
	Radial	Axial*	Radial	Axial*
Zr 31.857 nm SGBR	93603.9	146365.1	94364.9	146359.5
Mn 278.416 nm SGBR	153495.9	626650.3	156490.0	515466.1
As 200.151 nm SGBR	249893.5	100161.9	249495.9	156663.0
Y 744.481 nm SGBR	94349.9	2161253.9	94399.4	2161554.9

* Axial result is not applicable for G8014AA, G8022AA 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
RF Generator	Pass
Camera Test	Pass
Optics Test	Pass
Nebulizer 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	219.33% VAC	216.15% VAC
Main Current	0.21% A	0.11% A
Instrument Temperature	24.4 °C	24.3 °C
RF Air Flow (sample speed)	16.0 Hz	10.0 Hz
Plasma Exhaust Temperature	No measurement	6.9 °C
Water Flow Controller	No measurement	1.20 L/min
Water Flow Detector	1.12 L/min	1.0% L/min
Water Inlet Temperature	18.0 °C	18.6 °C
Refractometer Temperature	55.0 °C	55.0 °C
CCD Temperature	-40.0 °C	-40.0 °C
Thermal Stabilizer	34.9 °C	55.0 °C
Argon Supply Pressure	619.33 kPa	541.02 kPa
Purge Gas Supply Pressure	0.0% kPa	56.1.22 kPa
Optical Gas Supply Pressure	— kPa	— kPa
Nebulizer Flow	No measurement	0.30 L/min
Nebulizer Back Pressure	No measurement	255.76 kPa
Plasma Gas Flow	No measurement	11.0% L/min
Purge Gas Flow	No measurement	1.0 L/min
RF Power	No measurement	1100.0 W
RF Supply Current	No measurement	9.225 A
RF Supply Voltage	No measurement	194.402 V

* If option installed

Agilent 5110 Preventive Maintenance Checklist

Consumed PM Parts

Part Description	Part Number	Product or Model where used	Quantity consumed
Axial Pre-Optics Window	08010-68214	G8014A, G8014A, G8014A	1
Radial Pre-Optics Window	08010-68215	All	1
Agilent Cool Clear Condensate Filter	5799-0021	Agilent Water Recirculator	—
Purge Gas Filter	08010-68216	All	1
Air Inlet Filter	08010-68217	All	1
High Capacity Air Filter	08010-68218	Optional	—
Filter seat for 6" port valve for Air Side 1	08010-68219	G8014A, G8015	—
Filter seat for 4" port valve for Air Side 2	08010-68220	G8014A	—
Filter seat for 2" port valve for Air Side 3	08010-68221	G8014A	—
RF waste tubing (10m x 5mm ID)	08010-68222	SF5.4	1
RF waste tubing (10m x 5mm ID)	08010-68223	SF5.4	1
RF waste tubing (10m x 5mm ID)	08010-68224	SF5.4	1
RF waste tubing (10m x 5mm ID)	08010-68225	SF5.4	1

Additional Parts may be required from engineer's stock:

X-axis drive belt	541004-1500	SF5.4	—
Z-axis drive belt	541004-1500	SF5.4	—
Automatic pump tubing (PVC) 10m x 5mm ID	571004-0000	SF5.4	—

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
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Agilent 5110 Preventive Maintenance Checklist

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 tubing 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 Record Number	600933434	Date Service Completed	2 - May - 2023
Service Engineer Name	Berni Ngomijij	Customer Name	Thiara Bujjij
Service Engineer Signature	Berni Ng	Customer Signature	Thiara Bujjij

Total number of pages in this document

analytikjena

REVIEW BY	Susanti H
APPROVED BY	Susanti H
NEXT CAL DATE	01/05/2023

Maintenance Protocol

Atomic Fluorescence Spectrometer
mercure / mercure plus

Date: 7/06/2012 Carried out by: M. Spohr Falsch

☐

Company	2101 KINGSLEY STREET NW (ALABAMA) STATE
User	BRIGGS AND STRATTON
Department	Lab
Street	104 THOMPSON DR THUNDERBOLT ALABAMA
Zip Code, City	35066 THUNDERBOLT ALABAMA
Country	ALABAMA
Phone	
Fax	
E-mail	

- brightness visual check inside the Mercury
- visual check if gold-traps are broken
- visual check if spectrometer is containing
- reactor cleaning
- check pump-hose, if necessary change
- check drying-hose, output gas-liquid-sep
- test Bubble-Sensor
- check gas flows
- check volume flows, reagents
- recording stray light values
- measurement with 30 roll

