

ภาคผนวก ง
เอกสารสอบเทียบเครื่องมือ

Certificate of Calibration

WL-21 Wireless Anemometer

Scarlet Tech Ltd. hereby certifies that the WL-21 wireless anemometer listed below was thoroughly calibrated, tested and inspected following the standard calibration procedure (st-wl-21) and is within manufacturer's specification at the time when the calibration is done.

Client: Envir Service Co., Ltd.

Serial No.: 2111DT0004

Calibration Date: 2022/2/22

Calibration Expiry Date: 2023/2/21

The Result of Calibration

Velocity				
Measured Value (m/s)	Actual Value (m/s)	Deviation	Tolerance	Result
1.0	0.9	0.1	0.9 - 1.1	Pass
2.0	2	0	1.8 - 2.2	Pass
5.0	4.8	0.2	4.7 - 5.3	Pass
7.0	7.1	0.1	6.0 - 8.0	Pass
10.0	9.7	0.3	9.5 - 10.5	Pass
20.0	20	0	19.0 - 21.0	Pass

Wind Direction				
Measured Value	Actual Value	Deviation	Tolerance	Result
45°	48	3	42 - 48	Pass
135°	134	1	132 - 138	Pass
225°	227	2	222 - 228	Pass
315°	315	0	312 - 318	Pass
0°	1	1	357 - 3	Pass

Inspection Room Temp	Actual Value	Deviation	Tolerance	Result
22.5°C	22.1	0.4	21.5-23.5	Pass

Atmospheric Pressure Inspection	Actual Value	Deviation	Tolerance	Result
998	1000	2	994-1002	Pass

Environment conditions :

Air temperature: 24 °C
 Relative humidity: 58 %
 Static pressure: 118.3 kPa

Jim Lim

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 4F-3, No. 347, 2nd Sec., Heping E. Rd., Daan Dist. Taipei City 106, Taiwan

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Certificate of Calibration

WL-21 Wireless Anemometer

Scarlet Tech Ltd. hereby certifies that the WL-21 wireless anemometer listed below was thoroughly calibrated, tested and inspected following the standard calibration procedure (st-wl-21) and is within manufacturer's specification at the time when the calibration is done.

Client: Envir Service Co., Ltd.

Serial No.: 2111DT0041

Calibration Date: 2022/3/25

Calibration Expiry Date: 2023/3/24

The Result of Calibration

Velocity				
Measured Value (m/s)	Actual Value (m/s)	Deviation	Tolerance	Result
1.0	1	0	0.9 - 1.1	Pass
2.0	1.8	0.2	1.8 - 2.2	Pass
5.0	5	0	4.7 - 5.3	Pass
7.0	7.2	0.2	6.0 - 8.0	Pass
10.0	9.9	0.1	9.5 - 10.5	Pass
20.0	20	0	19.0 - 21.0	Pass

Wind Direction				
Measured Value	Actual Value	Deviation	Tolerance	Result
45°	43	2	42 - 48	Pass
135°	135	0	132 - 138	Pass
225°	227	2	222 - 228	Pass
315°	318	3	312 - 318	Pass
0°	0	0	357 - 3	Pass

Inspection Room Temp	Actual Value	Deviation	Tolerance	Result
24.2°C	24.8	0.6	23.2-25.2	Pass

Atmospheric Pressure Inspection	Actual Value	Deviation	Tolerance	Result
998	1001	3	994-1002	Pass

Environment conditions :

Air temperature: 22 °C
 Relative humidity: 62 %
 Static pressure: 102.2 kPa

Performed by:

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Certificate of Calibration

WL-21 Wireless Anemometer

Scarlet Tech Ltd. hereby certifies that the WL-21 wireless anemometer listed below was thoroughly calibrated, tested and inspected following the standard calibration procedure (st-wl-21) and is within manufacturer's specification at the time when the calibration is done.

Client: Envir Service Co., Ltd.

Serial No.: 2111DT0052

Calibration Date: 2022/3/25

Calibration Expiry Date: 2023/3/24

The Result of Calibration

Velocity				
Measured Value (m/s)	Actual Value (m/s)	Deviation	Tolerance	Result
1.0	0.9	0.1	0.9 - 1.1	Pass
2.0	1.9	0.1	1.8 - 2.2	Pass
5.0	4.8	0.2	4.7 - 5.3	Pass
7.0	7.0	0	6.0 - 8.0	Pass
10.0	9.9	0.1	9.5 - 10.5	Pass
20.0	20.0	0	19.0 - 21.0	Pass

Wind Direction				
Measured Value	Actual Value	Deviation	Tolerance	Result
45°	45	0	42 - 48	Pass
135°	137	2	132 - 138	Pass
225°	223	2	222 - 228	Pass
315°	316	2	312 - 318	Pass
0°	1	1	357 - 3	Pass

Inspection Room Temp	Actual Value	Deviation	Tolerance	Result
24.2°C	24.0	0.2	23.2-25.2	Pass

Atmospheric Pressure Inspection	Actual Value	Deviation	Tolerance	Result
998	1000	2	994-1002	Pass

Environment conditions :

Air temperature: 22 °C
 Relative humidity: 62 %
 Static pressure: 102.2 kPa

Performed by:

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Certificate of Calibration

WL-21 Wireless Anemometer

Scarlet Tech Ltd. hereby certifies that the WL-21 wireless anemometer listed below was thoroughly calibrated, tested and inspected following the standard calibration procedure (st-wl-21) and is within manufacturer's specification at the time when the calibration is done.

Client: Envir Service Co., Ltd.

Serial No.: 2111DT0058

Calibration Date: 2022/3/25

Calibration Expiry Date: 2023/3/24

The Result of Calibration

Velocity				
Measured Value (m/s)	Actual Value (m/s)	Deviation	Tolerance	Result
1.0	1.0	0.0	0.9 - 1.1	Pass
2.0	1.9	0.1	1.8 - 2.2	Pass
5.0	5.0	0.0	4.7 - 5.3	Pass
7.0	7.2	0.2	6.0 - 8.0	Pass
10.0	9.8	0.2	9.5 - 10.5	Pass
20.0	20.0	0	19.0 - 21.0	Pass

Wind Direction				
Measured Value	Actual Value	Deviation	Tolerance	Result
45°	47	2	42 - 48	Pass
135°	135	0	132 - 138	Pass
225°	224	1	222 - 228	Pass
315°	315	0	312 - 318	Pass
0°	359	1	357 - 3	Pass

Inspection Room Temp	Actual Value	Deviation	Tolerance	Result
24.2°C	24.5	0.3	23.2-25.2	Pass

Atmospheric Pressure Inspection	Actual Value	Deviation	Tolerance	Result
998	1000	2	994-1002	Pass

Environment conditions :

Air temperature: 22 °C
 Relative humidity: 62 %
 Static pressure: 102.2 kPa

Performed by:

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Certificate of Calibration

WL-21 Wireless Anemometer

Scarlet Tech Ltd. hereby certifies that the WL-21 wireless anemometer listed below was thoroughly calibrated, tested and inspected following the standard calibration procedure (st-wl-21) and is within manufacturer's specification at the time when the calibration is done.

Client: Envir Service Co., Ltd.

Serial No.: 2111DT0065

Calibration Date: 2022/3/25

Calibration Expiry Date: 2023/3/24

The Result of Calibration

Velocity				
Measured Value (m/s)	Actual Value (m/s)	Deviation	Tolerance	Result
1.0	1.0	0.0	0.9 - 1.1	Pass
2.0	2.0	0.0	1.8 - 2.2	Pass
5.0	4.8	0.2	4.7 - 5.3	Pass
7.0	7.1	0.1	6.0 - 8.0	Pass
10.0	9.8	0.2	9.5 - 10.5	Pass
20.0	19.8	0.2	19.0 - 21.0	Pass

Wind Direction				
Measured Value	Actual Value	Deviation	Tolerance	Result
45°	43	2	42 - 48	Pass
135°	136	1	132 - 138	Pass
225°	225	0	222 - 228	Pass
315°	315	0	312 - 318	Pass
0°	2	2	357 - 3	Pass

Inspection Room Temp	Actual Value	Deviation	Tolerance	Result
24.2°C	24.2	0.0	23.2-25.2	Pass

Atmospheric Pressure Inspection	Actual Value	Deviation	Tolerance	Result
998	997	1	994-1002	Pass

Environment conditions :

Air temperature: 22 °C
Relative humidity: 62 %
Static pressure: 102.2 kPa

Performed by: _____



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Certificate of Calibration

WL-21 Wireless Anemometer

Scarlet Tech Ltd. hereby certifies that the WL-21 wireless anemometer listed below was thoroughly calibrated, tested and inspected following the standard calibration procedure (st-wl-21) and is within manufacturer's specification at the time when the calibration is done.

Client: Envir Service Co., Ltd.

Serial No.: 2111DT0072

Calibration Date: 2022/3/25

Calibration Expiry Date: 2023/3/24

The Result of Calibration

Velocity				
Measured Value (m/s)	Actual Value (m/s)	Deviation	Tolerance	Result
1.0	1.1	0.1	0.9 - 1.1	Pass
2.0	2.0	0.0	1.8 - 2.2	Pass
5.0	4.8	0.2	4.7 - 5.3	Pass
7.0	7.0	0.0	6.0 - 8.0	Pass
10.0	9.9	0.1	9.5 - 10.5	Pass
20.0	20.2	0.2	19.0 - 21.0	Pass

Wind Direction				
Measured Value	Actual Value	Deviation	Tolerance	Result
45°	45	0	42 - 48	Pass
135°	135	0	132 - 138	Pass
225°	227	2	222 - 228	Pass
315°	314	1	312 - 318	Pass
0°	359	1	357 - 3	Pass

Inspection Room Temp	Actual Value	Deviation	Tolerance	Result
24.2°C	24.2	0.0	23.2-25.2	Pass

Atmospheric Pressure Inspection	Actual Value	Deviation	Tolerance	Result
998	1000	2	994-1002	Pass

Environment conditions :

Air temperature: 22 °C
Relative humidity: 62 %
Static pressure: 102.2 kPa

Performed by: _____



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Certificate of Calibration

WL-21 Wireless Anemometer

Scarlet Tech Ltd. hereby certifies that the WL-21 wireless anemometer listed below was thoroughly calibrated, tested and inspected following the standard calibration procedure (st-wl-21) and is within manufacturer's specification at the time when the calibration is done.

Client: Envir Service Co., Ltd.

Serial No.: 2112DT0102

Calibration Date: 2022/3/25

Calibration Expiry Date: 2023/3/24

The Result of Calibration

Velocity				
Measured Value (m/s)	Actual Value (m/s)	Deviation	Tolerance	Result
1.0	1.0	0.0	0.9 - 1.1	Pass
2.0	2.0	0.0	1.8 - 2.2	Pass
5.0	4.9	0.1	4.7 - 5.3	Pass
7.0	7.3	0.3	6.0 - 8.0	Pass
10.0	9.9	0.1	9.5 - 10.5	Pass
20.0	20.1	0.1	19.0 - 21.0	Pass

Wind Direction				
Measured Value	Actual Value	Deviation	Tolerance	Result
45°	45	0	42 - 48	Pass
135°	134	1	132 - 138	Pass
225°	224	1	222 - 228	Pass
315°	314	1	312 - 318	Pass
0°	0	0	357 - 3	Pass

Inspection Room Temp	Actual Value	Deviation	Tolerance	Result
24.2°C	24.8	0.6	23.2-25.2	Pass

Atmospheric Pressure Inspection	Actual Value	Deviation	Tolerance	Result
998	1000	2	994-1002	Pass

Environment conditions :

Air temperature: 22 °C
Relative humidity: 62 %
Static pressure: 102.2 kPa

Performed by: _____



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THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2894, 0-2399-0469

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue : 2 August, 2022

Certification No. 276/22

Page : 1 of 2

Object : Wind speed and wind direction

Manufacturer : LSI

Type : Data Logger E-LOG 305 wind speed and wind direction DNA 821

Serial No. : Data Logger 20080020 wind speed and wind direction 20040192

ID No. : No.18/20

Customer : United Analyst and Engineering Consultant Co., Ltd.

81 Soi Udomsuk 41, Sukhumvit Road,

Bangchak, Prakanong, Bangkok 10260.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1006.9 hPa

NATIONAL STANDARD WIND TUNNEL :

: Thermal Anemometer B42 S/N 91583

: HOOK GAGE NO 1425 Pitot Tube Theodor Friedrichs Type 080.0000 serial 9023

N.I.S.T. Test Reference Number 731/241460

: Standard Velocity at 20 - 30 m/sec

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)

Serial Number 110730029 (sensor 120529588)

JAPAN QUALITY ASSURANCE ORGANIZATION

: Standard Velocity at 20 - 30 m/sec

Calibrated by :

Mr. Watcharaporn

Mechanical Engineer





THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804,0-2399-0469

The Result of Calibration

Certification No. 276/22

2 August, 2022

Page : 2 of 2

Standard	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure	Vacuum	Velocity	Velocity	Correction
Ultrasonic Anemometer	m/sec	inches H ₂ O	inches H ₂ O	m/sec	m/sec
1.00	-	-	-	1.0	0.00
3.02	-	-	-	3.0	0.02
5.00	-	-	-	5.0	0.00
7.04	-	-	-	6.9	0.14
9.02	-	-	-	8.9	0.12
11.01	-	-	-	10.9	0.11
13.01	-	-	-	12.9	0.11
15.01	-	-	-	14.8	0.21
17.02	-	-	-	16.8	0.22
20.02	-	-	-	19.8	0.22

Wind Aloft Plotting Board.	
U.S. DEPARTMENT OF COMMERCE WEATHER BUREAU	
WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	90
180	180
270	270

Calibrated by :

Mr. W
Mech

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THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804,0-2399-0469

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue : 14 July, 2022

Certification No. 263/22

Page : 1 of 2

Object : Wind speed and wind direction

Manufacturer : Sensor : YOUNG
Basic Data logger : NRG

Type : Sensor : 05103-45 Basic Data logger : LR20

Serial No. : Sensor : 97947 Basic Data logger : 30905375

Customer : United Analyst and Engineering Consultant Co.,Ltd.
81 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Prakanong, Bangkok 10260.

Calibration Condition : Temperature : 25.1 °C Barometric Pressure : 1004.8 hPa

NATIONAL STANDARD WIND TUNNEL :

: Micromanometer Theodor Friedrichs FC014 Serial No. 9010119
: HOOK GAGE NO 1425 Pitot Tube Theodor Friedrichs Type 0800.0000 serial 9023
N.I.S.T. Test Reference Number 731/241480 : Standard Velocity at 20 - 30 m/sec
: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)
Serial Number 110730029 (sensor 120629566)

JAPAN QUALITY ASSURANCE ORGANIZATION : Standard Velocity

Calibrated by :

Mr. Watch
Mechanical Engineer

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THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804,0-2399-0469

The Result of Calibration

Certification No. 263/22

14 July, 2022

Page : 2 of 2

Standard	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure	Vacuum	Velocity	Velocity	Correction
Ultrasonic Anemometer	m/sec	inches H ₂ O	inches H ₂ O	m/sec	m/sec
1.00	-	-	-	0.95	0.05
3.02	-	-	-	2.94	0.08
5.00	-	-	-	4.94	0.06
7.04	-	-	-	6.98	0.06
9.02	-	-	-	8.93	0.09
11.01	-	-	-	10.92	0.09
13.01	-	-	-	12.92	0.09
15.01	-	-	-	15.02	-0.01
17.02	-	-	-	17.01	0.01
20.02	-	-	-	20.16	-0.14

Wind Aloft Plotting Board.	
U.S. DEPARTMENT OF COMMERCE WEATHER BUREAU	
WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	90
180	180
270	270

Calibrated by :

Mr. W
Mech

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INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
1109 MOO 12, SOI HUNTAENKORN 11 TAMBON BANG KAEDE
AMPHOR BANG PHU SAMUT PRAKAN PROVINCE 10540 THAILAND
TEL : 0809-2116-7000-1 FAX : 0809-2116-7140



Certificate of Calibration

Customer : UNITED ANALYST AND ENGINEERING CONSULTANT
Name : CO.,LTD.
Address : 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak,
Prakanong, Bangkok 10260

Certificate No : 22-ACT-373
Request No : Req-2022-0840

Unit Under Calibration Details

Measurement item : Acoustic Calibrator Class : 2
Manufacturer : LASON DAVIS Range : 94 , 114 dB / 1000 Hz
Model : CAL150 Instrument Status : Used
Serial Number : 6307
ID : UAE.EFM.049/2563

Calibration Environment and Details

Temperature : (23 ± 2 °C)
Humidity : (50 ± 20 %RH)
Barometric Pressure : (1013 ± 10.0 hPa)
Received Date : 10 May 2022
Calibration Date : 8 June 2022
Location of Calibration : LAB 1 Acoustic
Calibration Procedure : In-house method CP-ACT-02 based on IEC 60942:2017 Electroacoustics - Sound calibrators

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Sound Calibrator	SV 35A	58079	EEL	31 May 2023
THD Multimeter	2015	1047765	NIMT	2 February 2023

Traceability : This certificate provides traceability of measurement to recognized national standard, and to the realization of the international System of Units (SI).

Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor k=2, providing a level of confidence approximately 95 %.

Calibrated By :

Issue Date : 8 June 2022

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the laboratory.
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Certificate No : 22-ACT-373
Request No : Req-2022-0840

Sound pressure level

Calibration Results : Without Adjustment

Calibration Range (dB)	Without Adjustment (dB)		Adjustment (dB)		Uncertainty (± dB)	Acceptance limit Class 2 (± dB)
	Measured	Error	Measured	Error		
94 dB / 1000 Hz	94.02	0.02	-	-	0.11	0.40
114 dB / 1000 Hz	114.10	0.10	-	-	0.11	0.40

Frequency of Sound pressure level

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (± %)	Acceptance limit Class 2 (± %)
	Measured (Hz)	Error (%)	Measured (Hz)	Error (%)		
94 dB / 1000 Hz	999.00	0.10	-	-	0.10	1.7
114 dB / 1000 Hz	999.00	0.10	-	-	0.10	1.7

Total Harmonic Distortion plus Noise of Sound pressure level (THD+N %)

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (± %)	Acceptance limit Class 2 (± %)
	Measured (%)		Measured (%)			
94 dB / 1000 Hz	0.12		-		0.40	3.0
114 dB / 1000 Hz	0.23		-		0.40	3.0

Note :

- Acceptance limit was IEC60942:2017 Class 1
- The calibration results exclude the calibration pressure correction
- The calibration results exclude the microphone volume correction

End of Calibration

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the calibration body.
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Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT
CO.,LTD
Address : 81 Soi Udomnuak 41, Sukhumvit Road, Bangchak,
Prakanong, Bangkok 10260

Certificate No : 22-ACT-370
Request No : Req-2022-0839

Unit Under Calibration Details

Measurement item : Acoustic Calibrator Class : 2
Manufacturer : LASON DAVIS Range : 94 , 114 dB / 1000 Hz
Model : CAL150 Instrument Status : Used
Serial Number : 6457
ID : UAE.EPM.055/2564

Calibration Environment and Details

Temperature : (23 ±2 °C)
Humidity : (50 ± 20 %RH)
Barometric Pressure : (1013 ±10.0 hPa)
Received Date : 10 May 2022
Calibration Date : 8 June 2022
Location of Calibration : LAB 1 Acoustic

Calibration Procedure : In-house method CP-ACT-02 based on IEC 60942:2017 Electroacoustics - Sound calibrators

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Sound Calibrator	SV 35A	59079	EEL	31 May 2023
THD Multimeter	2015	1047765	NIMT	2 February 2023

Traceability : This certificate provides traceability of measurement to recognized national standard, and to the realization of the International System of Units (SI).

Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor k=2, providing a level of confidence approximately 95 %.

Calibrated By :

Issue Date : 8 June 2022

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the calibration body.
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Certificate No : 22-ACT-379
Request No : Req-2022-0839

Sound pressure level

Calibration Results : Without Adjustment

Calibration Range (dB)	Without Adjustment (dB)		Adjustment (dB)		Uncertainty (+ dB)	Acceptance limit Class 2 (± dB)
	Measured	Error	Measured	Error		
94 dB / 1000 Hz	93.86	-0.14	-	-	0.11	0.40
114 dB / 1000 Hz	113.92	-0.08	-	-	0.11	0.40

Frequency of Sound pressure level

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (± %)	Acceptance limit Class 2 (± %)
	Measured (Hz)	Error (%)	Measured (Hz)	Error (%)		
94 dB / 1000 Hz	1000.00	0.00	-	-	0.10	1.7
114 dB / 1000 Hz	1000.00	0.00	-	-	0.10	1.7

Total Harmonic Distortion plus Noise of Sound pressure level (THD+N %)

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (± %)	Acceptance limit Class 2 (± %)
	Measured (%)		Measured (%)			
94 dB / 1000 Hz	0.14		-		0.40	3.0
114 dB / 1000 Hz	0.29		-		0.40	3.0

Note :

- Acceptance limit was IEC60942:2017 Class 1
- The calibration results exclude the calibration processor correction
- The calibration results exclude the microphone velocity correction

End of Calibration

The results related only to the item indicated. The certificate shall not be reproduced except in full, without written approval of the head of Calibration Laboratory.
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SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY

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

Cert. No. : ACL22081
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : LARSON DAVIS
Model : LxT2/ Microphone 375B02 / Preamplifier PRML x T2B
Serial No. : 0005286 / 011740 / 056087
ID No. : -

Condition As Found : GOOD

Customer : UNITED ANALYST AND ENGINEERING CONSULTANT (UAE)
81 SOI UDOMSUK 41, SUKHUMVIT ROAD,
BANGCHAK SUB-DISTRICT,
PHRAKHANONG DISTRICT, BANGKOK 10260
THAILAND.

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

Received Date : 18 JANUARY 2022
Calibration Date : 26 JANUARY 2022
Date of Issue : 28 JANUARY 2022

Calibrated by : Nathakorn Pisutpaisan

Approved by :

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

QP-TS12-04-04-020664

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CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22081
Job No. : VC65AC0944
Pages : 2 of 8

Calibration Procedure : CP-AC-02

Calibration Method :

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

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0012-21	10-Feb-22
Waveform Generator	33511B	MY52302742	EF-0011-21	10-Feb-22
Digital Multimeter	33461A	MY53220104	EEL-BP_05/0264	10-Feb-22
Digital Multimeter	33461A	MY53220076	EEL-BP_03/0264	08-Feb-22
Digital Multimeter	34461A	MY60024273	1-15180725251-1	15-Sep-22
Programmable Attenuator	MAT-1070	62100114	IS00-07774E	08-Mar-22
Condenser Microphone	4180	2977900	AA-1008-21	05-Feb-22
Measuring Amplifier	NA-42KAJ	34560495	AA-3003-21	16-Feb-22

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

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

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

QP-TS12-04-04-020664

เอกสารไม่ควบคุม

Continuation of Calibration Certificate

Cert. No. : ACL22081
Job No. : VC65AC0044
Pages : 3 of 8

Summary of Measurement Result :

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

QF-TS12-04-04-020664

เอกสารไม่ควบคุม

Continuation of Calibration Certificate

Cert. No. : ACL22081
Job No. : VC65AC0044
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Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.96)	94.0	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
31.0

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

Frequency Weighting	Measured value (dB)
A - weight	30.8
C - weight	30.6
Flat	36.8

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	-0.1	0.1	0.0	±1.5
1000	-0.2	-0.2	-0.2	±1.0
8000	3.1	3.2	3.2	±5.0

QF-TS12-04-04-020664

เอกสารไม่ควบคุม

Continuation of Calibration Certificate

Cert. No. : ACL22081
Job No. : VC65AC0044
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	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.0	0.0	±5.0
16000	-0.1	0.0	0.1	±5.0 (-∞)

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz:

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

5.2 Time weighting at 1 kHz:

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

6. Long - term stability

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

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เอกสารไม่ควบคุม

Continuation of Calibration Certificate

Cert. No. : ACL22081
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Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
135.0	135.1	0.1	±1.1
134.0	134.1	0.1	±1.1
133.0	133.1	0.1	±1.1
132.0	132.1	0.1	±1.1
131.0	131.1	0.1	±1.1
129.0	129.1	0.1	±1.1
124.0	124.1	0.1	±1.1
119.0	119.1	0.1	±1.1
114.0	114.1	0.1	±1.1
109.0	109.1	0.1	±1.1
104.0	104.1	0.1	±1.1
99.0	99.0	0.0	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	54.0	0.0	±1.1
49.0	49.1	0.1	±1.1
44.0	44.2	0.2	±1.1
39.0	39.6	0.6	±1.1

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เอกสารไม่ควบคุม

Continuation of Calibration Certificate

Cert. No. : ACL22081
Job No. : VC65AC0044
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8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
140	94.0	94.0	0.0	±0.5

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.8	-0.2	1.5 ; -5.0
	2	8	117.0	116.7	-0.3	1.0 ; -2.5
	200	800	134.0	133.9	-0.1	±1.0
Slow	2	8	108.0	107.8	-0.2	1.5 ; -5.0
	200	800	127.6	127.5	-0.1	±1.0
SEL	0.25	1	N/A	N/A	N/A	1.5 ; -5.0
	2	8	N/A	N/A	N/A	1.0 ; -2.5
	200	800	N/A	N/A	N/A	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lepeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	135.7	-0.7	±3.0

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

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Continuation of Calibration Certificate

Cert. No. : ACL22081
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11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle	0.2	±1.5
89.2	89.4		

12. High level stability

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

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

End of Calibration Certificate

QF-TS12-04-04-020664

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SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY451-451/1 Srinthorn Rd., Bangbunma, Bangkok Bangkok 10700 THAILAND.
Tel:0-2435-8809 Fax:0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.comCert. No. : ACL22082
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : LARSON DAVIS
Model : LxT2/ Microphone 375B02 / Preamplifier PRML x T2B
Serial No.: 0005289 / 011732 / 056076
ID No.: -

Condition As Found : GOOD

Customer : UNITED ANALYST AND ENGINEERING CONSULTANT (UAE)
81 SOI UDOMSUK 41, SUKHUMVIT ROAD,
BANGCHAK SUB-DISTRICT,
PHRAKHANONG DISTRICT, BANGKOK 10260
THAILAND.

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

Received Date : 18 JANUARY 2022
Calibration Date : 26 JANUARY 2022
Date of Issue : 28 JANUARY 2022

Calibrated by : Nathakorn Pisutpaisan

Approved by :

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

QF-TS12-04-04-020664

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม

Continuation of Calibration Certificate

Cert. No. : ACL22082
Job No. : VC65AC0044
Pages : 2 of 8

Calibration Procedure : CP-AC-02

Calibration Method :

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

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0012-21	10-Feb-22
Waveform Generator	33511B	MY52302742	EF-0011-21	10-Feb-22
Digital Multimeter	33461A	MY53220104	EEL.BP. 05/0264	10-Feb-22
Digital Multimeter	33461A	MY53220076	EEL.BP. 03/0264	08-Feb-22
Digital Multimeter	34461A	MY60024273	1-15180725251-1	15-Sep-22
Programmable Attenuator	MAT-1070	62100114	1500-07774E	08-Mar-22
Condenser Microphone	4180	2977900	AA-1008-21	05-Feb-22
Measuring Amplifier	NA-42KA1	34560495	AA-3003-21	16-Feb-22

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

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

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

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เอกสารไม่ควบคุม

Continuation of Calibration Certificate

Cert. No. : ACL22082
Job No. : VC65AC0044
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Summary of Measurement Result :

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

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เอกสารไม่ควบคุม

Continuation of Calibration Certificate

Cert. No. : ACL22082
Job No. : VC65AC0044
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Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.96)	94.0	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
29.6

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

Frequency Weighting	Measured value (dB)
A - weight	29.4
C - weight	29.1
Flat	34.8

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	-0.1	0.2	0.2	±1.5
1000	-0.2	-0.2	-0.2	±1.0
8000	2.6	2.6	2.6	±5.0

QF-TS12-04-04-020664

เอกสารไม่ควบคุม

Continuation of Calibration Certificate

Cert. No. : ACL22082
Job No. : VC65AC0044
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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	0.1	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±2.0
4000	0.0	-0.1	0.0	±3.0
8000	0.0	0.1	0.0	±5.0
16000	-0.1	0.1	0.1	±5.0(-∞)

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long - term stability

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

QF-TS12-04-04-020664

เอกสารไม่ควบคุม

Continuation of Calibration Certificate

Cert. No. : ACL22082
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7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
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

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Continuation of Calibration Certificate

Cert. No. : ACL22082
Job No. : VC65AC0044
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8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
140	94.0	94.0	0.0	±0.5

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.8	-0.2	1.5 ; -5.0
	2	8	117.0	116.7	-0.3	±1.0 ; -2.5
	200	800	134.0	133.9	-0.1	±1.0
Slow	2	8	108.0	107.8	-0.2	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	N/A	N/A	N/A	1.5 ; -5.0
SEL	2	8	N/A	N/A	N/A	1.0 ; -2.5
	200	800	N/A	N/A	N/A	±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	135.8	-0.6	±3.0

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

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Continuation of Calibration Certificate

Cert. No. : ACL22082
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11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.2	89.4	0.2	±1.5

12. High level stability

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

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

End of Calibration Certificate

QF-TS12-04-04-020664

เอกสารนี้

Certificate of Calibration

Customer : UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Name : R1 Soi Udonnuk 43, Sukhumvit Road, Bangrak, Prakanong, Bangkok 10260
Request No : Req-2022-0629

Unit Under Calibration Details:

Measurement item : Sound Level Meter
Manufacturer : LARSON DAVIS
Model : Lx72
Serial Number : 0005304
ID : UAEFPM115/282
Resolution : 0.1 dB
Microphone Class : 2
Microphone Model : 375A04
Microphone SN : 529356
Pre-amplifier Model : PRLMx120
Pre-amplifier SN : 954899
Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 2 °C
Humidity : 50 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 23 March 2022
Calibrated Date : 1 April 2022
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3 : 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests
Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	SN	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188275	13 September 2022	GRAS
Multi-frequency Calibrator	Quest	Questcal	EFA000254	14 June 2022	T80
Audio Generator	Scantek	Scantek	133	18 October 2022	WK Electric

Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %.

Calibrated

Issue Date : 1 April 2022

Certificate No : 22-ACT-249

Request No : Req 2022-0629

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust	Adjust	UNCERTAINTY	Acceptance
FAST / A / 37-139	Level	UUC	ERR	UUC	ERR
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)
1000 Hz (114.00 dB)	113.85	113.8	-0.05	113.9	0.05
				(± dB)	(± dB)

Note: Absolute sensitivity was established by the use of Sound Calibrator Model SVANTEK, Model SV 31A, SN 39079

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	(± dB)
A	24.7	0.10

3. Self-generated noise, Microphone replaced by the electrical input signal device

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	(± dB)
A	24.1	0.10
C	23.5	0.10
Z	27.8	0.10

4. Acoustic signal test of frequency weightings (Without Windscreen)

UUC Setting	Deviation from various Frequency	UNCERTAINTY	Acceptance
FAST / 37-139	Weighting Response curve		Limit
STD Setting	A (dB) C (dB) Z (dB)	(± dB)	(± dB)
125 Hz	0.1 0.1 0.1	0.50	2.0
1000 Hz	0.0 0.0 0.0	0.60	1.0
4000 Hz	0.4 0.3 0.3	0.60	3.0
8000 Hz	-0.2 -0.3 -0.1	0.70	5.0

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

เอกสารไม่ควบคุม

Certificate No : 22-ACT-249

Request No : Req 2022-0629

5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz

UUC Setting	Deviation from various Frequency	UNCERTAINTY	Acceptance
FAST / 37-139	Weighting Response curve		Limit
STD Setting	A (dB) C (dB) Z (dB)	(± dB)	(± dB)
63 Hz	-0.1 -0.1 -0.1	0.2	2.0
125 Hz	-0.1 0.0 0.0		1.5
250 Hz	0.0 0.0 0.0		1.5
500 Hz	0.0 0.0 0.0		1.5
1000 Hz	0.0 0.0 0.0		1.0
2000 Hz	0.0 0.0 0.0		3.0
4000 Hz	0.0 0.0 0.0		3.0
8000 Hz	-0.1 -0.1 -0.1		5.0
10000 Hz	-0.1 -0.1 -0.1		+5, -INF

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured	UNCERTAINTY	Acceptance
FAST / 37-139	REF	UUC	ERR	Limit
UUC Weighting	(dB)	(dB)	(dB)	(± dB)
A	114.00	114.0	0.0	0.2
C	114.00	114.1	0.1	0.2
Z	114.00	114.1	0.1	0.2

UUC Setting	STD	Measured	UNCERTAINTY	Acceptance
37-139 / A	REF	UUC	ERR	Limit
UUC Time Response	(dB)	(dB)	(dB)	(± dB)
Fast	114.00	114.0	0.0	0.1
Slow	114.00	114.0	0.0	0.1
Long	114.00	114.0	0.0	0.1

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

เอกสารไม่ควบคุม

Certificate No : 22-ACT-249

Request No : Req 2022-0629

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC		Limit
STD Setting	(dB)	(± dB)	(± dB)
Initial	114.0		
Final	114.0		
Deviated	0.0	0.1	0.3

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation	UNCERTAINTY	Acceptance
FAST / A / 37-139	REF	UUC	ERR	Limit
STD dB	(dB)	(dB)	(dB)	(± dB)
120.00	120	119.0	0.0	1.1
114.00	114	114.0	0.0	1.1
108.00	108	108.0	0.0	1.1
102.00	102	102.0	0.0	1.1
96.00	96	96.0	0.0	1.1
90.00	90	90.0	0.0	1.1
84.00	84	84.0	0.0	1.1
78.00	78	78.0	0.0	1.1
72.00	72	72.0	0.0	1.1
66.00	66	66.0	0.0	1.1
60.00	60	60.0	0.0	1.1
54.00	54	54.0	0.0	1.1
48.00	48	48.0	0.0	1.1
42.00	42	42.0	0.0	1.1
36.00	36	36.0	0.0	1.1

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

เอกสารไม่ควบคุม

Certificate No : 22-ACT-249

Request No : Req 2022-0629

9. Level linearity including the level range control

UUC Setting	STD	Measured	UNCERTAINTY	Acceptance
FAST / A	REF	UUC	ERR	Limit
UUC Range	(dB)	(dB)	(dB)	(± dB)
37-139	43.9	44.1	0.2	1.1
	114	114.0	0.0	1.1

10. Tone burst response

UUC Setting	STD	Anticipated	Measured	UNCERTAINTY	Acceptance
A / 37-139	Toneburst	Ref	UUC	ERR	Limit
UUC Time Response	(ms)	(dB)	(dB)	(dB)	(± dB)
Fast	200	135.0	135.0	0.0	1.0
	2	118.0	117.8	-0.2	+1.0, -2.5
	0.25	100.0	100.8	+0.8	+1.5, -5.0
Slow	200	128.6	128.3	-0.3	1.0
	2	100.0	100.9	+0.9	+1.0, -5.0
STE	200	129.0	129.0	0.0	1.0
	2	100.0	100.9	+0.9	+1.0, -2.5
	0.25	100.0	99.9	-0.1	+1.5, -5.0

11. Peak C Sound level

UUC Setting	Anticipated	Measured	UNCERTAINTY	Acceptance
FAST / C / 95-142	REF	UUC	ERR	Limit
STD Setting	(dB)	(dB)	(dB)	(± dB)
Complete cycle	127.4	126.9	-0.50	3.0
Positive half cycle	126.4	126.2	-0.20	2.0
Negative half cycle	126.4	126.2	-0.20	2.0

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

เอกสารไม่ควบคุม

Certificate No : 22-ACT-349

Request No : Req-2022-0629

12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit
FAST / A / 37-139	UUC	(\pm dB)	(\pm dB)
STD Setting	60B		
Positive one-half cycle	142.9		
Negative one-half cycle	142.7		
Deviation	0.2	0.2	1.5

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit
FAST / A / 37-139	UUC	(\pm dB)	(\pm dB)
STD Setting	60B		
Initial	136.0		
Final	136.0		
Deviation	0.0	0.1	0.5

End of Certificate

The results related only to the items calibrated. The certificate shall not be reproduced except in full, without written approval of the issuing laboratory.

เอกสารไม่ควบคุม

Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address : 81 Soi Udomrak 41, Sukhumvit Road, Bangkok, Prakanong, Bangkok
10260

Certificate No : 22-ACT-248
Request No : Req-2022-0628

Unit Under Calibration Details

Measurement item : Sound Level Meter
Manufacturer : LARSON DAVIS
Model : LA72
Serial Number : 0002344
ID : UAEFFM.B41/2503
Resolution : 0.1 dB
Microphone Class : 2
Microphone Model : 375A04
Microphone SN : 329562
Preamplifier Model : PRMLA12C
Preamplifier SN : 071494
Instrument Status : Used

Calibration Environment and Details

Temperature : $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$
Humidity : $50\% \text{RH} \pm 20\% \text{RH}$
Barometric Pressure : $1013 \text{ hPa} \pm 10 \text{ hPa}$
Received Date : 23 March 2022
Calibrated Date : 1 April 2022
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-1:2013 Electroacoustics - Sound level meters - Part 1: Periodic tests
Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	SN	Due calibration	Traceability
Standard Microphone	GRAS	40AN	185273	15 September 2022	GRAS
Multi-frequency Calibrator	Quest	Questcal	EPA000234	14 June 2022	TSI
Audio Generator	Scantek	Swan401	131	18 October 2022	WK Electric

Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %.

Calibrated on

Issue Date : 1 April 2022

The results related only to the items calibrated. The certificate shall not be reproduced except in full, without written approval of the issuing laboratory.

เอกสารไม่ควบคุม

Certificate No : 22-ACT-248

Request No : Req-2022-0628

1. Indication at the calibration check frequency

UUC Setting	Normal	Before Adjust	Adjust	UNCERTAINTY	Acceptance Limit
FAST / A / 37-139	Level	UUC	ERR	UUC	ERR
Calibrator Setting	60B	60B	60B	60B	60B
1000 Hz 114.00 dB	113.85	113.7	-0.13	113.9	0.08
					0.2

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTER, Model SV 32A, SN-28979

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	60B	(\pm dB)
A	29.3	0.10

3. Self-generated noise, Microphone replaced by the electrical input signal device

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	60B	(\pm dB)
A	28.8	0.10
C	28.4	0.10
Z	27.6	0.10

4. Acoustic signal test of frequency weightings (Without Windscreen)

UUC Setting	Deviation from various Frequency Weighting Response curve	UNCERTAINTY	Acceptance Limit
FAST / 37-139	A C Z	(\pm dB)	(\pm dB)
STD Setting	60B 60B 60B		
125 Hz	0.0 0.1 0.1	0.30	2.0
1000 Hz	0.0 0.0 0.0	0.00	1.0
4000 Hz	0.2 0.2 0.2	0.00	3.0
8000 Hz	0.0 0.0 0.1	0.70	5.0

The results related only to the items calibrated. The certificate shall not be reproduced except in full, without written approval of the issuing laboratory.

เอกสารไม่ควบคุม

Certificate No : 22-ACT-248

Request No : Req-2022-0628

5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz

UUC Setting	Deviation from various Frequency Weighting Response curve	UNCERTAINTY	Acceptance Limit
FAST / 37-139	A 60B C 60B Z 60B	(\pm dB)	(\pm dB)
STD Setting	60B 60B 60B 60B 60B		
63 Hz	-0.2 -0.1 -0.1	0.2	2.0
125 Hz	-0.1 0.0 0.0		1.5
250 Hz	-0.1 0.0 0.0		1.5
500 Hz	-0.1 0.0 0.0		1.5
1000 Hz	0.0 0.0 0.0		1.0
2000 Hz	0.0 0.0 0.0		2.0
4000 Hz	0.0 0.0 0.0		3.0
8000 Hz	-0.1 -0.1 0.0		5.0
10000 Hz	-0.1 -0.1 -0.1		(+5, -INF)

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured	UNCERTAINTY	Acceptance Limit
FAST / 37-139	REF	UUC	ERR	(\pm dB)
UUC Weighting	60B	60B	60B	(\pm dB)
A	114.00	114.0	0.0	0.2
C	114.00	114.0	0.0	0.2
Z	114.00	114.0	0.0	0.2

UUC Setting	STD	Measured	UNCERTAINTY	Acceptance Limit
37-139 / A	REF	UUC	ERR	(\pm dB)
UUC Time Response	60B	60B	60B	(\pm dB)
Fast	114.00	114.0	0.0	0.1
Slow	114.00	114.0	0.0	0.1
Log	114.00	114.0	0.0	0.1

The results related only to the items calibrated. The certificate shall not be reproduced except in full, without written approval of the issuing laboratory.

เอกสารไม่ควบคุม

Certificate No : 22-ACT-248

Request No : Req-2022-0628

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC		Limit
STD Setting	(dB)	(± dB)	(± dB)
Initial	114.0		
Final	114.0		
Deviation	0.0	0.1	0.3

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation	UNCERTAINTY	Acceptance
FAST / A / 37-139	REF	UUC	ERR	Limit
STD dB	(dB)	(dB)	(dB)	(± dB)
139.00	139	139.0	0.0	1.1
134.00	134	134.0	0.0	1.1
129.00	129	129.0	0.0	1.1
124.00	124	124.0	0.0	1.1
119.00	119	119.0	0.0	1.1
114.00	114	114.0	0.0	1.1
109.00	109	109.0	0.0	1.1
104.00	104	104.0	0.0	1.1
99.00	99	99.0	-0.1	1.1
94.00	94	94.0	0.0	1.1
89.00	89	89.0	0.0	1.1
84.00	84	84.0	0.0	1.1
79.00	79	79.0	0.0	1.1
74.00	74	74.0	0.0	1.1
69.00	69	69.0	0.0	1.1
64.00	64	64.0	0.0	1.1
59.00	59	59.0	0.0	1.1
54.00	54	54.0	0.0	1.1
49.00	49	49.0	0.0	1.1
44.00	44	44.1	0.1	1.1
39.00	39	39.3	0.3	1.1
34.00	34	34.5	0.5	1.1

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Laboratory. เอกสารนี้ควบคุม

Certificate No : 22-ACT-248

Request No : Req-2022-0628

9. Level linearity including the level range control

UUC Setting	STD	Measured	UNCERTAINTY	Acceptance
FAST / A	REF	UUC	ERR	Limit
UUC Range	(dB)	(dB)	(dB)	(± dB)
37-139	44.2	44.4	0.2	1.1
	114	114.0	0.0	1.1

10. Tone burst response

UUC Setting	STD	Anticipated	Measured	UNCERTAINTY	Acceptance
A / 37-139	Timeburst	Ref	UUC	ERR	Limit
UUC Time Response	(ms)	(dB)	(dB)	(dB)	(± dB)
Fast	200	135.0	135.0	0.0	1.0
	2	118.0	117.7	-0.3	+1.0, -2.5
	9.25	100.0	100.8	-0.2	+1.5, -5.0
Slow	200	128.6	128.3	-0.1	1.0
	2	109.0	108.9	-0.1	+1.0, -9.0
SEL	200	129.0	129.1	+0.1	1.0
	2	109.0	109.1	+0.1	+1.0, -2.5
	9.25	100.0	100.0	0.0	+1.5, -5.0

11. Peak C Sound level

UUC Setting	Anticipated	Measured	UNCERTAINTY	Acceptance
FAST / C / 95-142	REF	UUC	ERR	Limit
STD Setting	(dB)	(dB)	(dB)	(± dB)
Complete cycle	137.4	136.7	-0.70	2.0
Positive half cycle	136.6	136.1	-0.39	2.0
Negative half cycle	136.4	136.2	-0.20	2.0

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Laboratory. เอกสารนี้ควบคุม

Certificate No : 22-ACT-248

Request No : Req-2022-0628

12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC		Limit
STD Setting	(dB)	(± dB)	(± dB)
Positive one-half cycle	143.2		
Negative one-half cycle	143.1		
Deviation	0.1	0.2	1.5

13. High level stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC		Limit
STD Setting	(dB)	(± dB)	(± dB)
Initial	138.0		
Final	138.0		
Deviation	0.0	0.1	0.3

End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Laboratory. เอกสารนี้ควบคุม

Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangkok, Pathumwan, Bangkok
10260

Certificate No : 22-ACT-034
Request No : Req-2022-0092

Unit Under Calibration Details

Measurement Item : Sound Level Meter
Manufacturer : LARSON DAVIS
Model : LxT2
Serial Number : 9005594
ID : UAEBFM0912864

Microphone Class : 2
Microphone Model : 375A04
Microphone S/N : 328501
Preamplifier Model : P8MEX12C
Preamplifier S/N : 9738110
Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 2 °C
Humidity : 30 %RH ± 20 %RH
Barometric Pressure : 1011 hPa ± 10 hPa
Received Date : 14 January 2022
Calibrated Date : 21 January 2022
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3 : 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests
Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	S/N	Due calibration	Traceability
Standard Microphone	GRAS	40AS	188271	19 September 2022	GRAS
Multi-frequency Calibrator	Quest	Questrol	ETFA00234	14 June 2022	T&I
Audio Generator	Svanok	Svanok	131	18 October 2022	WK Electric

Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %.

Calibrated By :

Calibration Officer

Calibration Engineer Supervisor

Issue Date : 21 January 2022

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Laboratory. เอกสารนี้ควบคุม

Certificate No : 22-ACT-634
Request No : Req-2022-0092

1. Indication at the calibration check frequency

UUC Setting	Nominal Level	Before Adjust			Adjust		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
		UUC (dB)	ERR (dB)	ERR (dB)	UUC (dB)	ERR (dB)		
FAST / A / 37-139								
Calibrator Setting	(dB)							
1000 Hz 114.00 dB	113.85	113.8	+0.05		113.9	0.05	0.20	0.3

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTEK, Model SV 23A, SN-53079.