[illegible]

Serial No.: 401 230

[illegible]

Device parameter	nominal value	actual value	
visual check general brightness inside the Mercury	o.k.	<input checked="" type="checkbox"/> changed <input type="checkbox"/>	
visual check Goodraps	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
visual check spectrometer	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
check pump hoses check hoses and hose connectors	cuvette	o.k.	<input checked="" type="checkbox"/> changed <input type="checkbox"/>
	lens	o.k.	<input checked="" type="checkbox"/> changed <input type="checkbox"/>
		o.k.	<input checked="" type="checkbox"/> changed <input type="checkbox"/>
check and clean reactor	o.k.	<input checked="" type="checkbox"/> changed <input type="checkbox"/>	
check drying hose output Gas-liquid-separator	o.k.	<input checked="" type="checkbox"/> changed <input type="checkbox"/>	
check bubble-sensor	o.k.	<input checked="" type="checkbox"/> not o.k. <input type="checkbox"/>	
Check gasflow			
Argon pressure valve 4	1.2 - 1.5 bar	1.5 bar	
Valve 1	12 Nl/h or 3.88 Nl/min	0.167 Nl/min	
Valve 2	50 Nl/h or 2.82 Nl/min	0.33 Nl/min	
Valve 3	5 Nl/h or 0.095 Nl/min	0.045 Nl/min	
Valve 4	12 Nl/h or 0.196 Nl/min	0.166 Nl/min	
Check liquid flow			
Acid	2.5 ml/min ± 1 ml	1.5 ml/min	
Red-agent	2.5 ml/min ± 1 ml	1.5 ml/min	
Sample	10 ml/min ± 2 ml	10 ml/min	
Adventitious light - values			
	(%)	from filter	
100	0	0	
200	0	0	
300	0	0	
350	0	0	
400	1	1	
450	3	3	
500	12	12	
550	12	12	
575	19	19	
600	27	28	

Device parameter	nominal value	actual value
Analytical parameters		
Conditions: max conc. 10 µg/L, PMT-voltage: $\overline{400}$ V Blank-solution without enrichment / FBR 30 ng/L	Int > 0.0215 RSD < 3 %	$\overline{6.0005}$ $\overline{6.024}$ RSD: $\overline{1.8}$ %
Conditions: max conc. 1.7 µg/L, PMT-voltage: $\overline{300}$ V Blank-solution with enrichment: / F BR 30 ng/L Fok - factor (Int ₁ / Int ₂)	Int > 0.028 RSD < 3 % ≥ 3.5	$\overline{6.019}$ $\overline{6.010}$ RSD: $\overline{2.99}$ % 4p
Comments		

Signature Technician
Bangkok, 7/06/2012
Place, Date (DD/MM/YYYY)

Signature Customer
06/04/2021
Place, Date (DD/MM/YYYY)

ภาคผนวก จ

สำเนาหนังสืออนุญาตขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน



ที่ อก ๐๓๑๐(๑)/ ๑๐๖๕

กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ เขตราชเทวี
กรุงเทพมหานคร ๑๐๕๐๐

๒๘ มกราคม ๒๕๖๕

เรื่อง ค่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด
อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารเคมีของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๓๐ กรกฎาคม ๒๕๖๓

สิ่งที่ส่งมาด้วย ๑. รายชื่อผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๑ แผ่น
๒. รายชื่อเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๕ แผ่น
๓. ขอบข่ายสารเคมีที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๓๑ แผ่น

ตามหนังสือที่อ้างถึง บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ขอต่ออายุ
หนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ๖-๒๐๕๔ สถานที่ตั้งเลขที่ ๑๐๔
ซอยพัฒนาการ ๔๐ ถนนพัฒนาการ แขวงพัฒนาการ เขตสวนหลวง กรุงเทพมหานคร
ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ใต้บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย)
จำกัด ค่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน โดยมีองค์ประกอบดังนี้
ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๖ ราย ตามสิ่งที่ส่งมาด้วย ๑
ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๖๒ ราย ตามสิ่งที่ส่งมาด้วย ๒
ค. ขอบข่ายสารเคมีที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย จำนวน ๕๔ รายการ น้ำได้ดิน
จำนวน ๑๒๖ รายการ อากาศเสีย ๑๖ รายการ สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน ๓๕ รายการ และดิน
จำนวน ๑๒๕ รายการ รวมทั้งสิ้นจำนวน ๓๖๑ รายการ ตามสิ่งที่ส่งมาด้วย ๓