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	(\pm dB)
A	27.8	0.10

3. Self-generated noise, Microphone replaced by the electrical input signal device

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	(\pm dB)
A	27.3	0.10
C	27.0	0.10
Z	21.8	0.10

4. Acoustic signal test of frequency weightings (Without Windscreen)

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
	A (dB)	C (dB)	Z (dB)		
FAST / 37-139					
STD Setting					
125 Hz	0.0	0.1	0.0	0.50	2.0
1000 Hz	0.0	0.0	0.0	0.60	1.0
4000 Hz	0.2	0.3	0.2	0.60	1.0
8000 Hz	-0.3	-0.3	-0.3	0.70	3.0

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Calibration Laboratory. **เอกสารไม่ควบคุม**
PRT-701-11-01-01 Rev. 001 Date 01/07/19

Certificate No : 22-ACT-634
Request No : Req-2022-0092

5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
	A (dB)	C (dB)	Z (dB)		
FAST / 37-139					
STD Setting					
63 Hz	-0.2	-0.1	0.0	0.2	2.0
125 Hz	-0.1	0.0	0.0		1.5
250 Hz	-0.1	0.0	0.0		1.5
500 Hz	-0.1	0.0	0.0		1.5
1000 Hz	0.0	0.0	0.0		1.0
2000 Hz	0.0	0.0	0.0		2.0
4000 Hz	0.0	0.0	0.0		3.0
8000 Hz	-0.1	-0.1	0.0		5
16000 Hz	-0.1	-0.1	-0.1		+5, -INF

6. Frequency and time weightings at 1kHz

UUC Setting	STD REF	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
		UUC (dB)	ERR (dB)		
FAST / 37-139					
UUC Weighting					
A	114.00	114.0	0.0	0.2	0.2
C	114.00	114.0	0.0		0.2
Z	114.00	114.0	0.0		0.2

UUC Setting	STD REF	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
		UUC (dB)	ERR (dB)		
37-139 / A					
UUC Time Response					
Fast	114.00	114.0	0.0	0.2	0.1
Slow	114.00	114.0	0.0		0.1
Leq	114.00	114.0	0.0		0.1

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Calibration Laboratory. **เอกสารไม่ควบคุม**
PRT-701-11-01-01 Rev. 001 Date 01/07/19

Certificate No : 22-ACT-634
Request No : Req-2022-0092

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit
FAST / A / 37-139			
STD Setting			
Initial	114.0		
Final	114.0		
Deviated	0.0	0.1	0.3

8. Level linearity on the reference level range

UUC Setting	Anticipated REF	Deviation		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
		UUC (dB)	ERR (dB)		
FAST / A / 37-139					
STD dB					
120.00	136	130.0	0.0	0.3	1.1
114.00	134	134.0	0.0		1.1
120.00	126	126.0	0.0		1.1
124.00	124	124.0	0.0		1.1
118.00	118	118.0	0.0		1.1
114.00	114	114.0	0.0		1.1
109.00	109	109.0	0.0		1.1
104.00	104	104.0	0.0		1.1
99.00	99	99.0	0.0		1.1
94.00	94	93.8	-0.1		1.1
89.00	89	88.9	-0.1	0.3	1.1
84.00	84	83.9	-0.1		1.1
79.00	79	78.9	-0.1		1.1
74.00	74	73.9	-0.1		1.1
69.00	69	69.0	0.0		1.1
64.00	64	63.9	-0.1		1.1
59.00	59	59.0	0.0		1.1
54.00	54	54.0	0.0		1.1
49.00	49	49.0	0.0		0.8
44.00	44	44.1	0.1		1.1
39.00	39	39.2	0.3		1.1
34.00	34	34.3	0.3		1.1
29.00	29	29.2	0.3		1.1

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Calibration Laboratory. **เอกสารไม่ควบคุม**
PRT-701-11-01-01 Rev. 001 Date 01/07/19

Certificate No : 22-ACT-634
Request No : Req-2022-0092

9. Level linearity including the level range control

UUC Setting	STD	Measured	UNCERTAINTY	Acceptance Limit
FAST / A	REF	UUC ERR	(\pm dB)	(\pm dB)
UUC Range				
37-139	42.8	42.0	0.2	1.1
	114	114.0	0.0	1.1

10. Tone burst response

UUC Setting	STD Timestep	Anticipated Ref		Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
		(ms)	(dB)	UUC (dB)	ERR (dB)		
A / 37-139							
UUC Time Response							
Fast	200	125.0	125.0	0.0		0.3	1
	2	118.0	117.7	-0.3			+1.0, -2.0
	0.25	109.0	108.8	-0.2			+1.5, -5.0
Slow	200	126.5	129.5	-0.1			1
	2	109.0	108.9	-0.1			+1.0, -5.0
	0.25	109.0	109.1	+0.1			1
SEL	200	129.0	129.0	0.0			+1.0, -2.5
	2	109.0	109.1	+0.1			+1.5, -5.0
	0.25	100.0	100.0	0.0			

11. Peak C Sound level

UUC Setting	Anticipated	Measured	UNCERTAINTY	Acceptance Limit
FAST / C / 95-140	REF	UUC ERR	(\pm dB)	(\pm dB)
STD Setting				
Complete cycle	137.4	136.8	-0.60	3.0
Positive half cycle	136.4	136.1	-0.30	2.0
Negative half cycle	136.4	136.2	-0.20	2.0

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Calibration Laboratory. **เอกสารไม่ควบคุม**
PRT-701-11-01-01 Rev. 001 Date 01/07/19

Certificate No : 22-ACT-054
Request No : Req-2022-0092

12. Overload Indication

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit
FAST / A / 37-129	UUC	(± dB)	(± dB)
STD Setting	(dB)		
Positive one-half cycle	141.7		
Negative one-half cycle	141.8		
Deviation	-0.1	0.2	1.5

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit
FAST / A / 37-129	UUC	(± dB)	(± dB)
STD Setting	(dB)		
Initial	128.0		
Final	128.0		
Deviation	0.0	0.1	0.3

End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.
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Certificate of Calibration

Customer : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address : 81 Soi Udonnok 41, Sukhumvit Road, Bangkok, Prakanong, Bangkok 10250
Certificate No : 22-ACT-047
Request No : Req-2022-0627

Unit Under Calibration Details

Measurement Item : Sound Level Meter
Manufacturer : LARSON DAVIS
Model : LxT2
Serial Number : 000595
ID : UAE.EFM.0327564
Resolution : 0.1 dB
Microphone Class : 2
Microphone Model : 375A04
Microphone S/N : 326035
Preamplifier Model : PKMLA12C
Preamplifier S/N : 073797
Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 2 °C
Humidity : 50 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 23 March 2022
Calibrated Date : 1 April 2022
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-1 : 2013 Electroacoustics - Sound level meters - Part 1: Periodic tests
Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	S/N	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	15 September 2022	GRAS
Multi-frequency Calibrator	Quest	Quest-val	EPA00234	14 June 2022	TSI
Audio Generator	Swanick	Swan40	131	18 October 2022	WK Electric

Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %.

Calibration

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.
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Certificate No : 22-ACT-047
Request No : Req-2022-0627

1. Indication at the calibration check frequency

UUC Setting	Normal	Before Adjust		Adjust		UNCERTAINTY (+/- dB)	Acceptance Limit (+/- dB)
FAST / A / 37-139	Level	UUC	ERR	UUC	ERR		
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)		
1000 Hz 114.00 dB	133.85	133.8	-0.65	133.9	0.05	0.26	0.3

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTEX, Model SV 33A, SN.58079

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		(± dB)
UUC Weighting	(dB)	
A	28.4	0.10

3. Self-generated noise, Microphone replaced by the electrical input signal device

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		(± dB)
UUC Weighting	(dB)	
A	28.1	0.10
C	27.7	0.10
Z	32.0	0.10

4. Acoustic signal test of frequency weightings (Without Windscreen)

UUC Setting	Deviation from various Frequency Weighting Response curve	UNCERTAINTY	Acceptance Limit
FAST / 37-139	A C Z	(± dB)	(± dB)
STD Setting	(dB)		
125 Hz	0.0 0.1 0.1	0.50	2.0
1000 Hz	0.0 0.0 0.0	0.60	1.0
4000 Hz	0.4 0.5 0.5	0.60	3.0
8000 Hz	0.2 0.1 0.1	0.70	5.0

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Certificate No : 22-ACT-047
Request No : Req-2022-0627

5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz

UUC Setting	Deviation from various Frequency Weighting Response curve	UNCERTAINTY	Acceptance Limit
FAST / 37-139	A (dB) C (dB) Z (dB)	(± dB)	(± dB)
STD Setting			
95 Hz	-0.2 -0.1 -0.1	0.2	2.0
125 Hz	-0.1 0.0 0.0		1.5
250 Hz	-0.1 0.0 0.0		1.5
500 Hz	-0.1 0.0 0.0		1.5
1000 Hz	0.0 0.0 0.0		1.0
2000 Hz	0.0 0.0 0.0		2.0
4000 Hz	0.0 0.0 0.0		3.0
8000 Hz	-0.1 -0.1 0.0		5.0
10000 Hz	-0.1 -0.1 -0.1		+5. -(-)dB

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured	UNCERTAINTY	Acceptance Limit
FAST / 37-139	REF	UUC	ERR	(± dB)
UUC Weighting	(dB)	(dB)	(dB)	(± dB)
A	114.00	114.0	0.0	0.2
C	114.00	114.0	0.0	0.2
Z	114.00	114.0	0.0	0.2

UUC Setting	STD	Measured	UNCERTAINTY	Acceptance Limit
37-139 / A	REF	UUC	ERR	(± dB)
UUC Time Response	(dB)	(dB)	(dB)	(± dB)
Fast	114.00	114.0	0.0	0.1
Slow	114.00	114.0	0.0	0.1
Leq	114.00	114.0	0.0	0.1

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Certificate No : 22-ACT-047
Request No : Req-2022-0627

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 35-139	UUC		Limit
STD Setting	(dB)	(\pm dB)	(\pm dB)
Initial	134.0		
Final	134.0		
Deviated	0.0	0.1	0.1

8. Level linearity on the reference level range

UUC Setting	Anticipated	Measured	UNCERTAINTY	Acceptance
FAST / A / 35-139	REF	UUC	ERR	Limit
STD dB	(dB)	(dB)	(dB)	(\pm dB)
139.00	139	139.0	0.0	1.1
134.00	134	134.0	0.0	1.1
129.00	129	129.0	0.0	1.1
124.00	124	124.0	0.0	1.1
119.00	119	119.0	0.0	1.1
114.00	114	114.0	0.0	1.1
109.00	109	109.0	0.0	1.1
104.00	104	104.0	0.0	1.1
99.00	99	99.0	0.0	1.1
94.00	94	94.0	0.0	1.1
89.00	89	89.0	0.0	1.1
84.00	84	84.0	0.0	1.1
79.00	79	79.0	0.0	1.1
74.00	74	74.0	0.0	1.1
69.00	69	69.0	0.0	1.1
64.00	64	64.0	0.0	1.1
59.00	59	59.0	0.0	1.1
54.00	54	54.0	0.0	1.1
49.00	49	49.0	0.0	1.1
44.00	44	44.1	0.1	1.1
39.00	39	39.3	0.3	1.1
34.00	34	34.4	0.4	1.1

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Certificate No : 22-ACT-047
Request No : Req-2022-0627

9. Level linearity including the level range control

UUC Setting	STD	Measured	UNCERTAINTY	Acceptance
FAST / A	REF	UUC	ERR	Limit
UUC Range	(dB)	(dB)	(\pm dB)	(\pm dB)
35-139	43.4	42.5	0.1	1.1
	114	114.0	0.0	1.1

10. Tone burst response

UUC Setting	STD	Anticipated	Measured	UNCERTAINTY	Acceptance
A / 35-139	Timeburst	Ref	UUC	ERR	Limit
UUC Time Response	(ms)	(dB)	(dB)	(dB)	(\pm dB)
Fast	200	135.9	134.9	-0.1	1.0
	2	118.9	117.8	-0.2	+1.0, -2.5
	0.25	100.9	100.7	-0.2	+1.5, -5.0
Slow	200	128.4	128.4	-0.2	1.0
	2	109.9	108.8	-0.2	+1.0, -5.0
SOL	200	129.9	129.9	0.0	1.0
	2	109.9	109.1	+0.1	+1.0, -2.5
	0.25	100.9	99.9	-0.1	+1.5, -5.0

11. Peak C Sound level

UUC Setting	Anticipated	Measured	UNCERTAINTY	Acceptance
FAST / C / 95-142	REF	UUC	ERR	Limit
STD Setting	(dB)	(dB)	(dB)	(\pm dB)
Complete cycle	137.4	136.8	-0.60	3.0
Positive half cycle	136.4	136.2	-0.20	2.0
Negative half cycle	136.4	136.2	-0.20	2.0

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Certificate No : 22-ACT-047
Request No : Req-2022-0627

12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 35-139	UUC		Limit
STD Setting	(dB)	(\pm dB)	(\pm dB)
Positive one-half cycle	142.2		
Negative one-half cycle	142.3		
Deviated	0.0	0.2	1.3

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 35-139	UUC		Limit
STD Setting	(dB)	(\pm dB)	(\pm dB)
Initial	138.0		
Final	138.0		
Deviated	0.0	0.1	0.3

End of Certificate

*The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

เอกสารไม่ควบคุม

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Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok
10260

Certificate No : 22-ACT-105

Request No : Req-2022-0229

Unit Under Calibration Details

Measurement item : Sound Level Meter
Manufacturer : LARSON DAVIS
Model : LxT2
Serial Number : 0005396
ID : UAE-EFM.033/2564
Resolution : 0.1 dB
Microphone Class : 2
Microphone Model : 375A04
Microphone S/N : 329030
Preamplifier Model : FRMLxT2C
Preamplifier S/N : 073812
Instrument Status : Used

Calibration Environment and Details

Temperature : $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$
Humidity : $50\%RH \pm 20\%RH$
Barometric Pressure : $1013\text{ hPa} \pm 10\text{ hPa}$
Received Date : 31 January 2022
Calibrated Date : 11 February 2022
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3 : 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests
Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	S/N	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	15 September 2022	GRAS
Multi-frequency Calibrator	Quest	Quest cal	EFA000224	14 June 2022	TSI
Audio Generator	Svanick	Svan401	131	18 October 2022	WK Electric

Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %.

Cal

Issue Date : 11 February 2022

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Certificate No : 22-ACT-105
Request No : Req-2022-0229

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		Adjust		UNCERTAINTY	Acceptance Limit
FAST / A / 37-139	Level	UUC	ERR	UUC	ERR	(\pm dB)	(\pm dB)
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)		
1000 Hz 114.00 dB	113.85	113.9	+0.05	113.9	0.05	0.20	0.3

Note: Absolute sensitivity was established by the use of Sound Calibrator Brand SYANTEK, Model SV 35A, SN 58979

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139	(dB)	(\pm dB)
UUC Weighting		
A	27.8	0.10

3. Self-generated noise, Microphone replaced by the electrical input signal device

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139	(dB)	(\pm dB)
UUC Weighting		
A	27.8	0.10
C	27.3	0.10
Z	33.1	0.10

4. Acoustic signal test of frequency weightings (Without Windscreen)

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY	Acceptance Limit
FAST / 37-139	A	C	Z	(\pm dB)	(\pm dB)
STD Setting	(dB)	(dB)	(dB)		
125 Hz	0.3	0.1	0.2	0.50	2.0
1000 Hz	0.0	0.0	0.0	0.60	1.0
4000 Hz	0.6	0.5	0.6	0.60	3.0
8000 Hz	0.3	0.0	0.2	0.70	5.0

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FIM-708-SLM-01 Rev.0 Issue date 01/07/21

เอกสารไม่ควบคุม

Certificate No : 22-ACT-105
Request No : Req-2022-0229

5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY	Acceptance Limit
FAST / 37-139	A (dB)	C (dB)	Z (dB)	(\pm dB)	(\pm dB)
STD Setting					
63 Hz	-0.2	0.0	0.0	0.2	2.0
125 Hz	-0.1	0.0	0.0		1.5
250 Hz	-0.1	0.0	0.0		1.5
500 Hz	-0.1	0.0	0.0		1.5
1000 Hz	0.0	0.0	0.0		1.0
2000 Hz	0.0	0.1	0.0		2.0
4000 Hz	0.0	0.0	0.0		3.0
8000 Hz	0.0	0.0	0.0		5.0
16000 Hz	-0.1	-0.1	-0.1		+3, -INF

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance Limit
FAST / 37-139	REF	UUC	ERR	(\pm dB)	(\pm dB)
UUC Weighting	(dB)	(dB)	(dB)		
A	134.00	134.0	0.0	0.2	0.2
C	134.00	134.0	0.0		0.2
Z	134.00	134.0	0.0		0.2

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance Limit
37-139 / A	REF	UUC	ERR	(\pm dB)	(\pm dB)
UUC Time Response	(dB)	(dB)	(dB)		
Fast	134.00	134.0	0.0	0.2	0.1
Slow	134.00	134.0	0.0		0.1
Log	134.00	134.0	0.0		0.1

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FIM-708-SLM-01 Rev.0 Issue date 01/07/21

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Certificate No : 22-ACT-105
Request No : Req-2022-0229

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit
FAST / A / 37-139	UUC	(\pm dB)	(\pm dB)
STD Setting	(dB)		
Initial	114.0	0.1	0.3
Final	114.0		
Deviated	0.0		

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY	Acceptance Limit
FAST / A / 37-139	REF	UUC	ERR	(\pm dB)	(\pm dB)
STD dB	(dB)	(dB)	(dB)		
129.00	129	129.0	0.0	0.3	1.1
130.00	130	130.0	0.0		1.1
131.00	131	131.0	0.0		1.1
132.00	132	132.0	0.0		1.1
133.00	133	133.0	0.0		1.1
134.00	134	134.0	0.0		1.1
135.00	135	135.0	0.0		1.1
136.00	136	136.0	0.0		1.1
137.00	137	137.0	0.0		1.1
138.00	138	138.0	0.0		1.1
139.00	139	139.0	0.0		1.1
140.00	140	140.0	0.0		1.1
141.00	141	141.0	0.0		1.1
142.00	142	142.0	0.0		1.1
143.00	143	143.0	0.0		1.1
144.00	144	144.0	0.0		1.1
145.00	145	145.0	0.0		1.1
146.00	146	146.0	0.0		1.1
147.00	147	147.0	0.0		1.1
148.00	148	148.0	0.0		1.1
149.00	149	149.0	0.0		1.1
150.00	150	150.0	0.0		1.1
151.00	151	151.0	0.0		1.1
152.00	152	152.0	0.0		1.1
153.00	153	153.0	0.0		1.1
154.00	154	154.0	0.0		1.1

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FIM-708-SLM-01 Rev.0 Issue date 01/07/21

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Certificate No : 22-ACT-105
Request No : Req-2022-0229

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance Limit
FAST / A	REF	UUC	ERR	(\pm dB)	(\pm dB)
UUC Range	(dB)	(dB)	(dB)		
37-139	43.2	42.8	-0.4	0.3	1.1
	114	114.0	0.0		1.1

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY	Acceptance Limit
A / 37-139	Timeburst	Ref	UUC	ERR	(\pm dB)	(\pm dB)
UUC Time Response	(ms)	(dB)	(dB)	(dB)		
Fast	200	135.0	134.0	-0.1	0.3	1.0
	2	118.0	117.6	-0.4		+1.0, -2.5
	0.25	109.0	108.7	-0.3		+1.3, -5.0
Slow	200	128.6	128.5	-0.1		1.0
	2	109.0	108.9	-0.1		+1.0, -5.0
	0.25	109.0	108.9	-0.1		1.0
SEL	200	129.0	129.0	0.0	0.3	+1.0, -2.5
	2	109.0	108.9	-0.1		+1.0, -2.5
	0.25	100.0	100.0	0.0		+1.5, -5.0

11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY	Acceptance Limit
FAST / C / 95-142	REF	UUC	ERR	(\pm dB)	(\pm dB)
STD Setting	(dB)	(dB)	(dB)		
Complete cycle	137.4	136.7	-0.70	0.2	3.0
Positive half cycle	136.4	136.2	-0.20		2.0
Negative half cycle	136.4	136.2	-0.20		2.0

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FIM-708-SLM-01 Rev.0 Issue date 01/07/21

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Certificate No : 22-ACT-105
Request No : Req-2022-0229

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12. Overload Indication

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit
FAST / A / 37-139	UUC		
STD Setting	(dB)	(\pm dB)	(\pm dB)
Positive one-half cycle	141.7		
Negative one-half cycle	141.8		
Deviated	-0.1	0.2	1.5

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit
FAST / A / 37-139	UUC		
STD Setting	(dB)	(\pm dB)	(\pm dB)
Initial	138.0		
Final	138.0		
Deviated	0.0	0.1	0.5

End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

PM: 108.5124-01 Rev. 04 issue date 01/07/19

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Certificate of Calibration

Customer : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address : 31 Soi Udonnuk 41, Sukhumvit Road, Bangchak, Prathung, Bangkok 10260
Certificate No : 22-ACT-035
Request No : Req-2022-0394

Unit Under Calibration Details

Measurement item : Sound Level Meter
Microphone Class : 2
Manufacturer : LARSON DAVIES
Microphone Model : 375A04
Model : LX72
Microphone SN : 128675
Serial Number : 0005398
Preamplifier Model : PSM42C
ID : UAE.FM.035/2864
Preamplifier SN : 873793
Resolution : 0.1 dB
Instrument Status : Used

Calibration Environment and Details

Temperature : 23 \pm 2 $^{\circ}$ C
Humidity : 50 %RH \pm 20 %RH
Barometric Pressure : 1013 hPa \pm 10 hPa
Received Date : 14 January 2022
Calibrated Date : 21 January 2022
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61073-3: 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests
Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	SN	Due calibration	Traceability
Standard Microphone	GRAS	40AN	100373	15 September 2022	GRAS
Multifrequency Calibrator	Queset	Queset	EF4000234	14 June 2022	TSL
Audio Generator	Scantek	Scantek	131	18 October 2022	WK Electric

Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %.



The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

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PM: 108.5124-01 Rev. 04 issue date 01/07/19

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Certificate No : 22-ACT-035
Request No : Req-2022-0094

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust	Adjust	UNCERTAINTY	Acceptance Limit
FAST / A / 37-139	Level	UUC	ERR	UUC	ERR
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)
1000 Hz 114.90 dB	113.85	114.0	+0.15	113.9	0.05
				0.20	0.3

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SYNTEK, Model SV 35A, SN.58079.

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	(\pm dB)
A	28.1	0.30

3. Self-generated noise, Microphone replaced by the electrical input signal device

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	(\pm dB)
A	27.9	0.10
C	27.5	0.10
Z	31.9	0.10

4. Acoustic signal test of frequency weightings (Without Windscreen)

UUC Setting	Deviation from various Frequency Weighting Response curve	UNCERTAINTY	Acceptance Limit
FAST / 37-139	A C Z	(\pm dB)	(\pm dB)
STD Setting	(dB) (dB) (dB)		
125 Hz	0.0 0.0 0.0	0.50	2.0
1000 Hz	0.0 0.0 0.0	0.50	1.0
4000 Hz	0.4 0.5 0.2	0.60	3.0
8000 Hz	-0.1 -0.2 -0.1	0.70	5.0

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

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PM: 108.5124-01 Rev. 04 issue date 01/07/19

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Certificate No : 22-ACT-035
Request No : Req-2022-0094

5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz

UUC Setting	Deviation from various Frequency Weighting Response curve	UNCERTAINTY	Acceptance Limit
FAST / 37-139	A (dB) C (dB) Z (dB)	(\pm dB)	(\pm dB)
STD Setting			
63 Hz	-0.2 -0.1 -0.1	0.2	2.0
125 Hz	-0.1 0.0 -0.1		1.5
250 Hz	-0.1 0.0 -0.1		1.5
500 Hz	-0.1 0.0 -0.1		1.5
1000 Hz	0.0 0.0 0.0		1.0
2000 Hz	0.0 0.0 0.0		2.0
4000 Hz	0.0 0.0 0.0		3.0
8000 Hz	-0.1 -0.1 0.0		5
16000 Hz	-0.1 -0.1 -0.1		+5, -INF.

6. Frequency and time weightings at 10Hz

UUC Setting	STD	Measured	UNCERTAINTY	Acceptance Limit
FAST / 37-139	REF	UUC	ERR	(\pm dB)
UUC Weighting	(dB)	(dB)	(dB)	(\pm dB)
A	114.00	114.0	0.0	0.2
C	114.00	114.0	0.0	0.2
Z	114.00	114.0	0.0	0.2

UUC Setting	STD	Measured	UNCERTAINTY	Acceptance Limit
37-139 / A	REF	UUC	ERR	(\pm dB)
UUC Time Response	(dB)	(dB)	(dB)	(\pm dB)
Fast	114.00	114.0	0.0	0.1
Slow	114.00	114.0	0.0	0.1
Log	114.00	114.0	0.0	0.1

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เอกสารไม่ควบคุม

PM: 108.5124-01 Rev. 04 issue date 01/07/19

Certificate No : 22-ACT-025
Request No : Req-2022-0094

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC	(± dB)	Limit (± dB)
STD Setting	(dB)		
Initial	114.0		
Final	114.0		
Deviation	0.0	0.1	0.3

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation	UNCERTAINTY	Acceptance
FAST / A / 37-139	REF	UUC	ERR	Limit
STD dB	(dB)	(dB)	(dB)	(± dB)
139.00	139	139.0	0.0	1.1
134.00	134	134.0	0.0	1.1
129.00	129	129.0	0.0	1.1
124.00	124	124.0	0.0	1.1
119.00	119	119.0	0.0	1.1
114.00	114	114.0	0.0	1.1
109.00	109	109.0	0.0	1.1
104.00	104	104.0	0.0	1.1
99.00	99	99.0	0.0	1.1
94.00	94	93.9	-0.1	1.1
89.00	89	88.9	-0.1	1.1
84.00	84	83.9	-0.1	1.1
79.00	79	78.9	-0.1	1.1
74.00	74	73.9	-0.1	1.1
69.00	69	69.0	0.0	1.1
64.00	64	63.9	-0.1	1.1
59.00	59	59.0	0.0	1.1
54.00	54	54.0	0.0	1.1
49.00	49	49.0	0.0	0.8
44.00	44	44.1	0.1	1.1
39.00	39	39.3	0.3	1.1
34.00	34	34.3	0.3	1.1
29.00	29	29.5	0.5	1.1

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Calibration Laboratory. (10/10)
เอกสารไม่ควบคุม

Certificate No : 22-ACT-035
Request No : Req-2022-0094

9. Level linearity including the level range control

UUC Setting	STD	Measured	UNCERTAINTY	Acceptance
FAST / A	REF	UUC	ERR	Limit
UUC Range	(dB)	(dB)	(dB)	(± dB)
37-139	43.2	43.4	0.2	1.1
	114	114.0	0.0	1.1

10. Tone burst response

UUC Setting	STD	Anticipated	Measured	UNCERTAINTY	Acceptance
A / 37-139	Toneburst	Ref	UUC	ERR	Limit
UUC Time Response	(ms)	(dB)	(dB)	(dB)	(± dB)
Fast	200	135.0	133.0	0.0	1
	2	118.0	117.9	-0.1	+1.0, -2.5
	0.25	100.0	100.7	-0.3	+1.5, -5.0
Slow	200	128.6	128.5	-0.1	1
	2	100.0	100.9	-0.1	+1.0, -5.0
SEL	200	129.0	129.0	0.0	1
	2	100.0	100.1	+0.1	+1.0, -2.5
	0.25	100.0	99.9	-0.1	+1.5, -5.0

11. Peak C Sound level

UUC Setting	Anticipated	Measured	UNCERTAINTY	Acceptance
FAST / C / 95-142	REF	UUC	ERR	Limit
STD Setting	(dB)	(dB)	(dB)	(± dB)
Complete cycle	137.4	136.8	-0.60	3.0
Positive half cycle	136.4	136.1	-0.30	2.0
Negative half cycle	136.4	136.1	-0.30	2.0

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Calibration Laboratory. (10/10)
เอกสารไม่ควบคุม

Certificate No : 22-ACT-035
Request No : Req-2022-0094

12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC	(± dB)	Limit (± dB)
STD Setting	(dB)		
Positive one-half cycle	142.3		
Negative one-half cycle	142.0		
Deviation	0.3	0.2	1.5

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC	(± dB)	Limit (± dB)
STD Setting	(dB)		
Initial	128.0		
Final	128.0		
Deviation	0.0	0.1	0.3

End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Calibration Laboratory. (10/10)
เอกสารไม่ควบคุม

Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Prakanong, (Bangkok)
10260

Certificate No : 22-ACT-036
Request No : Req-2022-0095

Unit Under Calibration Details

Measurement Item : Sound Level Meter
Manufacturer : LARSON DAVIS
Model : LxT2
Serial Number : 0092406
ID : UAEFM0372564
Resolution : 0.1 dB
Microphone Class : 2
Microphone Model : 275A04
Microphone S/N : 328876
Preamplifier Model : FRMLxTXC
Preamplifier S/N : 073863
Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 2 °C
Humidity : 50 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 14 January 2022
Calibrated Date : 21 January 2022
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3 : 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests
Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	S/N	Due calibration	Traceability
Standard Microphone	GRAS	40AN	183273	15 September 2022	GRAS
Multi-frequency Calibrator	Quest	Quacal	EFA000234	14 June 2022	ISI
Audio Generator	Swank	Swan401	131	18 October 2022	WK Electric

Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %.



The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Calibration Laboratory. (10/10)
เอกสารไม่ควบคุม

Certificate No : 22-ACT-036
Request No : Req-2022-0095

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust	Adjust	UNCERTAINTY	Acceptance Limit
FAST / A / 37-139	Level	UUC	ERR	UUC	ERR
Calibrator Setting	(dB)	(dB)	(dB)	(\pm dB)	(\pm dB)
100 Hz 114.00 dB	113.85	113.9	+0.05	113.9	0.05

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTEK, Model SV 35A, SN 58079

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	(\pm dB)
A	29.0	0.30

3. Self-generated noise, Microphone replaced by the electrical input signal device

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	(\pm dB)
A	28.8	0.30
C	28.2	0.30
Z	32.9	0.30

4. Acoustic signal test of frequency weightings (Without Windscreen)

UUC Setting	Deviation from various Frequency Weighting Response curve	UNCERTAINTY	Acceptance Limit
FAST / 37-139	A C Z	(\pm dB)	(\pm dB)
STD Setting	(dB) (dB) (dB)		
125 Hz	-0.1 0.1 0.0	0.30	2.0
1000 Hz	0.0 0.0 0.0	0.60	1.0
4000 Hz	0.5 0.5 0.6	0.60	3.0
8000 Hz	0.4 0.4 0.5	0.70	3.0

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เอกสารไม่ควบคุม

Certificate No : 22-ACT-036
Request No : Req-2022-0095

5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz

UUC Setting	Deviation from various Frequency Weighting Response curve	UNCERTAINTY	Acceptance Limit
FAST / 37-139	A (dB) C (dB) Z (dB)	(\pm dB)	(\pm dB)
STD Setting			
63 Hz	-0.2 -0.1 0.0	0.2	2.0
125 Hz	-0.1 0.0 0.0		1.5
250 Hz	-0.1 0.0 0.0		1.5
500 Hz	-0.1 0.0 0.0		1.5
1000 Hz	0.0 0.0 0.0		1.0
2000 Hz	0.0 0.0 0.0		2.0
4000 Hz	0.0 0.0 0.0		3.0
8000 Hz	-0.1 0.0 0.0		5
16000 Hz	-0.1 -0.1 0.0		+5, -INF

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured	UNCERTAINTY	Acceptance Limit
FAST / 37-139	REF	UUC	ERR	(\pm dB)
UUC Weighting	(dB)	(dB)	(dB)	(\pm dB)
A	114.00	114.0	0.0	0.2
C	114.00	114.0	0.0	0.2
Z	114.00	114.0	0.0	0.2

UUC Setting	STD	Measured	UNCERTAINTY	Acceptance Limit
37-139 / A	REF	UUC	ERR	(\pm dB)
UUC Time Response	(dB)	(dB)	(dB)	(\pm dB)
Fast	114.00	114.0	0.0	0.1
Slow	114.00	114.0	0.0	0.1
Log	114.00	114.0	0.0	0.1

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เอกสารไม่ควบคุม

Certificate No : 22-ACT-036
Request No : Req-2022-0095

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit
FAST / A / 37-139	UUC	(\pm dB)	(\pm dB)
STD Setting	(dB)		
Initial	114.0		
Final	114.0		
Deviated	0.0	0.1	0.2

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation	UNCERTAINTY	Acceptance Limit
FAST / A / 37-139	REF	UUC	ERR	(\pm dB)
STD dB	(dB)	(dB)	(dB)	(\pm dB)
139.00	139	139.0	0.0	1.1
134.00	134	134.0	0.0	1.1
129.00	129	129.0	0.0	1.1
124.00	124	124.0	-0.0	1.1
119.00	119	119.0	0.0	1.1
114.00	114	114.0	0.0	1.1
109.00	109	109.0	0.0	1.1
104.00	104	104.0	0.0	1.1
99.00	99	99.0	0.0	1.1
94.00	94	93.9	-0.1	1.1
89.00	89	88.9	-0.1	1.1
84.00	84	83.9	-0.1	1.1
79.00	79	78.9	-0.1	1.1
74.00	74	73.9	-0.1	1.1
69.00	69	69.0	0.0	1.1
64.00	64	63.9	-0.1	1.1
59.00	59	59.0	0.0	1.1
54.00	54	54.0	0.0	1.1
49.00	49	49.0	0.0	0.8
44.00	44	44.1	0.1	1.1
39.00	39	39.2	0.2	1.1
34.00	34	34.3	0.3	1.1
29.00	29	29.5	0.5	1.1

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เอกสารไม่ควบคุม

Certificate No : 22-ACT-036
Request No : Req-2022-0095

9. Level linearity including the level range control

UUC Setting	STD	Measured	UNCERTAINTY	Acceptance Limit
FAST / A	REF	UUC	ERR	(\pm dB)
UUC Range	(dB)	(dB)	(dB)	(\pm dB)
37-139	42.9	42.2	0.3	1.1
	114	114.0	0.0	1.1

10. Tone burst response

UUC Setting	STD	Anticipated	Measured	UNCERTAINTY	Acceptance Limit
A / 37-139	Touchard	Ref	UUC	ERR	(\pm dB)
UUC Time Response	(ms)	(dB)	(dB)	(dB)	(\pm dB)
Fast	200	135.9	135.0	0.0	1
	2	118.0	117.8	-0.2	+1.0, -2.0
	0.25	109.0	108.8	-0.2	+1.0, -2.0
Slow	200	128.6	128.5	-0.1	1
	2	109.0	108.8	-0.2	+1.0, -2.0
	200	129.0	129.0	0.0	1
SEL	2	109.0	109.0	0.0	+1.0, -2.0
	0.25	100.0	99.9	-0.1	+1.0, -2.0

11. Peak C Sound level

UUC Setting	Anticipated	Measured	UNCERTAINTY	Acceptance Limit
FAST / C / 95-142	REF	UUC	ERR	(\pm dB)
STD Setting	(dB)	(dB)	(dB)	(\pm dB)
Complete cycle	137.4	136.9	-0.30	3.0
Positive half cycle	136.4	136.2	-0.20	2.0
Negative half cycle	136.4	136.2	-0.20	2.0

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the responsible party. The results are valid only for the item calibrated. The certificate shall not be reproduced except in full, without written approval of the responsible party. The results are valid only for the item calibrated.

เอกสารไม่ควบคุม

Certificate No : 22-ACT-006
Request No : Req-2022-0095

12. Overload Indication

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit
FAST / A / 37-139	UUC	(± dB)	(± dB)
STD Setting	(dB)		
Positive one-half cycle	142.1		
Negative one-half cycle	141.9		
Deviant	0.2	0.2	1.5

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit
FAST / A / 37-139	UUC	(± dB)	(± dB)
STD Setting	(dB)		
Initial	133.0		
Final	133.0		
Deviant	0.0	0.1	0.3

End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.
เอกสารไม่ควบคุม

Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address : 81 Soi Udomrak 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok
10260

Certificate No : 22-ACT-103
Request No : Req-2022-0230

Unit Under Calibration Details

Measurement item : Sound Level Meter
Manufacturer : LARSON DAVIS
Model : LxT2
Serial Number : 0005402
ID : UAE-EFM.0382564
Resolution : 0.1 dB
Microphone Class : 2
Microphone Model : 375A04
Microphone S/N : 328668
Preamplifier Model : PRMLAT2C
Preamplifier S/N : 071540
Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 2 °C
Humidity : 50 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 31 January 2022
Calibrated Date : 11 February 2022
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3:2013 Electroacoustics - Sound level meters - Part 3: Periodic tests
Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	S/N	Our calibration	Traceability
Standard Microphone	GRAS	40AN	188273	15 September 2022	GRAS
Multi-frequency Calibrator	Quest	Quest-cal	EFA000254	14 June 2022	TSI
Audio Generator	Svante	Svante	131	18 October 2022	WK Electric

Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %.

Issue Date : 11 February 2022

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

PM-700-SLM-01 Rev.0 Issue date 01/07/21

เอกสารไม่ควบคุม

Certificate No : 22-ACT-103
Request No : Req-2022-0230

1. Indication at the calibration check frequency

UUC Setting	Measured	Before Adjust	Adjust	UNCERTAINTY	Acceptance Limit
FAST / A / 37-139	Level	UUC	ERR	UUC	ERR
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)
1000 Hz 114.00 dB	113.85	114.0	+0.15	113.9	0.05
				0.20	0.3

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTEK, Model SV 35A, SN.58079

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	(± dB)
A	28.1	6.10

3. Self-generated noise, Microphone replaced by the electrical input signal device

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	(± dB)
A	28.1	6.10
C	27.9	6.10
Z	34.4	6.10

4. Acoustic signal test of frequency weightings (Without Windscreen)

UUC Setting	Deviation from various Frequency Weighting Response curve	UNCERTAINTY	Acceptance Limit
FAST / 37-139	A C Z	(± dB)	(± dB)
STD Setting	(dB) (dB) (dB)		
125 Hz	0.0 0.1 0.1	0.59	2.0
1000 Hz	0.0 0.0 0.0	0.69	3.0
4000 Hz	0.9 0.9 1.0	0.60	3.0
8000 Hz	0.7 0.7 0.8	0.79	5.0

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

PM-700-SLM-01 Rev.0 Issue date 01/07/21

เอกสารไม่ควบคุม

Certificate No : 22-ACT-103
Request No : Req-2022-0230

5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz

UUC Setting	Deviation from various Frequency Weighting Response curve	UNCERTAINTY	Acceptance Limit
FAST / 37-139	A (dB) C (dB) Z (dB)	(± dB)	(± dB)
STD Setting			
63 Hz	-0.2 0.0 0.0		2.0
125 Hz	-0.1 0.0 0.0		1.5
250 Hz	-0.1 0.0 0.0		1.5
500 Hz	-0.1 0.0 0.0		1.5
1000 Hz	0.0 0.0 0.0	0.2	1.0
2000 Hz	0.0 0.1 0.0		2.0
4000 Hz	0.0 0.0 0.0		3.0
8000 Hz	0.0 0.0 0.0		5.0
16000 Hz	-0.1 -0.1 -0.1		+5, -INF.

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured	UNCERTAINTY	Acceptance Limit
FAST / 37-139	REF	UUC ERR	(± dB)	(± dB)
UUC Weighting	(dB)	(dB) (dB)		
A	114.00	114.0 0.0	0.2	0.2
C	114.00	114.0 0.0	0.2	0.2
Z	114.00	114.0 0.0	0.2	0.2

UUC Setting	STD	Measured	UNCERTAINTY	Acceptance Limit
37-139 / A	REF	UUC ERR	(± dB)	(± dB)
UUC Time Response	(dB)	(dB) (dB)		
Fast	114.00	114.0 0.0	0.2	0.1
Slow	114.00	114.0 0.0	0.2	0.1
Imp	114.00	114.0 0.0	0.2	0.1

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

PM-700-SLM-01 Rev.0 Issue date 01/07/21

เอกสารไม่ควบคุม

Certificate No : 22-ACT-103
Request No : Req-2022-0230

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC		Limit
STD Setting	(dB)	(± dB)	(± dB)
Initial	114.0		
Final	114.0		
Deviated	0.0	0.1	0.3

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation	UNCERTAINTY	Acceptance
FAST / A / 37-139	REF	UUC	ERR	Limit
STD dB	(dB)	(dB)	(dB)	(± dB)
139.00	139	139.0	0.0	1.1
134.00	134	134.0	0.0	1.1
129.00	129	129.0	0.0	1.1
124.00	124	124.0	0.0	1.1
119.00	119	119.0	0.0	1.1
114.00	114	114.0	0.0	1.1
109.00	109	109.0	0.0	1.1
104.00	104	104.0	0.0	1.1
99.00	99	99.0	0.0	1.1
94.00	94	94.0	0.0	1.1
89.00	89	89.0	0.0	1.1
84.00	84	84.0	0.0	1.1
79.00	79	79.0	0.0	1.1
74.00	74	74.0	0.0	1.1
69.00	69	69.0	0.0	1.1
64.00	64	64.0	0.0	1.1
59.00	59	59.0	0.0	1.1
54.00	54	54.0	0.0	1.1
49.00	49	49.0	0.0	1.1
44.00	44	44.0	0.0	1.1
39.00	39	39.0	0.1	1.1
34.00	38	38.3	0.3	1.1

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FSM-708-SLM-01 Rev.0 Issue Date: 01/07/21

เอกสารไม่ควบคุม

Certificate No : 22-ACT-103
Request No : Req-2022-0230

9. Level linearity including the level range control

UUC Setting	STD	Measured	UNCERTAINTY	Acceptance
FAST / A	REF	UUC	ERR	Limit
UUC Range	(dB)	(dB)	(dB)	(± dB)
37-139	43.2	42.9	-0.3	1.1
	114	114.0	0.0	1.1

10. Tone burst response

UUC Setting	STD	Anticipated	Measured	UNCERTAINTY	Acceptance
A / 37-139	Toneburst	Ref	UUC	ERR	Limit
UUC Time Response	(ms)	(dB)	(dB)	(dB)	(± dB)
Fast	200	133.6	133.0	0.0	1.0
	2	118.0	117.7	-0.3	+1.0, -2.5
	0.25	109.0	108.7	-0.3	+1.5, -5.0
Slow	200	128.6	128.3	-0.3	1.0
	2	109.0	108.9	-0.1	+1.0, -5.0
	0.25	129.0	129.0	0.0	1.0
SEL	200	129.0	129.0	0.0	+1.0, -2.5
	2	109.0	109.0	0.0	+1.5, -5.0
	0.25	100.0	99.9	-0.1	

11. Peak C sound level

UUC Setting	Anticipated	Measured	UNCERTAINTY	Acceptance
FAST / C / 95-142	REF	UUC	ERR	Limit
STD Setting	(dB)	(dB)	(dB)	(± dB)
Complete cycle	137.4	136.7	-0.70	3.0
Positive half cycle	136.4	136.1	-0.30	2.0
Negative half cycle	136.4	136.2	-0.20	2.0

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FSM-708-SLM-01 Rev.0 Issue Date: 01/07/21

เอกสารไม่ควบคุม

Certificate No : 22-ACT-101
Request No : Req-2022-0230

12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC		Limit
STD Setting	(dB)	(± dB)	(± dB)
Positive one-half cycle	142.2		
Negative one-half cycle	142.1		
Deviated	-0.1	0.2	1.3

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC		Limit
STD Setting	(dB)	(± dB)	(± dB)
Initial	135.0		
Final	135.0		
Deviated	0.0	0.1	0.3

End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FSM-708-SLM-01 Rev.0 Issue Date: 01/07/21

เอกสารไม่ควบคุม

Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangkok, Prakanong, Bangkok
10260

Certificate No : 22-ACT-101
Request No : Req-2022-0231

Unit Under Calibration Details

Measurement item : Sound Level Meter
Microphone Class : 2
Manufacturer : LARSON DAVIS
Microphone Model : 375A04
Model : LX12
Microphone S/N : 329260
Serial Number : 0005405
Preamplifier Model : PRMLA12C
ID : UAE-EFM-041/2564
Preamplifier S/N : 073800
Resolution : 0.1 dB
Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 2 °C
Humidity : 50 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 kPa
Received Date : 31 January 2022
Calibrated Date : 11 February 2022
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3:2013 Electroacoustics - Sound level meters - Part 3: Periodic tests
Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	S/N	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	15 September 2022	GRAS
Multi-frequency Calibrator	Quest	Quest-cal	EFA000234	14 June 2022	TSI
Audio Generator	Svanteck	Svan401	131	18 October 2022	WK Electric

Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %.

Issue Date : 11 February 2022

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FSM-708-SLM-01 Rev.0 Issue Date: 01/07/21

เอกสารไม่ควบคุม

Certificate No : 22-ACT-191
Request No : Req-2022-0231

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust	Adjust	UNCERTAINTY	Acceptance Limit
FAST / A / 37-139	Level	UUC	ERR	UUC	ERR
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)
1090 Hz: 114.00 dB	113.85	113.9	+0.05	113.9	0.05
				(± dB)	(± dB)
				0.20	0.5

Note : Absolute sensitivity was established by the use of Sound Calibrator Braud SVANTEK, Model SV 35A, SN.5879

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	(± dB)
A	27.3	6.10

3. Self-generated noise, Microphone replaced by the electrical input signal device

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	(± dB)
A	27.6	6.10
C	27.3	6.10
Z	33.2	6.10

4. Acoustic signal test of frequency weightings (Without Windscreen)

UUC Setting	Deviation from various Frequency Weighting Response curve	UNCERTAINTY	Acceptance Limit
FAST / 37-139	A C Z	(± dB)	(± dB)
STD Setting	(dB) (dB) (dB)		
125 Hz	0.0 0.1 0.1	0.50	2.0
1000 Hz	0.0 0.0 0.0	0.60	1.0
4000 Hz	0.2 0.2 0.2	0.60	3.0
8000 Hz	-0.1 -0.1 0.0	0.70	5.0

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd

FSM-TSR-02.04-01 Rev.0 Issue date 01/07/21

เอกสารไม่ควบคุม

Certificate No : 22-ACT-191
Request No : Req-2022-0231

5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz

UUC Setting	Deviation from various Frequency Weighting Response curve	UNCERTAINTY	Acceptance Limit
FAST / 37-139	A (dB) C (dB) Z (dB)	(± dB)	(± dB)
STD Setting			
63 Hz	-0.2 0.0 0.0	0.2	2.0
125 Hz	-0.1 0.0 0.0		1.5
250 Hz	-0.1 0.0 0.0		1.5
500 Hz	-0.1 0.0 0.0		1.5
1000 Hz	0.0 0.0 0.0		1.0
2000 Hz	0.0 0.0 0.0		2.0
4000 Hz	0.0 0.0 0.0		3.0
8000 Hz	0.0 0.0 0.0		5
16000 Hz	-0.1 -0.1 -0.1		+5, -INF.