หนังสือฉบับนี้จะมีผลต่ออายุในวันที่ ๒ กันยายน ๒๕๖๖ หากประสงค์จะต่ออายุหนังสือ
รับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอ
ต่อกรมโรงงานอุตสาหกรรม ภายใน ๓๐ วัน ก่อนวันสิ้นสุดของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์
เอกชน ซึ่งคำขอต่ออายุดังกล่าวขอรับได้ที่กรมโรงงานอุตสาหกรรม

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายศิระ จันทน์เล็ก)

ผู้อำนวยการฝ่ายปฏิบัติการพิเศษ วิชาการความปลอดภัย
ผู้อำนวยการกองวิจัยและเฝ้าระวังมลพิษโรงงาน
ปลัดกระทรวงมหาดไทย

กองวิจัยและเฝ้าระวังมลพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๒๐๒ ๔๑๔๖ ๐ ๒๒๐๒ ๔๐๐๒

โทรสาร ๐ ๒๒๕๔ ๓๒๐๘ ๐ ๒๒๕๔ ๓๔๕๕

เอกสารแนบท้ายหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด เลขทะเบียน ๖-๒๐๕๔
ที่ อก ๐๓๑๐(๑)/ ๑๐๖๕ ลงวันที่ ๒๘ มกราคม ๒๕๖๕
ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๖ ราย

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(นายศิระ จันทน์เล็ก)

ผู้อำนวยการฝ่ายปฏิบัติการพิเศษ วิชาการความปลอดภัย
ผู้อำนวยการกองวิจัยและเฝ้าระวังมลพิษโรงงาน
ปลัดกระทรวงมหาดไทย

เอกสารแนบท้ายหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด เลขทะเบียน ๖-๒๐๕๔
ที่ อก ๐๓๑๐(๑)/ ๑๐๖๕ ลงวันที่ ๒๘ มกราคม ๒๕๖๕

ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๖๒ ราย

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(นายศิระ จันทน์เล็ก)

ผู้อำนวยการฝ่ายปฏิบัติการพิเศษ วิชาการความปลอดภัย
ผู้อำนวยการกองวิจัยและเฝ้าระวังมลพิษโรงงาน
ปลัดกระทรวงมหาดไทย

๓๕) นางสาวปรางค์ทิพย์...

(นายศิระ จันทน์เล็ก)
ผู้อำนวยการฝ่ายปฏิบัติการพิเศษ วิชาการความปลอดภัย
ผู้อำนวยการกองวิจัยและเฝ้าระวังมลพิษโรงงาน
ปลัดกระทรวงมหาดไทย

๓๖) นายสมบุญ...

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(นายศิระ จันทร์เจิด)
นักวิทยาศาสตร์ชำนาญการพิเศษ วิชาการสาธารณสุข
ผู้อำนวยการกองวิจัยและเฝ้าระวังมลพิษในชุมชน
ปทุมธานี

๑๐๕) นายสมชาย...

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ปทุมธานี

๑๕๖) นางสาวสุภากร...

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ปทุมธานี

เอกสารแนบท้ายหนังสือรับข้ออาชญากรรมขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท เอแอลเอส แล็บอราทอรี กรุ๊ป (ประเทศไทย) จำกัด เลขทะเบียน ๖-๒๐๔
ที่ อภ ๐๓๑๐(๑) ๑๐๖๕ ลงวันที่ ๒๔ มกราคม ๒๕๖๕
ขอข่ายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๓๖๑ รายการ

น้ำเสีย จำนวน 59 รายการ

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

(นางศุภกานต์ ชัยพร)
ผู้อำนวยการกลุ่มมาตรฐานวิชาการวิเคราะห์มลพิษ
และทะเบียนห้องปฏิบัติการ

19 Copper...

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

วิมล
(นางสาวกัญจน์ อัครสกุลวิไล)
ผู้อำนวยการศูนย์มาตรฐานวิชาการ/กองมาตรฐานและ
.....ศูนย์ปฏิบัติการ

44 Methomyl...

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

น้ำดื่ม จำนวน 126 รายการ

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

วิมล
(นางสาวกัญจน์ อัครสกุลวิไล)
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.....ศูนย์ปฏิบัติการ