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured	UNCERTAINTY	Acceptance Limit
FAST / 37-139	REF	UUC	ERR	(± dB) (± dB)
UUC Weighting	(dB)	(dB)	(dB)	
A	114.00	114.0	0.0	0.2
C	114.00	114.0	0.0	0.2
Z	114.00	114.0	0.0	0.2

UUC Setting	STD	Measured	UNCERTAINTY	Acceptance Limit
37-139 / A	REF	UUC	ERR	(± dB) (± dB)
UUC Time Response	(dB)	(dB)	(dB)	
Fast	114.00	114.0	0.0	0.1
Slow	114.00	114.0	0.0	0.1
Log	114.00	114.0	0.0	0.1

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd

FSM-TSR-02.04-01 Rev.0 Issue date 01/07/21

เอกสารไม่ควบคุม

Certificate No : 22-ACT-191
Request No : Req-2022-0231

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit
FAST / A / 37-139	UUC	(± dB)	(± dB)
STD Setting	(dB)		
Initial	114.0		
Final	114.0		
Deviated	0.0	0.1	0.3

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation	UNCERTAINTY	Acceptance Limit
FAST / A / 37-139	REF	UUC	ERR	(± dB) (± dB)
STD dB	(dB)	(dB)	(dB)	
139.00	139	139.0	0.0	1.1
134.00	134	134.0	0.0	1.1
129.00	129	129.0	0.0	1.1
124.00	124	124.0	0.0	1.1
119.00	119	119.0	0.0	1.1
114.00	114	114.0	0.0	1.1
109.00	109	109.0	0.0	1.1
104.00	104	104.0	0.0	1.1
99.00	99	99.0	0.0	1.1
94.00	94	93.9	-0.1	1.1
89.00	89	88.9	-0.1	1.1
84.00	84	83.9	-0.1	1.1
79.00	79	78.9	-0.1	1.1
74.00	74	74.0	0.0	1.1
69.00	69	69.0	0.0	1.1
64.00	64	64.1	0.1	1.1
59.00	59	59.0	0.0	1.1
54.00	54	54.0	0.0	1.1
49.00	49	49.0	0.0	1.1
44.00	44	44.1	0.1	1.1
39.00	39	39.2	0.2	1.1
34.00	34	34.4	0.4	1.1

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd

FSM-TSR-02.04-01 Rev.0 Issue date 01/07/21

เอกสารไม่ควบคุม

Certificate No : 22-ACT-191
Request No : Req-2022-0231

9. Level linearity including the level range control

UUC Setting	STD	Measured	UNCERTAINTY	Acceptance Limit
FAST / A	REF	UUC	ERR	(± dB) (± dB)
UUC Range	(dB)	(dB)	(dB)	
37-139	43.0	43.6	-0.3	1.1
	114	114.0	0.0	1.1

10. Tone burst response

UUC Setting	STD	Anticipated	Measured	UNCERTAINTY	Acceptance Limit
A / 37-139	Toneburst	Ref	UUC	ERR	(± dB) (± dB)
UUC Time Response	(ms)	(dB)	(dB)	(dB)	
Fast	200	135.0	134.9	-0.1	1
	2	118.0	117.6	-0.4	+1.0, -2.5
	0.25	109.0	108.8	-0.2	+1.1, -5.0
Slow	200	128.6	128.5	-0.1	1
	2	109.0	108.8	-0.2	+1.0, -5.0
	200	129.0	129.0	0.0	1
	2	109.0	109.0	0.0	+1.0, -2.5
	0.25	100.0	100.0	0.0	+1.5, -5.0

11. Peak C Sound level

UUC Setting	Anticipated	Measured	UNCERTAINTY	Acceptance Limit
FAST / C / 95-142	REF	UUC	ERR	(± dB) (± dB)
STD Setting	(dB)	(dB)	(dB)	
Complete cycle	137.4	136.7	-0.70	3.0
Positive half cycle	136.4	136.2	-0.20	2.0
Negative half cycle	136.4	136.2	-0.20	2.0

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd

FSM-TSR-02.04-01 Rev.0 Issue date 01/07/21

เอกสารไม่ควบคุม

Certificate No : 22-ACT-181
Request No : Req-2022-9231

12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit
FAST / A / 37-139	UUC	(± dB)	Limit (± dB)
STD Setting	(dB)		
Positive one-half cycle	141.8		
Negative one-half cycle	141.9		
Deviated	-0.1	0.2	1.5

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit
FAST / A / 37-139	UUC	(± dB)	Limit (± dB)
STD Setting	(dB)		
Initial	138.0		
Final	138.0		
Deviated	0.0	0.1	0.5

End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-708-92-M-01 Rev.0 Issue date 01/07/19

เอกสารไม่ควบคุม

Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address : 81 Soi Udomak 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok 10260
Certificate No : 22-ACT-037
Request No : Req-2022-0096

Unit Under Calibration Details

Measurement item : Sound Level Meter
Manufacturer : LARSON DAVIS
Model : LT2
Serial Number : 0005407
ID : CAE.BFM.043/2264
Resolution : 0.1 dB
Microphone Class : 2
Microphone Model : 375A04
Microphone S/N : 329338
Preamplifier Model : PRM5LXTC
Preamplifier S/N : 071802
Intrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 2 °C
Humidity : 50 % RH ± 20 % RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 14 January 2022
Calibrated Date : 21 January 2022
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-1:2013 Electroacoustics - Sound level meters - Part 3: Periodic tests
Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	S/N	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	15 September 2022	GRAS
Multi-frequency Calibrator	Quest	Questval	EF400234	14 June 2022	TSM
Audio Generator	Stanck	54040	131	18 October 2022	WK Electric

Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %.



Issue Date : 21 January 2022

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

เอกสารไม่ควบคุม

Certificate No : 22-ACT-037
Request No : Req-2022-0096

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust	Adjust	UNCERTAINTY	Acceptance Limit
FAST / A / 37-139	Level	UUC	ERR	UUC	ERR
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)
1000 Hz 114.00 dB	113.85	113.9	+0.05	113.9	0.05
				(± dB)	(± dB)

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SYANTER, Model SV 35A, SN.58079

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	(± dB)
A	29.0	0.10

3. Self-generated noise, Microphone replaced by the electrical input signal device

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	(± dB)
A	28.8	0.10
C	28.1	0.10
Z	22.8	0.10

4. Acoustic signal test of frequency weightings (Without Windscreen)

UUC Setting	Deviation from various Frequency Weighting Response curve	UNCERTAINTY	Acceptance Limit
FAST / 37-139	A C Z	(± dB)	Limit
STD Setting	(dB) (dB) (dB)		(± dB)
125 Hz	0.0 0.1 0.1	0.50	2.0
1000 Hz	0.0 0.0 0.0	0.60	1.0
4000 Hz	0.0 0.1 0.1	0.60	1.0
8000 Hz	-0.5 -0.5 -0.4	0.70	1.0

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

เอกสารไม่ควบคุม

FM-708-92-M-01 Rev.0 Issue date 01/07/19

Certificate No : 22-ACT-037
Request No : Req-2022-0096

5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz

UUC Setting	Deviation from various Frequency Weighting Response curve	UNCERTAINTY	Acceptance Limit
FAST / 37-139	A (dB) C (dB) Z (dB)	(± dB)	Limit (± dB)
STD Setting			
63 Hz	-0.2 -0.1 0.0	0.2	2.0
125 Hz	-0.1 0.0 0.0		1.5
250 Hz	-0.1 0.0 0.0		1.5
500 Hz	-0.1 0.0 0.0		1.5
1000 Hz	0.0 0.0 0.0		1.0
2000 Hz	0.0 0.0 0.0		2.0
4000 Hz	0.0 0.0 0.0		3.0
8000 Hz	-0.1 -0.1 0.0		5
16000 Hz	-0.1 -0.1 -0.1		+0. -10B

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured	UNCERTAINTY	Acceptance Limit
FAST / 37-139	REF	UUC	ERR	Limit
UUC Weighting	(dB)	(dB)	(dB)	(± dB)
A	114.00	114.0	0.0	0.2
C	114.00	114.0	0.0	0.2
Z	114.00	114.0	0.0	0.2

UUC Setting	STD	Measured	UNCERTAINTY	Acceptance Limit
37-139 / A	REF	UUC	ERR	Limit
UUC Time Response	(dB)	(dB)	(dB)	(± dB)
Fast	114.00	114.0	0.0	0.1
Slow	114.00	114.0	0.0	0.1
Leq	114.00	114.0	0.0	0.1

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

เอกสารไม่ควบคุม

FM-708-92-M-01 Rev.0 Issue date 01/07/19

Certificate No : 22-ACT-037
Request No : Req-2022-0096

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC	(± dB)	Limit (± dB)
STD Setting	(dB)		
Initial	134.0	0.3	1.1
Final	134.0		
Deviant	0.0	6.1	0.3

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY	Acceptance
EAST / A / 27-129	REF	UUC	ERR		Limit
STD dB	(dB)	(dB)	(dB)	(± dB)	(± dB)
139.00	139	139.0	0.0	0.3	1.1
134.00	134	134.0	0.0		1.1
129.00	129	129.0	0.0		1.1
124.00	124	124.0	0.0		1.1
119.00	119	119.0	0.0		1.1
114.00	114	114.0	0.0		1.1
109.00	109	109.0	0.0		1.1
104.00	104	104.0	0.0		1.1
99.00	99	99.0	0.0		1.1
94.00	94	93.9	-0.1		1.1
89.00	89	88.9	-0.1		1.1
84.00	84	83.9	-0.1		1.1
79.00	79	78.9	-0.1		1.1
74.00	74	73.9	-0.1		1.1
69.00	69	69.0	0.0		1.1
64.00	64	64.0	0.0		1.1
59.00	59	59.0	0.0		1.1
54.00	54	54.0	0.0		1.1
49.00	49	49.0	0.0		0.8
44.00	44	44.1	0.1		1.1
39.00	39	39.1	0.1	1.1	
34.00	34	34.2	0.2	1.1	
29.00	29	29.2	0.2	1.1	
24.00	24	24.2	0.2	1.1	
19.00	19	19.2	0.2	1.1	
14.00	14	14.2	0.2	1.1	
9.00	9	9.2	0.2	1.1	
4.00	4	4.2	0.2	1.1	
-1.00	-1	-1.2	0.2	1.1	
-6.00	-6	-6.2	0.2	1.1	
-11.00	-11	-11.2	0.2	1.1	
-16.00	-16	-16.2	0.2	1.1	
-21.00	-21	-21.2	0.2	1.1	
-26.00	-26	-26.2	0.2	1.1	
-31.00	-31	-31.2	0.2	1.1	
-36.00	-36	-36.2	0.2	1.1	
-41.00	-41	-41.2	0.2	1.1	
-46.00	-46	-46.2	0.2	1.1	
-51.00	-51	-51.2	0.2	1.1	
-56.00	-56	-56.2	0.2	1.1	
-61.00	-61	-61.2	0.2	1.1	
-66.00	-66	-66.2	0.2	1.1	
-71.00	-71	-71.2	0.2	1.1	
-76.00	-76	-76.2	0.2	1.1	
-81.00	-81	-81.2	0.2	1.1	
-86.00	-86	-86.2	0.2	1.1	
-91.00	-91	-91.2	0.2	1.1	
-96.00	-96	-96.2	0.2	1.1	
-101.00	-101	-101.2	0.2	1.1	
-106.00	-106	-106.2	0.2	1.1	
-111.00	-111	-111.2	0.2	1.1	
-116.00	-116	-116.2	0.2	1.1	
-121.00	-121	-121.2	0.2	1.1	
-126.00	-126	-126.2	0.2	1.1	
-131.00	-131	-131.2	0.2	1.1	
-136.00	-136	-136.2	0.2	1.1	
-141.00	-141	-141.2	0.2	1.1	
-146.00	-146	-146.2	0.2	1.1	
-151.00	-151	-151.2	0.2	1.1	
-156.00	-156	-156.2	0.2	1.1	
-161.00	-161	-161.2	0.2	1.1	
-166.00	-166	-166.2	0.2	1.1	
-171.00	-171	-171.2	0.2	1.1	
-176.00	-176	-176.2	0.2	1.1	
-181.00	-181	-181.2	0.2	1.1	
-186.00	-186	-186.2	0.2	1.1	
-191.00	-191	-191.2	0.2	1.1	
-196.00	-196	-196.2	0.2	1.1	
-201.00	-201	-201.2	0.2	1.1	
-206.00	-206	-206.2	0.2	1.1	
-211.00	-211	-211.2	0.2	1.1	
-216.00	-216	-216.2	0.2	1.1	
-221.00	-221	-221.2	0.2	1.1	
-226.00	-226	-226.2	0.2	1.1	
-231.00	-231	-231.2	0.2	1.1	
-236.00	-236	-236.2	0.2	1.1	
-241.00	-241	-241.2	0.2	1.1	
-246.00	-246	-246.2	0.2	1.1	
-251.00	-251	-251.2	0.2	1.1	
-256.00	-256	-256.2	0.2	1.1	
-261.00	-261	-261.2	0.2	1.1	
-266.00	-266	-266.2	0.2	1.1	
-271.00	-271	-271.2	0.2	1.1	
-276.00	-276	-276.2	0.2	1.1	
-281.00	-281	-281.2	0.2	1.1	
-286.00	-286	-286.2	0.2	1.1	
-291.00	-291	-291.2	0.2	1.1	
-296.00	-296	-296.2	0.2	1.1	
-301.00	-301	-301.2	0.2	1.1	
-306.00	-306	-306.2	0.2	1.1	
-311.00	-311	-311.2	0.2	1.1	
-316.00	-316	-316.2	0.2	1.1	
-321.00	-321	-321.2	0.2	1.1	
-326.00	-326	-326.2	0.2	1.1	
-331.00	-331	-331.2	0.2	1.1	
-336.00	-336	-336.2	0.2	1.1	
-341.00	-341	-341.2	0.2	1.1	
-346.00	-346	-346.2	0.2	1.1	
-351.00	-351	-351.2	0.2	1.1	
-356.00	-356	-356.2	0.2	1.1	
-361.00	-361	-361.2	0.2	1.1	
-366.00	-366	-366.2	0.2	1.1	
-371.00	-371	-371.2	0.2	1.1	
-376.00	-376	-376.2	0.2	1.1	
-381.00	-381	-381.2	0.2	1.1	
-386.00	-386	-386.2	0.2	1.1	
-391.00	-391	-391.2	0.2	1.1	
-396.00	-396	-396.2	0.2	1.1	
-401.00	-401	-401.2	0.2	1.1	
-406.00	-406	-406.2	0.2	1.1	
-411.00	-411	-411.2	0.2	1.1	
-416.00	-416	-416.2	0.2	1.1	
-421.00	-421	-421.2	0.2	1.1	
-426.00	-426	-426.2	0.2	1.1	
-431.00	-431	-431.2	0.2	1.1	
-436.00	-436	-436.2	0.2	1.1	
-441.00	-441	-441.2	0.2	1.1	
-446.00	-446	-446.2	0.2	1.1	
-451.00	-451	-451.2	0.2	1.1	
-456.00	-456	-456.2	0.2	1.1	
-461.00	-461	-461.2	0.2	1.1	
-466.00	-466	-466.2	0.2	1.1	
-471.00	-471	-471.2	0.2	1.1	
-476.00	-476	-476.2	0.2	1.1	
-481.00	-481	-481.2	0.2	1.1	
-486.00	-486	-486.2	0.2	1.1	
-491.00	-491	-491.2	0.2	1.1	
-496.00	-496	-496.2	0.2	1.1	
-501.00	-501	-501.2	0.2	1.1	
-506.00	-506	-506.2	0.2	1.1	
-511.00	-511	-511.2	0.2	1.1	
-516.00	-516	-516.2	0.2	1.1	
-521.00	-521	-521.2	0.2	1.1	
-526.00	-526	-526.2	0.2	1.1	
-531.00	-531	-531.2	0.2	1.1	
-536.00	-536	-536.2	0.2	1.1	
-541.00	-541	-541.2	0.2	1.1	
-546.00	-546	-546.2	0.2	1.1	
-551.00	-551	-551.2	0.2	1.1	
-556.00	-556	-556.2	0.2	1.1	
-561.00	-561	-561.2	0.2	1.1	
-566.00	-566	-566.2	0.2	1.1	
-571.00	-571	-571.2	0.2	1.1	
-576.00	-576	-576.2	0.2	1.1	
-581.00	-581	-581.2	0.2	1.1	
-586.00	-586	-586.2	0.2	1.1	
-591.00	-591	-591.2	0.2	1.1	
-596.00	-596	-596.2	0.2	1.1	
-601.00	-601	-601.2	0.2	1.1	
-606.00	-606	-606.2	0.2	1.1	
-611.00	-611	-611.2	0.2	1.1	
-616.00	-616	-616.2	0.2	1.1	
-621.00	-621	-621.2	0.2	1.1	
-626.00	-626	-626.2	0.2	1.1	
-631.00	-631	-631.2	0.2	1.1	
-636.00	-636	-636.2	0.2	1.1	
-641.00	-641	-641.2	0.2	1.1	
-646.00	-646	-646.2	0.2	1.1	
-651.00	-651	-651.2	0.2	1.1	
-656.00	-656	-656.2	0.2	1.1	
-661.00	-661	-661.2	0.2	1.1	
-666.00	-666	-666.2	0.2	1.1	
-671.00	-671	-671.2	0.2	1.1	
-676.00	-676	-676.2	0.2	1.1	
-681.00	-681	-681.2	0.2	1.1	
-686.00	-686	-686.2	0.2	1.1	
-691.00	-691	-691.2	0.2	1.1	
-696.00	-696	-696.2	0.2	1.1	
-701.00	-701	-701.2	0.2	1.1	
-706.00	-706	-706.2	0.2	1.1	
-711.00	-711	-711.2	0.2	1.1	
-716.00	-716	-716.2	0.2	1.1	
-721.00	-721	-721.2	0.2	1.1	
-726.00	-726	-726.2	0.2	1.1	
-731.00	-731	-731.2	0.2	1.1	
-736.00	-736	-736.2	0.2	1.1	
-741.00	-741	-741.2	0.2	1.1	
-746.00	-746	-746.2	0.2	1.1	
-751.00	-751	-751.2	0.2	1.1	
-756.00	-756	-756.2	0.2	1.1	
-761.00	-761	-761.2	0.2	1.1	
-766.00	-766	-766.2	0.2	1.1	
-771.00	-771	-771.2	0.2	1.1	
-776.00	-776	-776.2	0.2	1.1	
-781.00	-781	-781.2	0.2	1.1	
-786.00	-786	-786.2	0.2	1.1	
-791.00	-791	-791.2	0.2	1.1	
-796.00	-796	-796.2	0.2	1.1	
-801.00	-801	-801.2	0.2	1.1	
-806.00	-806	-806.2	0.2	1.1	
-811.00	-811	-811.2	0.2	1.1	
-816.00	-816	-816.2	0.2	1.1	
-821.00	-821	-821.2	0.2	1.1	
-826.00	-826	-826.2	0.2	1.1	
-831.00	-831	-831.2	0.2	1.1	
-836.00	-836	-836.2	0.2	1.1	
-841.00	-841	-841.2	0.2	1.1	
-846.00	-846	-846.2	0.2	1.1	
-851.00	-851	-851.2	0.2	1.1	
-856.00	-856	-856.2	0.2	1.1	
-861.00	-861	-861.2	0.2	1.1	
-866.00	-866	-866.2	0.2	1.1	
-871.00	-871	-871.2	0.2	1.1	
-876.00	-876	-876.2	0.2	1.1	
-881.00	-881	-881.2	0.2	1.1	
-886.00	-886	-886.2	0.2	1.1	
-891.00	-891	-891.2	0.2	1.1	
-896.00	-896	-896.2	0.2	1.1	
-901.00	-901	-901.2	0.2	1.1	
-906.00	-906	-906.2	0.2	1.1	
-911.00	-911	-911.2	0.2	1.1	
-916.00	-916	-916.2	0.2	1.1	
-921.00	-921	-921.2	0.2	1.1	
-926.00	-926	-926.2	0.2	1.1	
-931.00	-931	-931.2	0.2	1.1	
-936.00	-936	-936.2	0.2	1.1	
-941.00	-941	-941.2	0.2	1.1	
-946.00	-946	-946.2	0.2	1.1	
-951.00	-951	-951.2	0.2	1.1	
-956.00	-956	-956.2	0.2	1.1	
-961.00	-961	-961.2	0.2	1.1	
-966.00	-966	-966.2	0.2	1.1	
-971.00	-971	-971.2	0.2	1.1	
-976.00	-976	-976.2	0.2	1.1	
-981.00	-981	-981.2	0.2	1.1	
-986.00	-986	-986.2	0.2	1.1	
-991.00	-991	-991.2	0.2	1.1	
-996.00	-996	-996.2	0.2	1.1	
-1001.00	-1001	-1001.2	0.2	1.1	
-1006.00	-1006	-1006.2	0.2	1.1	
-1011.00	-1011	-1011.2	0.2	1.1	
-1016.00	-1016	-1016.2	0.2	1.1	
-1021.00	-1021	-1021.2	0.2	1.1	
-1026.00	-1026	-1026.2	0.2	1.1	
-1031.00	-1031	-1031.2	0.2	1.1	
-1036.00	-1036	-1036.2	0.2	1.1	
-1041.00	-1041	-104	0.2	1.1	

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Accuracy Calibration Certificate

Customer

Company: United Analytical and Engineering Consultant Co., Ltd.
Address: 3 Sri Udom Suk 41, Sukhumvit Rd., Bang Cret
City: Phra Khanong Contact: Suttit Chotnong
Zip / Postal: 10250
State / Province: Bangkok
Order Number:

Weighing Device

Manufacturer: Mettler Toledo Instrument Type: Weighing Instrument
Model: AB064-S Asset Number: UAE AIR.016/2550
Serial No.: 1126312528 Terminal Model: N/A
Building: N/A Terminal Serial No.: N/A
Floor: 2 Terminal Asset No.: N/A
Room: Balance Room 2 (2B0)

Range	Max. Capacity	Readability (d)
g	220 g	0.0001 g

Procedure

Calibration Guidelines: EURAMET cg-18 v. 4.0 (11/2015)
Mettler Toledo Work Instruction: CPW002/20
This calibration certificate contains measurements for As Found calibration. No As Left calibration was performed because the device was not modified after As Found calibration. Therefore, results for As Left correspond to As Found.
The sensitivity (span) of the weighing instrument was adjusted before calibration with a built-in weight.
In accordance with EURAMET cg-18 (11/2015), the test loads were selected to reflect the specific use of the weighing device or to accommodate specific calibration conditions.

	Temperature	Humidity
As Found	Start: 22.5 °C End: 21.4 °C	Start: 56.1 % End: 63.2 %

As Found Calibration Date: 07-Apr-2022
As Left Calibration Date: N/A
Issue Date: 08-Apr-2022
Calibrator:
Approved Signatory:

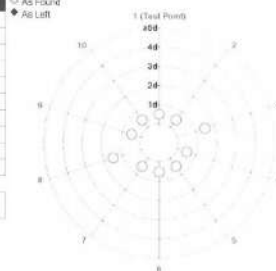
☐ Switched Substrate

เอกสารไม่ควบคุม

Measurement Results

Repeatability

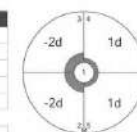
Test Load: 100 g	As Found	As Left
1	99.9999 g	N/A
2	100.0000 g	N/A
3	99.9998 g	N/A
4	100.0000 g	N/A
5	99.9999 g	N/A
6	100.0000 g	N/A
7	99.9999 g	N/A
8	100.0001 g	N/A
9	99.9999 g	N/A
10	100.0000 g	N/A
Standard Deviation	0.00008 g	N/A



The "1d" in the graph represents the readability of the range interval in which the test was performed.
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

Test Load: 100 g		
Position	As Found	As Left
1	100.0000 g	N/A
2	99.9998 g	N/A
3	99.9998 g	N/A
4	100.0001 g	N/A
5	100.0001 g	N/A
Maximum Deviation	0.0002 g	N/A

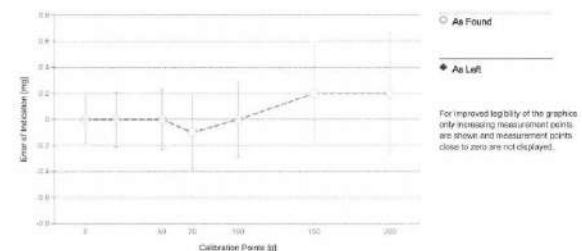


The "1d" in the graph represents the readability of the range interval in which the test was performed.

เอกสารไม่ควบคุม

Error of Indication

As Found	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.0000 g	0.0000 g	0.0000 g	6.16 mg	2
2	0.1000 g	0.1000 g	0.0000 g	6.16 mg	2
3	1.0000 g	0.9998 g	-0.0001 g	6.16 mg	2
4	5.0000 g	5.0000 g	0.0000 g	6.16 mg	2
5	10.0000 g	9.9998 g	-0.0001 g	6.20 mg	2
6	20.0000 g	20.0000 g	0.0000 g	6.21 mg	2
7	50.0000 g	50.0000 g	0.0000 g	6.23 mg	2
8	70.0001 g	70.0000 g	-0.0001 g	6.28 mg	2
9	100.0000 g	100.0000 g	0.0000 g	6.29 mg	2
10	150.0000 g	150.0002 g	0.0002 g	6.40 mg	2
11	200.0001 g	200.0003 g	0.0002 g	6.46 mg	2



The uncertainty stated is the expanded uncertainty at calibration obtained by multiplying the standard combined uncertainty by the coverage factor k - which can be larger than 2 according to EURAMET cg-18. The value of the measurand lies within the assigned range of values with a probability of approximately 95%.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated.

Test Equipment

All weights used for metrological testing are traceable to national or international standards. The weights were calibrated and certified by an accredited calibration laboratory.

Weight Set 1: OIML E2

Weight Set No.: W550 Date of Issue: 25-Feb-2022
Certificate Number: C080581631 Calibration Due Date: 14-Aug-2023

Thermo Hygrometer

Equipment No.: IN161 Date of Issue: 14-Jun-2021
Certificate Number: 21H1226 Calibration Due Date: 01-Jun-2022

เอกสารไม่ควบคุม

Remarks

Equipment condition: Good
Next calibration according to customer's procedure
Calibration data not decide by calibration laboratory
Test weight by Filler pan : 1 g = 0.9999 g, 3 g = 3.0000 g, 5 g = 5.0000 g

End of Accredited Section

The information below and any attachments to this calibration certificate are not part of the accredited calibration.

เอกสารไม่ควบคุม

Measurement Uncertainty of the Weighing Instrument in Use

Stated is the expanded uncertainty with $k=2$ in use. The formula shall be used for the estimation of the uncertainty under consideration of the errors of indication. The value R represents the net load indication in the unit of measure of the device.

Temperature coefficient for the evaluation of the measurement uncertainty in use: $3.0 \cdot 10^{-5} / K$

Temperature range on site for the evaluation of the measurement uncertainty in use: $3 K$

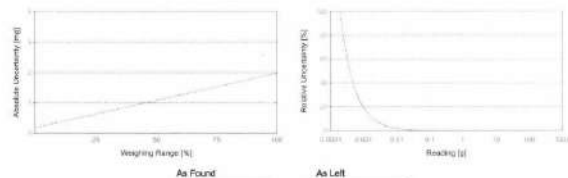
Linearization of Uncertainty Equation

Range	Max	As Found	As Left
1 0.0001 g	220 g	$U_1 = 0.19 \text{ mg} + 6.00E-17 \text{ mg/g} \cdot R$	N/A

To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

Absolute and Relative Measurement Uncertainty in Use for Various Net Indications (Example)

Net Indication	As Found	As Left
0.0220 g	0.19 mg	0.86%
0.2200 g	0.19 mg	0.087%
2.2000 g	0.21 mg	0.0095%
22.0000 g	0.37 mg	0.0017%
220.0000 g	2.0 mg	0.0009%



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Accuracy Calibration Certificate

Customer

Company: United Analyst and Engineering Consultant Co., Ltd.
Address: 3 Sri Uppon Suk 41, Sukhumvit Rd., Bang Chak
City: Phra Khanong Contact: Suret Chotruk
Zip / Postal: 10260
State / Province: Bangkok
Order Number: 7037427000

Weighing Device

Manufacturer: Mettler Toledo Instrument Type: Weighing Instrument
Model: AB204-SF-FACT Asset Number: UNE.AIR.016/2355
Serial No.: 8108119808 Terminal Model: N/A
Building: N/A Terminal Serial No.: N/A
Floor: 2 Terminal Asset No.: N/A
Room: Balance Room 2 (230)

Range	Max. Capacity	Readability (d)
1	220 g	0.0001 g

Procedure

Calibration Guideline: EURAMET-08-18 v. 4.0 (11/2015)
Mettler TOLEDO Work Instruction: CPW02/2019

This calibration certificate contains measurements for As Found and As Left calibrations.
The sensitivity/span of the weighing instrument was adjusted before As Found and As Left calibrations with a built-in weight.
In accordance with EURAMET-08-18 (11/2015), the test loads were selected to reflect the specific use of the weighing device or to accommodate specific calibration conditions.

	Temperature	Humidity
As Found	Start: 22.6 °C End: 22.1 °C	Start: 55.0 % End: 51.9 %
As Left	Start: 22.3 °C End: 22.4 °C	Start: 46.2 % End: 55.8 %

As Found Calibration Date: 07-Apr-2022
As Left Calibration Date: 07-Apr-2022
Issue Date: 08-Apr-2022
Calibrator:
Approved Signatory:

☐ Sand Jirayom
☐ Surachet Sukkato

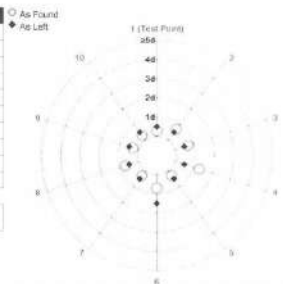
Measurement Results

Repeatability

Test Load: 100 g

	As Found	As Left
1	100.0305 g	99.9900 g
2	100.0304 g	100.0000 g
3	100.0304 g	99.9999 g
4	100.0308 g	100.0000 g
5	100.0305 g	99.9999 g
6	100.0304 g	99.9998 g
7	100.0305 g	100.0000 g
8	100.0304 g	100.0000 g
9	100.0305 g	100.0000 g
10	100.0305 g	100.0000 g

Standard Deviation	0.00007 g	0.00007 g
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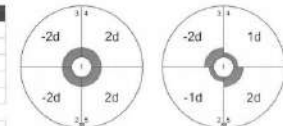
The "s" in the graph represents the repeatability of the range/interval in which the test was performed.
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

Test Load: 100 g

Position	As Found	As Left
1	100.0008 g	100.0000 g
2	100.0003 g	99.9999 g
3	100.0003 g	99.9998 g
4	100.0007 g	100.0001 g
5	100.0007 g	100.0002 g

Maximum Deviation	0.0002 g	0.0002 g
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The "s" in the graph represents the repeatability of the range/interval in which the test was performed.

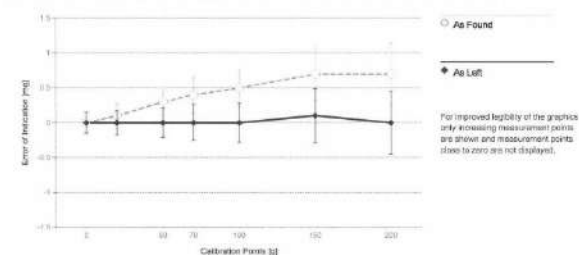
Error of Indication

As Found

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.0000 g	0.0000 g	0.0000 g	6.15 mg	2
2	0.1000 g	0.1001 g	0.0001 g	6.16 mg	2
3	1.0000 g	0.9996 g	-0.0001 g	6.16 mg	2
4	5.0000 g	5.0000 g	0.0000 g	6.16 mg	2
5	10.0000 g	10.0001 g	0.0001 g	6.17 mg	2
6	20.0000 g	20.0001 g	0.0001 g	6.16 mg	2
7	50.0000 g	50.0003 g	0.0003 g	6.20 mg	2
8	70.0001 g	70.0005 g	0.0004 g	6.26 mg	2
9	100.0000 g	100.0005 g	0.0005 g	6.27 mg	2
10	150.0000 g	150.0007 g	0.0007 g	6.38 mg	2
11	200.0001 g	200.0008 g	0.0007 g	6.44 mg	2

As Left

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.0000 g	0.0000 g	0.0000 g	6.15 mg	2
2	0.1000 g	0.1000 g	0.0000 g	6.16 mg	2
3	1.0000 g	0.9999 g	-0.0001 g	6.17 mg	2
4	5.0000 g	5.0000 g	0.0000 g	6.17 mg	2
5	10.0000 g	10.0000 g	0.0000 g	6.17 mg	2
6	20.0000 g	20.0000 g	0.0000 g	6.16 mg	2
7	50.0000 g	50.0000 g	0.0000 g	6.21 mg	2
8	70.0001 g	70.0001 g	0.0000 g	6.26 mg	2
9	100.0000 g	100.0000 g	0.0000 g	6.28 mg	2
10	150.0000 g	150.0001 g	0.0001 g	6.30 mg	2
11	200.0001 g	200.0001 g	0.0000 g	6.43 mg	2



The uncertainty stated is the expanded uncertainty at calibration obtained by multiplying the standard combined uncertainty by the coverage factor $k=2$ - which can be larger than 2 according to EURAMET-08-18. The value of the measurand lies within the assigned range of values with a probability of approximately 95%.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated.

Test Equipment

All weights used for metrological testing are traceable to national or international standards. The weights were calibrated and certified by an accredited calibration laboratory.

Weight Set 1: OIML E2

Weight Set No.:	WS80	Date of Issue:	23-Feb-2022
Certificate Number:	C06581831	Calibration Due Date:	14-Aug-2023
Thermo Hygrometer			
Equipment No.:	RN161	Date of Issue:	14-Jun-2021
Certificate Number:	21H1226	Calibration Due Date:	01-Jun-2022

Remarks

FACT adjustment functionality activated
Value of the built-in weight adjusted
Equipment condition: Good
Next calibration according to customer's procedure
Calibration data not decide by calibration laboratory
Test weight by Fiber pen: 1 g = 1.0000 g, 3 g = 3.0000 g, 5 g = 5.0000 g

End of Accredited Section

The information below and any attachments to this calibration certificate are not part of the accredited calibration.

Measurement Uncertainty of the Weighing Instrument in Use

Stated is the expanded uncertainty with $k=2$ in use. The formula shall be used for the estimation of the uncertainty under consideration of the errors of indication. The value K represents the net load indication in the unit of measure of the device.

Temperature coefficient for the evaluation of the measurement uncertainty in use: $2.5 \cdot 10^{-4} / K$

Temperature range on site for the evaluation of the measurement uncertainty in use: 3 K

Linearization of Uncertainty Equation

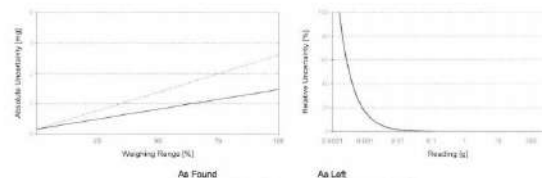
Range	Max	As Found	As Left
1	0.0201 g	229 g	

$U_1 = 0.16 \text{ mg} + 0.0111 \text{ mg/g} \cdot R$ $U_1 = 0.16 \text{ mg} + 0.00682 \text{ mg/g} \cdot R$

To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

Absolute and Relative Measurement Uncertainty in Use for Various Net Indications (Examples)

Net Indication	As Found	As Left
0.0220 g	0.16 mg	0.73%
0.2200 g	0.16 mg	0.074%
2.2000 g	0.16 mg	0.0084%
22.0000 g	0.46 mg	0.0018%
226.0000 g	2.6 mg	0.0012%



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Accuracy Calibration Certificate

Customer

Company: United Analyst and Engineering Consultant Co., Ltd.
Address: 3 Sar Udon Suk 41, Sukhumvit Rd., Bang Chak
City: Phra Khanong Contact: Suwit Chotboks
Zip / Postal: 10260
State / Province: Bangkok
Order Number: 4131235084

Weighing Device

Manufacturer: Mettler Toledo Instrument Type: Weighing Instrument
Model: XPE Asset Number: UAE-AIR-0100558
Serial No.: B322373893 PAT
Building: N/A Terminal Serial No.: B322373893
Floor: 2 Terminal Asset No.: N/A
Room: Balance Room 2 (206)

Range	Max. Capacity	Readability (g)
1	6.1 g	0.000001 g

Procedure

Calibration Guidelines: EURAMET cg-18 v. 4.0 (11/2015)
METTLER TOLEDO Work Instruction: CPW03020
This calibration certificate contains measurements for As Found and As Left calibrations.
The sensitivity span of the weighing instrument was adjusted before As Found and As Left calibrations with a built-in weight.
In accordance with EURAMET cg-18 (11/2015), the test loads were selected to reflect the specific use of the weighing device or to accommodate specific calibration conditions.

	Temperature	Humidity
As Found	Start: 22.7 °C End: 22.8 °C	Start: 54.2 % End: 53.0 %
As Left	Start: 22.8 °C End: 22.9 °C	Start: 52.0 % End: 50.5 %

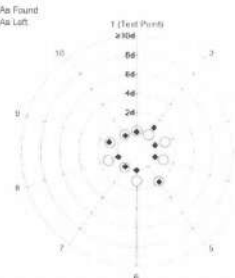
As Found Calibration Date: 07-Apr-2022
As Left Calibration Date: 07-Apr-2022
Issue Date: 08-Apr-2022

Calibrator:
Approved Signature:

Measurement Results

Repeatability

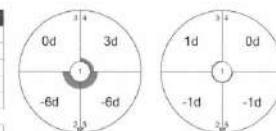
Test Load: 2 g	As Found	As Left
1	2.000007 g	2.000008 g
2	2.000007 g	2.000008 g
3	2.000008 g	2.000008 g
4	2.000008 g	2.000008 g
5	2.000005 g	2.000008 g
6	2.000008 g	2.000008 g
7	2.000007 g	2.000008 g
8	2.000008 g	2.000008 g
9	2.000005 g	2.000008 g
10	2.000007 g	2.000008 g
Standard Deviation	0.0000019 g	0.0000008 g



The "r" in the graph represents the repeatability of the measurement in which the test was performed.
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

Test Load: 2 g	As Found	As Left
Position		
1	2.000008 g	2.000008 g
2	2.000002 g	2.000007 g
3	2.000008 g	2.000009 g
4	2.000011 g	2.000008 g
5	2.000002 g	2.000007 g
Maximum Deviation	0.000006 g	0.000001 g



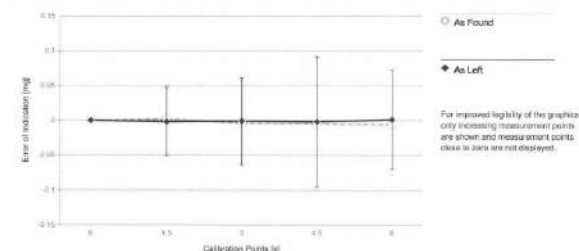
The "d" in the graph represents the readability of the measurement in which the test was performed.

Error of Indication

As Found	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1*	0.00000 g	0.00000 g	0.00000 g	0.0054 mg	2
2	0.01000 g	0.01000 g	0.00001 g	0.0074 mg	2
3*	0.05000 g	0.05000 g	-0.00002 g	0.011 mg	2
4*	0.10000 g	0.10000 g	0.00000 g	0.015 mg	2
5	0.15001 g	0.15001 g	-0.00001 g	0.025 mg	2
6	0.17001 g	0.17001 g	-0.00002 g	0.034 mg	2
7*	0.20001 g	0.20000 g	-0.00002 g	0.049 mg	2
8	1.50002 g	1.50002 g	0.00002 g	0.049 mg	2
9	3.00021 g	3.00017 g	-0.00004 g	0.062 mg	2
10	4.50031 g	4.50026 g	-0.00005 g	0.094 mg	2
11	6.00020 g	6.00020 g	-0.00006 g	0.072 mg	2

As Left	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1*	0.00000 g	0.00000 g	0.00000 g	0.0054 mg	2
2	0.01000 g	0.01000 g	0.00001 g	0.0074 mg	2
3*	0.05000 g	0.05000 g	0.00000 g	0.011 mg	2
4*	0.10000 g	0.10000 g	0.00000 g	0.015 mg	2
5	0.15001 g	0.15001 g	-0.00001 g	0.025 mg	2
6	0.17001 g	0.17001 g	0.00000 g	0.034 mg	2
7*	0.20001 g	0.20001 g	-0.00001 g	0.049 mg	2
8	1.50002 g	1.50002 g	-0.00002 g	0.049 mg	2
9	3.00021 g	3.00020 g	-0.00001 g	0.062 mg	2
10	4.50031 g	4.50029 g	-0.00002 g	0.093 mg	2
11	6.00020 g	6.00027 g	0.00007 g	0.071 mg	2

The calculated uncertainty was replaced by the GNC (Calibration and Measurement Capabilities) value because the calculated uncertainty was smaller than the GNC value.



The uncertainty stated is the expanded uncertainty at calibration obtained by multiplying the standard combined uncertainty by the coverage factor k – which can be larger than 2 according to EURAMET cg-16. The value of the measurand lies within the assigned range of values with a probability of approximately 95%.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated.

Test Equipment

All weights used for metrological testing are traceable to national or international standards. The weights were calibrated and certified by an accredited calibration laboratory.

Weight Set 1: OIML E2

Weight Set No.:	WS80	Date of Issue:	25-Feb-2022
Certificate Number:	C20581631	Calibration Due Date:	14-Aug-2023
Thermo Hygrometer			
Equipment No.:	RL161	Date of Issue:	14-Jun-2021
Certificate Number:	2114220	Calibration Due Date:	01-Jun-2022

Remarks

FACT adjustment functionality activated

Value of the built-in weight adjusted

Equipment condition: Good

Next calibration according to customer's procedure

Calibration data not decide by calibration laboratory

Test weight by filter : 0.050005 g ± 0.00004 g, 0.150012 g ± 0.00011 g

End of Accredited Section

The information below and any attachments to this calibration certificate are not part of the accredited calibration.

Measurement Uncertainty of the Weighing Instrument in Use

Stated is the expanded uncertainty with $k=2$ in use. The formula shall be used for the estimation of the uncertainty under consideration of the errors of indication. The value R represents the net load indication in the unit of measure of the device.

Temperature coefficient for the evaluation of the measurement uncertainty in use: $1.0 \cdot 10^{-6} / K$

Temperature range on site for the evaluation of the measurement uncertainty in use: $3 K$

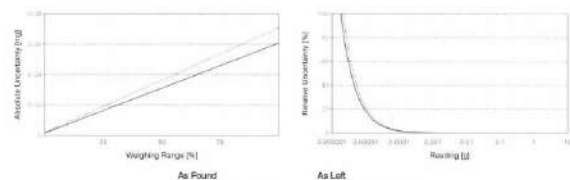
Linearization of Uncertainty Equation

Range	d	Max	As Found	As Left
1	0.000001 g	6.1 g	$U_1 = 0.0021 \text{ mg} + 0.0113 \text{ mg/g} \cdot R$	$U_1 = 0.0018 \text{ mg} + 0.0096 \text{ mg/g} \cdot R$

To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

Absolute and Relative Measurement Uncertainty in Use for Various Net Indications (Examples)

Net Indication	As Found	As Left
0.000010 g	0.0021 mg	0.0018 mg
0.000100 g	0.0022 mg	0.0019 mg
0.001000 g	0.0028 mg	0.0024 mg
0.010000 g	0.0069 mg	0.0057 mg
0.100000 g	0.0171 mg	0.0141 mg



CERTIFICATE OF CALIBRATION

Certificate No. : SP22-016

Page 1 of 5

Customer : United Analyst and Engineering Consultant Co., Ltd. (Head Office)

Address : 3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong,

Bangkok 10260

Location of calibration : Laboratory 315

Equipment : UV-Vis Spectrophotometer

Manufacturer : Agilent Technologies

Model : Cary 60

Serial No. : MY15410009

ID No. : N/A

Received Date : 23 May 2022

Calibration Date : 23 May 2022

Issue Date : 26 May 2022

Condition Instrument : Good

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

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

The measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the DQE Services Co., Ltd.



REPORT OF CALIBRATION

Certificate No. : SP22-016

Page 2 of 5

Environment Condition : Ambient Temperature 25 ± 5 °C

Relative humidity 55 ± 20 %RH

Calibration method : In-house method CP-01 Based on ASTM E275-08

Certified Reference Materials :

Material	Serial No.	Certificate No.	Due date
Absorbance Standard set	25760	95935	22 October 2023
Absorbance Standard set	25757	95929	22 October 2023
Wavelength Standard set	25806	95916	22 October 2023
Wavelength Standard set	25758	95915	22 October 2023

Traceability : This certification is traceable to the International System of Unit maintained at National

Institute of Standards and Technology (NIST) through Starna Scientific Limited

Spectral Band Width of UUC : 1.5 nm.

Scan Speed of UUC : 90 nm/min

Scan Interval of UUC : 0.15 nm.

Resolution of UUC : Photometric 0.0001 Abs.

Wavelength 0.1 nm.

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FM-708-02 R01 1/11/2021



REPORT OF CALIBRATION

Certificate No. : SP22-016

Page 3 of 5

Calibration Results : Without adjustment

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
420	0.0000	0.0000	0.0000	0.0028	2.00
	0.5787	0.5755	0.0032	0.0031	2.00
	1.0490	1.0436	0.0054	0.0029	2.00
	2.1900	2.1847	0.0053	0.0075	2.00
440	0.0000	0.0000	0.0000	0.0028	2.00
	0.5607	0.5588	0.0019	0.0034	2.00
	1.0247	1.0232	0.0015	0.0035	2.00
	2.1229	2.1211	0.0018	0.0082	2.00
465	0.0000	0.0000	0.0000	0.0028	2.00
	0.5236	0.5197	0.0039	0.0029	2.00
	0.9634	0.9625	0.0009	0.0028	2.00
	1.9763	1.9752	0.0011	0.0070	2.00
546.1	0.0000	-0.0001	0.0001	0.0028	2.00
	0.5191	0.5171	0.0020	0.0031	2.00
	1.0003	0.9984	0.0019	0.0033	2.00
	1.9987	1.9946	0.0041	0.0084	2.00
590	0.0000	0.0000	0.0000	0.0028	2.00
	0.5523	0.5509	0.0014	0.0030	2.00
	1.0809	1.0799	0.0010	0.0029	2.00
	2.0391	2.0329	0.0062	0.0080	2.00
635	0.0000	0.0000	0.0000	0.0028	2.00
	0.5601	0.5584	0.0017	0.0031	2.00
	1.0512	1.0498	0.0014	0.0029	2.00
	1.9294	1.9265	0.0029	0.0082	2.00

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REPORT OF CALIBRATION

Certificate No. : SP22-016

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Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
235	0.0000	0.0001	-0.0001	0.0050	2.00
	0.7478	0.7421	0.0057	0.0056	2.00
257	0.0000	0.0000	0.0000	0.0050	2.00
	0.8686	0.8619	0.0067	0.0059	2.00
313	0.0000	0.0000	0.0000	0.0050	2.00
	0.2912	0.2896	0.0016	0.0051	2.00
350	0.0000	0.0000	0.0000	0.0050	2.00
	0.6448	0.6403	0.0045	0.0055	2.00

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REPORT OF CALIBRATION

Certificate No. : SP22-016

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Wavelength Accuracy :

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor k
241.72	242.0	-0.28	0.18	2.00
279.45	279.5	-0.05	0.18	2.00
287.81	287.5	0.31	0.18	2.00
334.06	333.5	0.56	0.18	2.00
360.93	360.5	0.43	0.18	2.00
418.59	418.0	0.59	0.18	2.00
445.94	445.4	0.54	0.18	2.00
453.66	453.2	0.46	0.18	2.00
460.02	459.7	0.32	0.18	2.00
536.59	536.2	0.39	0.18	2.00
637.98	638.3	-0.32	0.18	2.00
431.38	431.0	0.38	0.18	2.00
472.50	472.5	0.00	0.18	2.00
513.47	513.5	-0.03	0.18	2.00
528.88	528.5	0.38	0.18	2.00
573.17	573.0	0.17	0.18	2.00
585.35	585.0	0.35	0.20	2.00
684.40	684.7	-0.30	0.18	2.00
740.72	740.8	-0.08	0.20	2.00
748.55	748.5	0.05	0.18	2.00
807.03	807.3	-0.27	0.18	2.00
879.28	879.0	0.28	0.18	2.00

Remark : - UUC = Unit Under Calibration

- N/A = Not Available

- The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor k, which for a normal distribution corresponds to a coverage probability of approximately 95%

- * Indicates non ISO accredited

- End of Certificate -

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FM-708-02 R01 1/11/2021

DQE Services Co.,Ltd.
32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230
Phone : +66 (0)2 538 2054, Email : dqeserviceinfo@gmail.com

CERTIFICATE OF CALIBRATION

Certificate No. : SP22-007 Page 1 of 5

Customer : United Analyst and Engineering Consultant Co.,Ltd. (Head Office)

Address : 3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong,
Bangkok 10260

Location of calibration : Laboratory 315

Equipment : UV-Vis Spectrophotometer

Manufacturer : Hitachi

Model : U-1900

Serial No. : 2021-064

ID No. : UAE.WAS.006/2552

Received Date : 20 January 2022

Calibration Date : 20 January 2022

Issue Date : 24 January 2022

Condition Instrument : Good

Calibrated by : [REDACTED]

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

The measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the DQE Services Co., Ltd.