3 Aldrin...

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

วิมล
(นางสาวกัญจน์ อัครสกุลวิไล)
ผู้อำนวยการศูนย์มาตรฐานวิชาการ/กองมาตรฐานและ
.....ศูนย์ปฏิบัติการ

18 Bis(2-ethylhexyl)phthalate...

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

วิมล
(นางสาวกัญจน์ อัครสกุลวิไล)
ผู้อำนวยการศูนย์มาตรฐานวิชาการ/กองมาตรฐานและ
.....ศูนย์ปฏิบัติการ

34 Chromium (III)...


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


 (นางจิราญพร จิตคุมกาน) 51 cis-1,2-Dichloroethylene...
 ผู้อำนวยการศูนย์มาตรฐานวิธีการวิเคราะห์ห้องสอบมลพิษ
 กรมควบคุมมลพิษ


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


 (นางจิราญพร จิตคุมกาน) 68 Fluorene...
 ผู้อำนวยการศูนย์มาตรฐานวิธีการวิเคราะห์ห้องสอบมลพิษ
 กรมควบคุมมลพิษ


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


 (นางจิราญพร จิตคุมกาน) 84 Methanol...
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 กรมควบคุมมลพิษ

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


 (นางจิราญพร จิตคุมกาน) 97 Pentachlorophenol...
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 กรมควบคุมมลพิษ


ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
97	Pentachlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
98	pH	Electrometric Method ⁽⁴⁾
99	Phenanthrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
100	Phenol	1) Distillation, Direct Photometric Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
101	Pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
102	Selenium	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
103	Silver	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
104	Styrene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
105	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
106	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
107	Toluene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
108	Toxaphene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
109	TPH (C ₉ -C ₆)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(1,2,4)
110	TPH (C ₉ -C ₁₀)	Solvent Extraction, Gas Chromatographic Method ^(9,21)
111	TPH (C ₁₁ -C ₁₃)	Solvent Extraction, Gas Chromatographic Method ^(9,21)
112	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
113	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾

 114 1,1,2-Trichloroethane...
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 และประเมินผลปฏิบัติการ


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

อากาศเสีย (ปล่องระบาย) จำนวน 16 รายการ

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


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

 สิ่งปฏิกูล...
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 และประเมินผลปฏิบัติการ

สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน 35 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Aldrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,6,23) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10,22) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(22,31)
2	Antimony	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,16) 3) Digestion, Inductively Coupled Plasma Method ^(7,15) 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,16)
3	Arsenic	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,16) 3) Digestion, Inductively Coupled Plasma Method ^(7,15) 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,16)
4	Barium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,16) 3) Digestion, Inductively Coupled Plasma Method ^(7,15) 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,16)
5	Beryllium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,16) 3) Digestion, Inductively Coupled Plasma Method ^(7,15) 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,16)

 6 Cadmium...
 (นางธิภาณุณันต์ อัครสกุลวิไล)
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 และประเมินผลปฏิบัติการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
6	Cadmium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1.6.15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1.6.16) 3) Digestion, Inductively Coupled Plasma Method ^(7.15) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7.16)
7	Chlordane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.25) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10.22) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(22.31)
8	Chromium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1.6.15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1.6.16) 3) Digestion, Inductively Coupled Plasma Method ^(7.15) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7.16)
9	Chromium (III)	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method; Waste Extraction, Colorimetric Method; Calculation Method ^(1.6.15.17) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method; Waste Extraction, Colorimetric Method; Calculation Method ^(1.6.16.17) 3) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^(7.8.15.17) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^(7.8.16.17)
10	Chromium (VI)	1) Waste Extraction, Colorimetric Method ^(1.6.17) 2) Alkaline Digestion, Colorimetric Method ^(8.17)

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กระทรวงพาณิชย์

11 Cobalt...

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

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กระทรวงพาณิชย์

2) Soxhlet...

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

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กรมส่งเสริมการค้าระหว่างประเทศ
กระทรวงพาณิชย์

2) Waste Extraction...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
23	Methoxychlor	2) Waste Extraction, Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method ^(1.6.19) 3) Waste Extraction, Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method ^(1.6.20) 4) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^(1.8) 5) Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method ^(1.8) 6) Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method ⁽²⁰⁾
24	Mirex	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.25) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10.22) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(22.31)
25	Molybdenum	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1.6.15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1.6.16) 3) Digestion, Inductively Coupled Plasma Method ^(7.15) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7.16)
26	Nickel	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1.6.15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1.6.16) 3) Digestion, Inductively Coupled Plasma Method ^(7.15) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7.16)

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
27 Polychlorinated...