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REPORT OF CALIBRATION

Certificate No. : SP22-007 Page 2 of 5

Environment Condition : Ambient Temperature 25 ± 5 °C

Relative humidity 55 ± 20 %RH

Calibration method : In-house method CP-01 Based on ASTM E275-08

Certified Reference Materials :

Material	Serial No.	Certificate No.	Due date
Absorbance Standard set	25760	95935	22 October 2023
Absorbance Standard set	25757	95929	22 October 2023
Wavelength Standard set	25806	95916	22 October 2023
Wavelength Standard set	25758	95915	22 October 2023

Traceability This certification is traceable to the International System of Unit maintained at National -
Institute of Standards and Technology (NIST) through Starna Scientific Limited

Spectral Band Width of UUC : 4.0 nm.

Scan Speed of UUC : 200 nm/min

Scan Interval of UUC : 0.1 nm.

Resolution of UUC : Photometric 0.001 Abs.

Wavelength 0.1 nm.

FM-708-02 R01 1/11/2021

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DQE Services Co.,Ltd.
32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230
Phone : +66 (0)2 538 2054, Email : dqeserviceinfo@gmail.com

REPORT OF CALIBRATION

Certificate No. : SP22-007 Page 3 of 5

Calibration Results : Without adjustment

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor
420	0.0000	0.000	0.0000	0.0028	2.00
	0.5787	0.577	0.0017	0.0031	2.00
	1.0490	1.050	-0.0010	0.0029	2.00
	2.1900	2.183	0.0070	0.0080	2.00
440	0.0000	0.000	0.0000	0.0028	2.00
	0.5607	0.560	0.0007	0.0034	2.00
	1.0247	1.023	0.0017	0.0035	2.00
	2.1229	2.118	0.0049	0.0079	2.00
465	0.0000	0.000	0.0000	0.0028	2.00
	0.5236	0.521	0.0026	0.0030	2.00
	0.9634	0.963	0.0004	0.0029	2.00
	1.9763	1.974	0.0023	0.0070	2.00
546.1	0.0000	0.000	0.0000	0.0028	2.00
	0.5191	0.518	0.0011	0.0031	2.00
	1.0003	1.000	0.0003	0.0033	2.00
	1.9987	1.996	0.0027	0.0084	2.00
590	0.0000	0.000	0.0000	0.0028	2.00
	0.5523	0.552	0.0003	0.0030	2.00
	1.0809	1.082	-0.0011	0.0030	2.00
	2.0391	2.033	0.0061	0.0079	2.00
635	0.0000	0.000	0.0000	0.0028	2.00
	0.5601	0.562	-0.0019	0.0031	2.00
	1.0512	1.052	-0.0008	0.0030	2.00
	1.9294	1.925	0.0044	0.0079	2.00

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Phone : +66 (0)2 538 2054, Email : dqeserviceinfo@gmail.com

REPORT OF CALIBRATION

Certificate No. : SP22-007 Page 4 of 5

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor
235	0.0000	0.000	0.0000	0.0050	2.00
	0.7478	0.746	0.0018	0.0057	2.00
257	0.0000	0.000	0.0000	0.0050	2.00
	0.8686	0.861	0.0076	0.0059	2.00
313	0.0000	0.000	0.0000	0.0050	2.00
	0.2912	0.291	0.0002	0.0051	2.00
350	0.0000	0.000	0.0000	0.0050	2.00
	0.6448	0.638	0.0068	0.0055	2.00

FM-708-02 R01 1/11/2021

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DQE Services Co., Ltd.
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Phone : +66 (0)2 538 2054, Email : dqservicethai@gmail.com

REPORT OF CALIBRATION

Certificate No.: SP22-007 Page 5 of 5

Wavelength Accuracy :

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor #
241.54	240.8	0.74	0.18	2.00
279.40	278.5	0.90	0.18	2.00
288.70	288.0	0.70	0.18	2.00
334.22	333.5	0.72	0.18	2.00
361.26	360.5	0.76	0.18	2.00
418.48	418.0	0.48	0.18	2.00
446.70	446.0	0.70	0.18	2.00
453.20	453.0	0.20	0.18	2.00
460.06	459.5	0.56	0.18	2.00
536.90	536.0	0.90	0.18	2.00
637.94	637.2	0.74	0.18	2.00
440.74	440.0	0.74	0.18	2.00
472.22	471.6	0.62	0.18	2.00
513.70	513.0	0.70	0.18	2.00
528.72	528.0	0.72	0.18	2.00
574.60	573.8	0.80	0.18	2.00
585.48	584.6	0.88	0.20	2.00
684.63	684.0	0.63	0.18	2.00
740.27	739.8	0.47	0.20	2.00
748.28	747.8	0.48	0.18	2.00
807.16	806.4	0.76	0.18	2.00
879.70	878.8	0.90	0.18	2.00

Remark : - UUC = Unit Under Calibration

- N/A = Not Available

- The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor k.

which for a normal distribution corresponds to a coverage probability of approximately 95%

- * Indicates non TSM accredited

- End of Certificate -

SP22-007 R01 1/11/2021

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Agilent 55 240 280 Series Atomic Absorption Spectroscopy Systems

Preventive Maintenance Checklist

Agilent Preventive Maintenance provides factory recommended service for your analytical systems 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 everything you need to reduce unplanned downtime and keep your systems operating at their peak. This checklist will be completed at the end of the service and provided to you as a record of the installation.

Note: While non-current production AA instrument and/or accessory models are not covered specifically in this document it can be used as a basic reference.

For more information about Agilent Technologies services please visit our web site using the following URL: <http://www.agilent.com/en-us/services>

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.
- 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.

Revision: 10.00, Issued November 2021

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Instrument: Preventive Maintenance Checklist

Important Customer Web Links

- For more information about Agilent Technologies services, please visit our website using the following URL: <http://www.agilent.com/en-us/products/crosslab-instrument-services/service-repair>
- To access Agilent University, visit <http://www.agilent.com/crosslab/university/> to learn about training options, which include online, classroom and onsite delivery. A training specialist can work directly with you to help determine your best options.
- A useful Agilent Resource Center web page is available, which includes short videos on maintenance, quick lists of consumables for new instruments, and other valuable information. Check out the Resource Page here: <https://www.agilent.com/en-us/agilentresources>
- Need technical support, FAQs, supplies? - visit our Support Home page at <http://www.agilent.com/search/support>
- Get answers, Share insights, Build connections. Join the Agilent Community at <https://community.agilent.com/welcome>

Service Engineer's Responsibilities

- Contact the customer and ensure that all necessary supplies are available before the preventive maintenance visit.
- Confirm the ability of the instrument to deliver continued safe operation as established via the Agilent AA safe operation flow chart. (Refer directly to the AA 55/240/280 Preventive Maintenance Scope of Work to make this decision.)
- Only select those pages that relate to the system or module being serviced.
- Complete empty fields with the relevant information.
- Complete the relevant checkboxes in the checklist; using either a "X" or tick mark "✓".
- Check "Section not applicable" check boxes to indicate services/tasks not delivered, as appropriate.
- Complete the Preventive Maintenance 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.
- Complete the total number of pages field in the Service Completion section.
- Ask the customer to sign the Service Completion section including the customer's and your signature.

This information is subject to change without notice

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Instrument 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	240FS AAS
Instrument System Site and Location	United Analyst and Engineering Consultant

List System Component Product Numbers	List the Serial Numbers of each Component
1. G 8432 A	MY 13160001
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	

Preparation, Safe operation and Initial performance checks

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- ☐ Agilent AA safe operation flow chart instructions (to determine if the PM can be performed).

NOTE: If by following the flow chart the instrument is deemed to be unsafe for continued use you MUST NOT continue PM work. Inform the customer immediately of the Agilent recommendation that use of the instrument be discontinued.

- ☒ Discuss any specific issues with the customer before starting
- ☐ For HF application systems, if standard sample introduction system was not installed, ask the customer to install it. **W/H**
- ☒ Review the instrument logbook for recorded problems and comments
- ☒ Save instrument control settings before starting the procedure.
- ☒ Perform a general inspection of the system for cleanliness
- ☒ Check for proper installation of parts, assemblies, sensors etc.
- ☒ Check system for required installation of components, settings as defined by current Service Notes
- ☒ Check for required firmware updates and verify with customers if they would like them installed
- ☒ Use SVD to perform a Full Wavelength Scan for Cu HCL - "As found test L1"
- ☒ Perform a Basic Cu ABS test - "As found test L2"
- ☒ Print the Details page or screen captures of the test results and attach to the end of this checklist.

Preventive Maintenance Procedures

FLAME SYSTEM section

- ☐ Section not applicable

Electronic components

- ☒ Review and confirm instrument configuration data in SVD
- ☒ Confirm power supply voltages using the **SVD Power Supply diagnostic**
- ☒ For Dual Beam Instruments - Confirm RBC frequency using the **SVD RBC frequency diagnostic**.

Mechanical components

- ☒ Check the burner adjuster controls for complete and free movement. If the burner adjuster needs lubrication, use Molykote 321 or mineral-based molybdenum disulphide grease.
- ☒ Run SVD tests to exercise all motor drives over the full range of their travel:
 - ☒ Monochromator drive
 - ☒ Slit drive
 - ☒ Lamp selector
 - ☐ ABA. **W/H**

Optics components

- ☒ Check that external optical surfaces are clean – Clean or replace as required.
- ☒ Use SVD and perform **Mono Wavelength Correction**.
- ☒ Use SVD and perform **Slit Calibration**.
- ☒ Use SVD and perform **Grating Squareness Diagnostic**.
- ☒ Use SVD and perform **Zero Order Offset/Mono Correction**.
- ☒ Use SVD and perform **Wavelength Repeatability**.
- ☒ Physically inspect selected HC lamps (customer to supply per their choice) and measure the % Gain for each lamp. Advise customer if lamps are showing emission degradation due to age.
- ☒ Check that the signal energy of the D2 and HC lamps track properly. Advise customer if their D2 lamp is showing emission degradation due to age.

Sample Introduction and Atomization

- ☒ Inspect the burner interlock plate to ensure that the interlock pin is secure and correct for the burner type.
- ☒ Clean the burner slot with a clean white card.
- ☒ Check the uniformity of the slot width.
- ☒ Clean the burner if required.
- ☒ Change the burner o-ring.
- ☒ Clean the nebulizer, spray chamber and liquid trap.
- ☒ Change all o-rings and seals in the nebulizer, nebulizer block and spray chamber.
- ☒ Check that the pressure relief bung releases readily.
- ☒ Change o-rings on the fuel and oxidant delivery barbs
- ☒ Leave the liquid trap EMPTY and verify the flame will not ignite in this state.
- ☒ Refill liquid trap and check that overflow drains freely into the drain/waste tube.
- ☒ Check the drain/waste tube for good drainage. It should not have tight bends, kinks or loops and the lower end must be above the liquid level in the waste vessel
- ☒ Check and clean the igniter electrode

Gas handling components and safety interlocks

- ☒ Pressure test for leaks
- ☒ Leak test gasbox internal components and connections
- ☒ Check safety interlock status and operation using the **SVD Interlock monitoring diagnostic**.

Analytical performance for Flame systems

- ☒ Ignite a flame.
- ☒ Check that you can adjust the nebulizer uptake rate from 4 to 6.5 mL per minute.
- ☒ Optimize the instrument ready to perform Cu sensitivity test.
- ☒ Create a manual method to perform a Basic Cu ABS test - "Final Performance Testing"
- ☒ Run a PM completed sensitivity test for a 5 ppm copper sample and record the results in the AA PM Performance test results and measurements table.

FURNACE SYSTEM section

- ☒ Section not applicable.

Electronic components

- ☐ Review and confirm instrument configuration data in SVD
- ☐ Confirm power supply voltages using the **SVD Power Supply diagnostic**.

Mechanical components

- ☐ Run SVD tests to exercise all motor drives over the full range of their travel:
 - ☐ Monochromator drive
 - ☐ Slit drive
 - ☐ Lamp selector

Optics components

- ☐ Check that external optical surfaces are clean – Clean or replace as required.
- ☐ Use SVD and perform **Mono Wavelength Correction**.
- ☐ Use SVD and perform **Slit Calibration**.
- ☐ Use SVD and perform **Grating Squareness Diagnostic**.
- ☐ Use SVD and perform **Zero Order Offset/Mono Correction**.
- ☐ Use SVD and perform **Wavelength Repeatability**.
- ☐ Physically inspect selected HC lamps (customer to supply per their choice) and measure the % Gain for each lamp. Advise customer if lamps are showing emission degradation due to age.

Gas handling, water system and workhead component checks

- ☐ Inspect the GTA workhead gas hoses and connections for leaks.
- ☐ Pressure test for gas leaks
- ☐ If the cooler system is accessible (stand-alone) check for correct operation and coolant/water level – This includes any temperature and pressure settings plus filter cleaning (air flow and water)
- ☐ Inspect the GTA workhead water hoses and connections for leaks
- ☐ Check all graphite components and replace if necessary.

- ☐ Tube
- ☐ Electrodes
- ☐ Shroud

- ☐ Check and clean the end windows on the worldwide
- ☐ Check safety interlock operation.

Analytical performance for Furnace systems

- ☐ Optimize the instrument ready to perform Cu sensitivity test
- ☐ Run the sensitivity test for a 25 ppb copper sample and record the results in the results table.

PSD autosampler accessory for Furnace systems

- ☐ Section NOT Applicable
- ☐ Check condition of the PSD capillary – replace if necessary
- ☐ Check condition and operation of PSD syringe – ensure it does not have air locks and bubbles.
- ☐ Change PSD rinse bottle capping
- ☐ Check and clean the rinse vessel.
- ☐ Check the drain tube for good drainage. It should not have tight bends, kinks or loops and the lower end must be above the liquid level in the waste vessel.
- ☐ Ensure that the waste vessel is suitable for use with the furnace system

Sample introduction pump system (SIPS) accessory

- ☐ Section NOT Applicable
- ☐ Re-torque screws securing the hubs, presser arms and pump rotors.
- ☐ Adjust each roller so that it rotates freely
- ☐ Wipe clean the pump rotor rollers and pump bands with a dry clean cloth.
- ☐ Ensure that the presser arms and the surfaces near the pump are free from dirt and spills.
- ☐ Remove the pump module roof cover and check for the incursion of liquids and any signs of corrosion.
- ☐ Re-torque the nuts that fasten the motor mounting plates to the chassis.
- ☐ Check clips securing the diluents holder and replace if necessary.
- ☐ Disconnect, clean T-piece, and reassemble the tubing using the following steps.

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- ☐ Remove the T-piece by disconnecting the pump tubes, the pump bands and all other tubing.
- ☐ Place the T-piece in an ultrasonic bath containing strong detergent 1-5% Decon 30 or similar, for approximately 5-10 minutes.
- ☐ Wash the T-piece under a tap with a strong flow of water.
- ☐ Rinse with distilled water through all of the inlets in the reverse direction to normal sample flow.
- ☐ Reassemble.

Sample preparation system (SPS 4) accessory

- ☒ Section NOT Applicable

The Agilent SPS 4 autosampler is designed to need minimal maintenance.

The following maintenance requirements are suggested to maintain the performance of the autosampler

- ☐ Cleaning the spill tray, rack location mat, end frames and chassis accessories with a damp soft cloth and diluted mild detergent
- ☐ Cleaning the autosampler cover panels with domestic window cleaner.
- ☐ Checking the X-axis and Z-axis drive bolts for cracks, splits, damaged teeth, excessive fraying, color changes or degradation from fumes.
- ☐ Check the X-axis, Theta-axis and Z-axis FFO cables for cracks, incorrect positioning, damaged edge or damaged connectors.

NOTE: The autosampler requires no extra lubrication throughout its lifetime.
For further details refer to the SPS 4 service manual 68410-90050

Sample preparation system (SPS 3) accessory

- ☒ Section NOT Applicable

- ☐ Check the x-axis and z-axis timing belts – Replace if there is any cracks, splits or color deterioration and belt tension
- ☐ Check bolt tensions – adjust if required
- ☐ Check the lubrication pad for single x-axis shaft. If pad is dry or customer has observed any vibration or erratic movements of the x-axis carriage, add 1 mL of Dow Corning 200 SF Fluid, 200 CS into the well.
- ☐ Check the auto-sampler ability to find tube positions – Calibrate if required
- ☐ Clean the exterior surfaces of the accessory with soft lint free cloth. This cloth can be dampened with warm water or a mild detergent. Do not use organic solvents or abrasive cleaning agents.

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Vapor generation accessory VGA (hydride generator)

- ☐ Section NOT Applicable
- ☒ Inspect VGA gas supply hose
- ☒ Inspect/replace VGA pump tubing.
- ☒ Check low gas pressure interlock setting – adjust if required
- ☒ Check precision on-line gas flow setting – adjust if required.
- ☒ Check gas regulator pressure to 46 psi (325 kPa) – adjust if required
- ☐ Clean the exterior surfaces of the accessory with soft lint free cloth. This cloth can be dampened with warm water or a mild detergent. Do not use organic solvents or abrasive cleaning agents.

UltrAA lamp accessory (external)

- ☒ Section NOT Applicable
- ☐ Check the condition of the power cable.
- ☐ Clean the exterior surfaces of the accessory with soft lint free cloth. This cloth can be dampened with warm water or a mild detergent. Do not use organic solvents or abrasive cleaning agents.

Restore System

- ☐ If you have altered the customer's instrumentation during the course of PM, restore to the original status to allow the customer to conduct their normal activities (e.g., reload the customer's method.)

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.

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Signature Page

Service Review

- ☒ Attach available reports/printouts of all tests to this documentation.
- ☒ Record the Preventive Maintenance service activity in the customer's records/logbook.
- ☒ Update/reset instrument maintenance counters as appropriate.
- ☒ Affix the PM sticker to the system or instrument logbook based on the customer's request.
- ☒ Complete the Service Engineer Comments section if there are additional comments.
- ☒ Review this service, parts replaced, and test results obtained with the customer.
- ☒ If the instrument firmware was updated, record the details of the change in the Service Engineer's Comments box or if necessary, in the customer's IQ records.

Test Results

Test Description	Expected Test Result	Actual Test Result
Flame optics PMT Gain test		
For copper at 324.8 nm, 4 mA, 0.5 nm slit width	< 5%	4.2 %
Flame performance test with 5 ppm copper sample		
Air /acetylene, mixing paddle removed	Abs value > 0.5	0.9963
Air /acetylene, mixing paddle installed, 10 replicates	%RSD < 1.0	0.4
Deuterium furnace optics PMT Gain test		
For copper at 324.8 nm, 4 mA, 0.5 nm slit width	< 5%	
Deuterium furnace performance test with 25 ppb copper sample (324.8 nm)		
Precision %RSD	≤ 4.0%	—
Abs value	≥ 0.15	—
Zetman furnace analytical performance: 25 ppb copper sample (327.4 nm)		
Precision %RSD	≤ 4.0%	—
Abs value	≥ 0.10	—
MSR%	≥ 70%	—

As VGA-77 test Abs. 0.2 Abs 0.2166 Abs

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AA consumable and parts list table

Part Description	Part Number	Product/Model # where used	PM supplied or Consumable	Instrument Type
Test Solution - Cu Spym solution	6610030100	50 55 140 240 280	PM supplied	Common
Test Solution - Blank solution	5190-7001	50 55 140 240 280	PM supplied	Common
Copper, 1000 ug/mL, 100mL	5190-8279	50 55 140 240 280	*	Common
K2, Mk 7 O-rings, aqueous, complete set	9910093400	50 55 140 240 280	PM supplied	Flame
Organic Kit	9910093500	50 55 140 240 280	PM supplied	Flame
Wire Nebulizer Cleaning	9910024700	50 55 140 240 280	consumable	Flame
Tubing-Capillary Std Neb	9910024800	50 55 140 240 280	consumable	Flame
Capillary Tube Hvac Neb (3) (organics only)	9910044000	50 55 140 240 280	consumable	Flame
Glass impact beads (5/pk)	9910025700	50 55 140 240 280	consumable	Flame
Teflon impact beads (5/pk) (organics only)	9910053300	50 55 140 240 280	consumable	Flame
Burner cleaning strip (100/pk)	9910053900	50 55 140 240 280	consumable	Flame
Window UV silica - round (right side)	2010082500	50 55 140 240 280	PM supplied	Common
Window UV silica - rectangular (left side)	2010082500	50 55 140 240 280	PM supplied	Common
Pad adhesive window (round)	4910012700	50 55 140 240 280	PM supplied	Common
Pad adhesive window (rectangular)	4910012800	50 55 140 240 280	PM supplied	Common
Electrode kit (1 pr) (D2)	6310003400	GTA120	PM supplied	Furnace
Shroud (D2)	6310003100	GTA120	PM supplied	Furnace
Zeeman electrode kit (1 pr)	6310003500	GTA120	PM supplied	Furnace
Zeeman shroud	6310003600	GTA120	PM supplied	Furnace
O-ring, PSD rinse bottle	6910025900	PSD120	PM supplied	Furnace

* For engineers who only service AA instruments 5190-8279 can be used as a cheaper alternative for 6610030100.

Items classified as PM supplied in the above table are included in the standard PM. Those classified as consumable should be provided by the customer or charged to the customer if supplied by the Agilent service engineer.

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Service Engineer Comments (optional)

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

Service

Service ne

Agilent sig

Total num

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SVD Results Report



Report ID: Diagnostic Start Time: 28/01/2022 8:48:57 AM Diagnostic End Time: 28/01/2022 9:54:21 AM

Customer: UAE

Service Engineer: Kanyakorn S.