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


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28 Pentachloropheno...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
28	Pentachlorophenol	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,23) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10,22) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(22,31)
29	pH	Electrometric Method ^(29,30)
30	Selenium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,16) 3) Digestion, Inductively Coupled Plasma Method ^(7,15) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,16)
31	Silver	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,16)
32	Thallium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,16) 3) Digestion, Inductively Coupled Plasma Method ^(7,15) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,16)
33	Toxaphene	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,23) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10,22) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(22,31)
34	Vanadium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,6,16) 3) Digestion, Inductively Coupled Plasma Method ^(7,15)


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4) Digestion...

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


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


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9 Benz(a)anthracene...

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


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26 Carbon tetrachloride...

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

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40 DDE...

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

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57 Dieldrin...

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

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71 Hexachlorobenzene...

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

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2) Thermal...

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

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- Aroclor 1242...

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

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101 Selenium...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
101	Selenium	1) Digestion, Inductively Coupled Plasma Method ^(7,15) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,14)
102	Silver	1) Digestion, Inductively Coupled Plasma Method ^(7,15) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,14)
103	Styrene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
104	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
105	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
106	Toluene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
107	Toxaphene	1) Soxhlet Extraction, Gas Chromatographic Method ^(10,23) 2) Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)
108	TPH (C ₅ -C ₆)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
109	TPH (C ₈ -C ₁₄)	1) Solvent Extraction, Gas Chromatographic Method ^(11,21) 2) Automated Soxhlet Extraction, Gas Chromatographic Method ^(21,31)
110	TPH (C ₁₅ -C ₃₃)	1) Solvent Extraction, Gas Chromatographic Method ^(11,21) 2) Automated Soxhlet Extraction, Gas Chromatographic Method ^(21,31)
111	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
112	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
113	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
114	Trichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
115	2,4,5-Trichlorophenol	Automated Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(25,31)

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116 2,4,6-TrichlorophenoL...

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

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(นางวิภาดาญจน์ นิลกรกุลวิไล)
ผู้อำนวยการศูนย์การวิจัยการวิเคราะห์ทดสอบผลิตภัณฑ์
และประเมินผลกระทบต่อสุขภาพ



ที่ อก ๐๓๑๐(๑)/ ๕๕๗๗

กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

๐๕ มีนาคม ๒๕๖๖

เรื่อง เปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารเคมีของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๔ กุมภาพันธ์ ๒๕๖๖

ตามที่หนังสือที่อ้างถึง บริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด ห้องปฏิบัติการ
วิเคราะห์เอกชน เลขทะเบียน ๖๒๐๔ สถานที่ตั้งเลขที่ ๑๐๔ ซอยพัฒนาการ ๔๐ ถนนพัฒนาการ แขวงพัฒนาการ
เขตสวนหลวง กรุงเทพมหานคร ขอเปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์ ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว มีความเห็นดังนี้

๑. ให้ยกเลิกเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๔ ราย

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๒. ให้เพิ่มเจ้าหน้าที่...

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และประเมินผลกระทบต่อสุขภาพ

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบผลิตภัณฑ์และประเมินห้องปฏิบัติการ ขอวิจัยและเตือนภัยถึงโรงงาน กรมโรงงานอุตสาหกรรม โทร. ๐ ๒๒๖๖ ๔๐๐๖, ๔๐๐๖

๒. ให้เพิ่มเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๕ ราย

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อนึ่ง หนังสือฉบับนี้จะหมดอายุพร้อมหนังสือต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
ที่ อก ๐๓๑๐(๑)/๑๐๖๔ ลงวันที่ ๒๘ มกราคม ๒๕๖๔ คือในวันที่ ๒ กันยายน ๒๕๖๖ ทั้งนี้ สามารถยื่นคำขอ
ผ่านระบบอิเล็กทรอนิกส์ได้ที่หน้าเว็บไซต์กรมโรงงานอุตสาหกรรม ตาม QR Code ที่แนบหนังสือฉบับนี้

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นางวิภาดาญจน์ นิลกรกุลวิไล)
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กองวิจัยและเตือนภัยถึงโรงงาน
กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบผลิตภัณฑ์และประเมินห้องปฏิบัติการ
โทร. ๐ ๒๕๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕
โทรสาร ๐ ๒๕๓๐ ๖๓๑๒ ต่อ ๒๑๑๙
ไปรษณีย์อิเล็กทรอนิกส์ saraban@dw.mail.go.th



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