Address:

Contact Details: 026375363#1

Instrument Configuration

Configuration:

Serial Number: MY13160001 Turret Type: Automatic
Instrument Model: Varian AA140/240/280 Number Of Lamps: 4
Flame Instrument: True Mono Type: Automatic
Furnace Instrument: True Gasbox Type: N Gas Box
Zeeman Present: False Auto Burner Adjuster: False
Internal Zeeman: False Mains Frequency: 60
Internal UltraAA: False Firmware Version: 2.11
Optics Type: Double Beam Photomultiplier Type: Normal(900nm)
D2 BG Correction Fitted: True PWB Version: 45
Boot Block Version: 1.09

EEPROM Data:

Instrument Run Hours: 48968.684 D2 Run Hours: 38036.500
Zero Wavelength Offset: 30.071 D2 Serial Number: not set
Mono Correction: 0.795 D2 Install Date: 01/01/1975
Flame Hours: 23619.168 D2 Original Intensity: 1.000
D2 Last Intensity: 475.000

Frequency:

Averaging Period: 30.0
Datapoint Count: 20

Upper Limit:
51.00

Average Frequency:
59.00

Lower Limit:
49.00

Highest Measured Frequency:
59.00

Lowest Measured Frequency:
50.00

Result: **Passed**

Power Supply:

Averaging Period: 30.0

Datapoint Count: 20

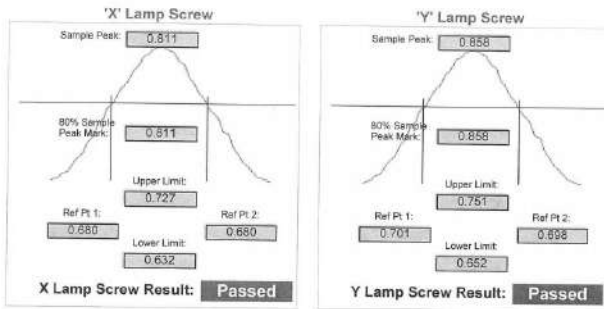
	Lower Limit (V)	Actual (V)	Upper Limit (V)	Result:
12.00V Rail	10.80	12.20	13.20	Passed
-12.00V Rail	-13.20	-11.90	-10.80	Passed
5.00V Rail	4.50	5.01	5.50	Passed
310.00V Rail	279.00	320.00	341.00	Passed

Optics

Beam Balance:

Lamp Type: Copper
Lamp Socket Used: 3

Peak Selected: 324.80
Lamp Alignment: **Performed**



Grating Squareness:

Lamp Element(s): Copper
Lamp Turret Position: 3
Lamp Current(mA): 4.00
Slit Width(nm): 0.5
1st Order Wavelength(nm): 324.80
Lamp Alignment: **Performed**

	Lower Limit (nm)	Actual (nm)	Upper Limit (nm)	Result:
Zero Order	-0.10	0.00	0.10	Passed
First Order	324.45	324.75	325.15	Passed
Second Order	649.23	649.52	649.97	Passed

Report Generated At: 28/01/2022 9:52:26 AM

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SVD Results Report SVD
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Wavelength Repeatability:

Lamp Used: Copper
Peak Used(nm): 324.750
Connected to Socket: 3
Lamp Current(mA): 4
Slit Width(nm): 0.2
Slit Height: Normal
Lamp Alignment: **Performed**
Lower Limit(nm) 324.763 324.883 Upper Limit(nm)
(Approach from Zero Order) (Approach from end)
Sample 1: 324.823 Sample 2: 324.623
Sample 3: 324.823 Sample 4: 324.819
Sample 5: 324.818 Sample 6: 324.819
Sample 7: 324.819 Sample 8: 324.819
Sample 9: 324.819 Sample 10: 324.819
Mean: 324.821 Standard Deviation: 0.002
Result: **Passed**

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SVD Results Report SVD
เอกสารไม่ควบคุม

Mechanical

Wavelength Drive:

Passed

Slit Drive:

Passed

Turret Drive:

Passed

Auto Burner Adjuster Drive:

Untested

Miscellaneous

Signal Processing Linearity:

Calculate Mode: New Calc Mode

	Lower Limit	Actual	Upper Limit	Result:
S0	114	280	267	Passed
S1	136	164	191	Passed
S2	271	295	332	Passed
S3	474	505	579	Passed
S4	825	913	1008	Passed
S5	1435	1519	1754	Passed
S6	2498	2763	3053	Passed
S7	4347	4724	5313	Passed

Interlocks:

Burner Fitted: **Working**
N2O Burner Fitted: **Untested**
Flame Shield Closed: **Working**
Gas Control Fitted: **Untested**
Pressure Release Bung Fitted: **Working**
Liquid Trap Fitted: **Working**
Flame Detect: **Working**
GCU Active: **Working**
Oxidant Pressure: **Working**
Oxidant Changeover: **Untested**
Ignition: **Working**

Report Generated At: 28/01/2022 9:52:26 AM

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SVD Results Report SVD
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Auto Lamp Recognition:

Lamp 1: 12 - Chromium (Cr)
Lamp 2: Uncoded Lamp/Not Connected
Lamp 3: 14 - Copper (Cu)
Lamp 4: 87 - Silver/Cadmium/Lead/Zinc(UltrAA) (Ag/C/Lamp 8: Not Supported
Lamp 5: Not Supported
Lamp 6: Not Supported
Lamp 7: Not Supported

Result: **Passed**

GTA Temperature Monitoring:

Not Performed

Notes:

Signatures:

Report Generated At: 28/01/2022 9:52:26 AM

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SVD Results Report SVD
เอกสารไม่ควบคุม

Analyst
Date Started 28/01/2022 9:56 AM GMT: 28/01/2022 2:06 AM
Worksheet FM 28-01-2022 01-Sandvity test
Comment
Methods Cu
Computer name HBA-212
Serial Number: IM743169001

Method: Cu (Flame)

Sample ID	Exp. Path	%RSD	Mean Abs
Cu Spgrn	0.500	0.4	0.0004
Readings			
0.6942	0.5002	0.4978	0.6006
0.9019	0.5004	0.4988	0.4896
28/01/2022			

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Analyst
Date Started 28/01/2022 11:04 AM GMT: 28/01/2022 4:04 AM
Worksheet As Hydride
Comment
Methods As
Computer name HBA-212
Serial Number: IM743169001

Method: As (Vapor)

Sample ID	Exp. Path	%RSD	Mean Abs
As 10 ppb	0.22	1.1	0.2158
Readings			
0.2188	0.2171	0.2150	0.2146
0.2125			
28/01/2022			

เอกสารไม่ควบคุม

Agilent 5110 and 5100 ICP-OES
Preventive Maintenance Checklist

Agilent Preventive Maintenance provides factory recommended service for your analytical systems 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 everything you need to reduce unplanned downtime and keep your systems operating at their peak.

For more information about Agilent Technologies services please visit our web site using the following URL: <http://www.agilent.com/en-us/services/analytical-instrument-services>

Customer Information

- Customers should provide all necessary operating supplies upon request of the engineer.
- For customers using IIF applications, the instrument should be returned to its standard sample introduction system.
- A customer representative should be available to the engineer while performing the preventive maintenance procedures.
- 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 additional or special procedures and/or parts for the instrument service, then these must be ordered separately and charged as a repair, which may incur additional

Service Engineer's Responsibilities

- Only complete/printout pages that relate to the system being serviced.
- Complete empty fields with the relevant information.
- Complete the relevant checkboxes in the checklist using a "X" or tick mark "✓" in the checkbox.
- Complete Not Applicable check boxes to indicate services not delivered, as needed.
- Complete the PM service in the order of the tasks listed.
- Complete the Service Review section together with the customer.

เอกสารไม่ควบคุม

Agilent 5110 and 5100 ICP-OES
Preventive Maintenance Checklist

System Information

Instrument system name and ID	ICP-OES 5110 V04
Instrument system site and location	UAE Consultant
List system component product numbers	List the serial numbers of each component
1. 81615A	1. MY 15038001
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.
7.	7.
8.	8.
9.	9.
10.	10.

ICP-OES Configuration table	Circle the type or write in the type if other
Nebulizer Type	SeaSpray OneNeb other
Spray Chamber	Cyclonic Single Pass Cyclonic Double Pass other
Torch	Radial Dual View other
Injector Diameter	2.4mm 1.8mm 1.4mm 0.8mm other
Injector Material	Quartz Ceramic other

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Agilent 5110 and 5100 ICP-OES Preventive Maintenance Checklist

General Preparation

- ☒ Discuss any specific questions or issues with the customer prior to starting.
- ☒ Review the instrument logbook.
- ☒ Perform general external inspection of system for cleanliness.
- ☒ Check for proper installation of safety-related parts, assemblies, sensors etc.
- ☒ Check for required firmware/software updates and verify with customers if they would like it installed.
- ☐ For HF application systems, if standard sample introduction system was not installed, ask the customer to install it. *not applicable*
- ☒ Run Instrument Performance test and record results in Instrument Performance Test Results Table - Pre PM.

Inspect and clean the system

- ☒ Look for any obvious external damage or problems.
- ☒ Inspect water cooling hoses, gas lines and power cord for excessive wear or damage.
- ☒ Perform a general internal inspection of the system for excessive dust accumulation, clean if necessary.
- ☒ Inspect sample introduction components and record any required maintenance in the Service Engineer Comments and notify the customer as the required actions required.
- ☒ Record the instrument operating conditions in the ICP-OES Status Results Table.
- ☒ Replace the polychromator purge filter.
- ☒ Replace the radial pre-optics window
- ☒ Replace the axial pre-optics window for SVDV and VDV instruments.
- ☒ Check exhaust flow for the correct positive extraction at the exhaust duct to insure they meet minimum specifications.
- ☒ Replace air inlet dust filter.
- ☐ Replace high capacity air inlet dust filter element if installed. *not applicable*
- ☒ Remove and clean instrument water inlet filter.

Agilent Water Recirculator

- ☐ Section NOT Applicable
- ☒ Drain cooling fluid and remove any particles from the chiller reservoir
- ☒ Remove, clean, and reinstall water inlet metal mesh filter if present.
- ☒ Re fill with Polyclear Plus cooling fluid.
- ☒ Clean the cooling system Air filter and the condenser.

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Agilent Technologies

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Agilent 5110 and 5100 ICP-OES Preventive Maintenance Checklist

SPS 3 Auto Sampler

- ☒ Section 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 racks and the Agilent software move the sample probe to the 4 outermost corners and rinse port, ensure that the probe is approximately centered in the vial.

SPS 4 Auto Sampler

- ☒ Section 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 FPC cables for cracks, incorrect positioning, damaged edges or damaged connectors.
- ☐ Pump Tubing Replacement. Replace peristaltic pump tubing. Replace all tubing that goes from the rinse station to the pump and from the pump to the waste/rinse bottles

AVS 4, 6, 7

- ☒ Section NOT Applicable
- ☐ Replace valve rotor 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

Instrument Adjustment

- ☒ Check position of Zn peak, adjust if required.
- ☒ Check Argon Ratio, adjust to specified value if required.
- ☒ Perform Detector Calibration.
- ☒ Perform Instrument Calibration.
- ☒ Run Instrument Performance Test and 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 and record the result in the Instrument Test Results Table
 - ☒ Subsystem Communications Test
 - ☒ Air Flow

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Agilent 5110 and 5100 ICP-OES Preventive Maintenance Checklist

- ☒ Water Flow
- ☒ Gas Flows
- ☒ RF Generator
- ☒ Camera Test
- ☒ Optics Test
- ☒ Nebulizer Test

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*
Zn 213.807 nm SRBR	4.01E-3	3.45E-1	4.11E-3	3.91E-1
Mn 267.610 nm SRBR	1.14E-1	3.01E-1	1.19E-1	3.04E-1
Al 306.152 nm SBR	3.4	15.3	6.7	13.5
K 766.491 nm SBR	9.3	31.9	5.7	44.4

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

Instrument Test Results Table

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

Instrument Test	Result
Subsystem Communications Test	Pass
Air Flow	Pass
Water Flow	Pass
Gas Flows	Pass
RF Generator	Pass
Camera Test	Pass
Optics Test	Pass
Nebulizer test	Pass

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เอกสารไม่ควบคุม

Agilent 5110 and 5100 ICP-OES Preventive Maintenance Checklist

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	
Mains Voltage	215.113	VAC	194.510	VAC
Mains Current	0.114	A	3.113	A
Instrument Temperature	23.4	°C	23.5	°C
RF Air Flow (sensor speed)	14.0	Hz	14.0	Hz
Plasma Exhaust Temperature	No measurement		15.0	°C
Water Flow Oscillator	No measurement		1.03	L/min
Water Flow Detector	1.00	L/min	1.13	L/min
Water Inlet Temperature	19.1	°C	19.8	°C
Polychromator Temperature	35.0	°C	35.0	°C
CCD Temperature	24.9	°C	-39.3	°C
Thermal Stabilizer	35.0	°C	35.0	°C
Argon Supply Pressure	114.15	kPa	124.92	kPa
Purge Gas Supply Pressure*1	14.14	kPa	15.13	kPa
Option Gas Supply Pressure*1	-	kPa	-	kPa
Nebulizer Flow	No measurement		0.90	L/min
Nebulizer Back Pressure	No measurement		12.15	kPa
Plasma Gas Flow	No measurement		15.00	L/min
Auxiliary Gas Flow	No measurement		1.20	L/min
RF Power	No measurement		1201.1	W
RF Supply Current	No measurement		5.233	A
RF Supply Voltage	No measurement		194.510 V	V

*1 If option installed

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เอกสารไม่ควบคุม

Agilent 5110 and 5100 ICP-OES Preventive Maintenance Checklist

ICP-OES Parts List Table

Part description	Part Number	Product / Model # where used	Quantity Consumed
Axial Pre-Optic Window	G8010-68014	G8010A, G8011A, G8014A/G8015A	1
Radial Pre-Optic Window	G8010-68015	All	1
Polyclear Plus Cooling Fluid	G3292-80012	Agilent Water Recirculator	—
Purge Gas Filter	G8010-60136	All	1
Air inlet filter	G8000-68002	All	1
High Capacity Air Filter	G8010-60189	Optional	—
Rotor seal for 6-7 port valve for AVS6/7	G8494-60002	G8494A/G8495	—
Rotor seal for 4 port valve for AVS4	G8493-60002	G8493A	—
Rinse solution to rinse station 2.5mm id x 1m	G8410-80123	SPS 4	—
Barb connector 2.5mm-1.5mm ID	G8410-80124	SPS 4	—
PVC waste tubing 8mm od x 5mm id, 2m	G8410-80122	SPS 4	—
Additional Parts may be required from engineers stock:			
X axis drive belt	5410047500	SPS 3	—
Z axis drive belt	5410047400	SPS 3	—
Peristaltic pump tubing, PVC Solvaflex, 3 bridged,	3710049000	SPS 4	—

Restore system

For HF applications, ask the customer to reinstall their sample introduction system.

Leave system in an idle state: on and purging.

Guidance: If the PM service is performed prior to a qualification service, then use the qualification procedure as a guide for final instrument set up and checkout.

Service Review

- ☒ Affix the PM sticker to the system or instrument logbook based on the customer's request.
- ☒ Complete the Service Engineer Comments section below if there are additional comments.

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เอกสารไม่ควบคุม

Agilent 5110 and 5100 ICP-OES Preventive Maintenance Checklist

- ☒ Review the service and any test results with the customer.
- ☒ If the Instrument firmware was updated, record the details of the change in the Service Engineer's Comments box below or if necessary, in the customer's IQ records.

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.

Other Important Customer Web Links

How to get information on your product:

- ☐ Literature Library - <http://www.agilent.com/en-us/products/icp-oes/icp-oes-systems/5110-icp-oes/literature>
- ☐ Need to know more? - <http://www.agilent.com/crosslab/university/>
- ☐ Need technical support, FAQs? - <http://www.agilent.com/en-us/support/landing/icp-oes>
- ☐ Need supplies? - www.agilent.com/chem/supplies

Service Completion

Service request number

Agilent signature

Document part number: G8014-90075

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เอกสารไม่ควบคุม

Page PM

Report Summary

Instrument Model	Agilent 5100/5110 VDV ICP-OES
Instrument ID	G8011A/G8015A
Instrument Serial Number	M Y 16030001
Software Version	7.3.1.9507
Firmware Version	3442
Tested By	Nutkon L
Test Completed On	12/9/2021 9:14:59 AM

Result Summary

Subsystem Communications Test	Skipped
Air Flow Test	Skipped
Water Flow Test	Skipped
Gas Flows Test	Skipped
RF Generator Test	Skipped
Camera Test	Skipped
Optics Test	Skipped
Advanced Valve System Test:	Skipped
Resolution Test	Pass
Sensitivity Test	Pass
Precision Test	Pass

เอกสารไม่ควบคุม

Resolution Test

Pass

Element Wavelength	Specification	Width
N (174.213 nm)	≤ 9.40	7.27
As (188.960 nm)	≤ 8.20	6.23
C (193.027 nm)	≤ 11.50	8.26
Mo (202.032 nm)	≤ 8.20	6.42
Cr (206.158 nm)	≤ 13.40	9.27
Zn (213.857 nm)	≤ 6.70	6.77
Pb (220.353 nm)	≤ 9.90	7.12
Co (225.615 nm)	≤ 17.20	11.58
Ba (230.424 nm)	≤ 8.40	7.35
Mn (257.610 nm)	≤ 13.30	3.52
Mn (260.588 nm)	≤ 20.30	14.30
Cr (267.719 nm)	≤ 11.00	7.90
Cu (324.754 nm)	≤ 25.00	19.06
Cu (327.395 nm)	≤ 14.20	11.32
Sr (338.071 nm)	≤ 33.50	24.39
Ba (455.403 nm)	≤ 44.00	32.86
Sr (460.733 nm)	≤ 36.00	12.38
Ba (483.408 nm)	≤ 36.00	25.53
Ba (614.171 nm)	≤ 42.00	24.99
Ar (675.283 nm)	≤ 74.00	55.45
K (766.491 nm)	≤ 80.00	65.27

เอกสารไม่ควบคุม

Sensitivity Test			Pass		
Radial					
Element Wavelength	Specification	Method	Ratio	Standard	Blank
As (188.980 nm)	≥ 46.0	SRBR	167.2	1151.3	42.4
Se (196.026 nm)	≥ 41.0	SRBR	119.1	1177.1	64.2
Zn (213.857 nm)	≥ 1421.0	SRBR	4082.3	49908.2	148.6
Pb (220.353 nm)	≥ 48.0	SRBR	191.1	2682.8	172.8
Mn (257.610 nm)	≥ 3618.0	SRBR	11416.2	265002.2	536.8
Al (396.152 nm)	≥ 3.4	SBR	7.8	49636.0	6676.5
Ba (493.408 nm)	≥ 34.0	SBR	118.1	1990041.4	17066.5
K (766.491 nm)	≥ 1.8	SBR	6.3	101078.4	16104.6
Axial					
Element Wavelength	Specification	Method	Ratio	Standard	Blank
As (188.980 nm)	≥ 206.0	SRBR	252.9	3214.2	147.0
Se (196.026 nm)	≥ 159.0	SRBR	216.2	3838.7	272.2
Zn (213.857 nm)	≥ 234.0	SRBR	1203.3	14046.1	133.7
Pb (220.353 nm)	≥ 1743.0	SRBR	7896.1	171323.1	472.9
Cd (214.439 nm)	≥ 4227.0	SRBR	7054.9	129539.3	335.4
Mn (257.610 nm)	≥ 320.0	SRBR	531.7	13218.2	566.2
Cr (267.716 nm)	≥ 10625.0	SRBR	30884.7	1314844.0	1807.4
Cu (324.754 nm)	≥ 1043.0	SRBR	4442.1	174420.3	1615.1
Al (396.152 nm)	≥ 19.0	SBR	50.7	374603.8	7249.0
Ba (493.408 nm)	≥ 6.0	SBR	209.7	10899956.6	51728.3
K (766.491 nm)	≥ 24.0	SBR	36.9	1983197.5	49748.6

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เอกสารไม่ควบคุม

Precision Test			Pass		
Radial					
Element Wavelength	Specification	Measured Value % RSD			
As (188.980 nm)	≤ 2.60	0.31			
Se (196.026 nm)	≤ 2.80	1.21			
Zn (213.857 nm)	≤ 1.50	0.39			
Pb (220.353 nm)	≤ 2.50	0.61			
Mn (257.610 nm)	≤ 1.50	0.45			
Al (396.152 nm)	≤ 1.50	0.41			
Ba (493.408 nm)	≤ 1.50	0.51			
K (766.491 nm)	≤ 1.50	0.36			
Axial					
Element Wavelength	Specification	Measured Value % RSD			
As (188.980 nm)	≤ 1.50	0.51			
Se (196.026 nm)	≤ 1.50	0.73			
Zn (213.857 nm)	≤ 1.50	0.30			
Pb (220.353 nm)	≤ 1.50	0.37			
Cd (214.439 nm)	≤ 1.50	0.36			
Pb (220.353 nm)	≤ 1.50	0.28			
Mn (257.610 nm)	≤ 1.50	0.63			
Cr (267.716 nm)	≤ 1.50	0.30			
Cu (324.754 nm)	≤ 1.50	0.64			
Al (396.152 nm)	≤ 1.50	0.46			
Ba (493.408 nm)	≤ 1.50	0.94			
K (766.491 nm)	≤ 1.50	0.56			

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เอกสารไม่ควบคุม

Report Summary		
Instrument Model	Agilent 5100/5110 VDV ICP-OES	
Instrument ID	G8011A/G8016A	
Instrument Serial Number	MY18U30001	
Software Version	7.3.1.9507	
Firmware Version	3442	
Tested By	Nukoon L	
Test Completed On	12/9/2021 12:55:49 PM	
Result Summary		
Subsystem Communications Test	Skipped	
Air Flow Test	Skipped	
Water Flow Test	Skipped	
Gas Flows Test	Skipped	
RF Generator Test	Skipped	
Camera Test	Skipped	
Optics Test	Pass	
Advanced Valve System Test	Skipped	
Resolution Test	Pass	
Sensitivity Test	Pass	
Precision Test	Pass	
Optics Test		
	Radial	Axial
Intensity	5296135	5755042
Wavelength	737.212	737.212

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เอกสารไม่ควบคุม

Resolution Test			Pass		
Element Wavelength	Specification	Width			
N (174.213 nm)	≤ 9.40	7.22			
As (188.980 nm)	≤ 9.20	6.16			
C (193.027 nm)	≤ 11.50	8.22			
Mo (202.032 nm)	≤ 8.20	6.33			
Cr (205.158 nm)	≤ 13.40	8.21			
Zn (213.857 nm)	≤ 8.70	6.87			
Pb (220.353 nm)	≤ 9.50	7.02			
Co (228.615 nm)	≤ 17.20	11.81			
Ba (230.424 nm)	≤ 9.40	7.48			
Mn (257.610 nm)	≤ 13.30	9.49			
Mn (260.588 nm)	≤ 20.30	14.19			
Cr (267.716 nm)	≤ 11.00	7.90			
Cu (324.754 nm)	≤ 26.00	18.92			
Cu (327.395 nm)	≤ 14.20	11.22			
Sr (338.071 nm)	≤ 33.50	24.29			
Ba (455.403 nm)	≤ 44.00	33.08			
Sr (460.733 nm)	≤ 38.00	17.64			
Ba (463.408 nm)	≤ 36.00	25.56			
Ba (614.171 nm)	≤ 47.00	24.75			
Ar (675.283 nm)	≤ 74.00	59.18			
K (766.491 nm)	≤ 80.00	65.10			

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เอกสารไม่ควบคุม

Sensitivity Test			Pass			
Radial						
Element	Wavelength	Specification	Method	Ratio	Standard	Blank
As (188.980 nm)	> 45.0	SRBR	154.8	1242.3	58.5	
Se (196.026 nm)	≥ 41.0	SRBR	117.4	1250.6	97.9	
Zn (213.857 nm)	≥ 1421.0	SRBR	4192.8	52402.8	155.3	
Pb (220.353 nm)	≥ 46.0	SRBR	196.4	2814.2	179.9	
Mn (257.610 nm)	≥ 3516.0	SRBR	11993.6	281210.1	547.6	
Al (396.152 nm)	≥ 3.4	SBR	8.7	55103.6	5662.9	
Ba (493.408 nm)	≥ 34.0	SBR	125.4	2152916.8	17032.2	
K (766.491 nm)	≥ 1.8	SBR	5.7	107908.7	16079.8	
Axial						
Element	Wavelength	Specification	Method	Ratio	Standard	Blank
As (188.980 nm)	≥ 208.0	SRBR	267.5	4054.8	170.4	
Se (196.026 nm)	≥ 159.0	SRBR	260.2	4794.9	288.5	
Zn (213.857 nm)	≥ 234.0	SRBR	1305.9	16162.3	150.3	
Pb (220.353 nm)	≥ 1743.0	SRBR	8920.7	200815.6	504.7	
Mn (257.610 nm)	≥ 4227.0	SRBR	7958.3	149327.5	350.4	
Al (396.152 nm)	≥ 320.0	SRBR	606.7	15244.5	584.0	
Ba (493.408 nm)	≥ 10825.0	SRBR	34460.9	1493092.8	1572.5	
K (766.491 nm)	≥ 1048.0	SRBR	6018.6	199000.6	1532.6	
Cu (324.754 nm)	≥ 19.0	SBR	67.5	423683.7	7248.8	
Al (396.152 nm)	≥ 6.0	SBR	18.5	320004.9	18441.4	
Ba (493.408 nm)	≥ 60.0	SBR	233.3	11862815.4	50714.5	
K (766.491 nm)	≥ 24.0	SBR	44.6	2218974.4	40657.9	

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เอกสารไม่ควบคุม

Precision Test			
Radial			
Element	Wavelength	Specification	Measured Value % RSD
As	(188.980 nm)	≤ 2.00	1.38
Se	(196.026 nm)	≤ 2.00	0.91
Zn	(213.857 nm)	≤ 1.50	0.38
Pb	(220.353 nm)	≤ 2.00	0.44
Mn	(257.610 nm)	≤ 1.50	0.43
Al	(396.152 nm)	≤ 1.50	0.36
Ba	(493.406 nm)	≤ 1.50	0.66
K	(766.491 nm)	≤ 1.50	0.96
Axial			
Element	Wavelength	Specification	Measured Value % RSD
As	(188.980 nm)	≤ 1.50	0.61
Se	(196.026 nm)	≤ 1.50	0.52
Zn	(213.857 nm)	≤ 1.50	0.36
Pb	(220.353 nm)	≤ 1.50	0.33
Mn	(257.610 nm)	≤ 1.50	0.41
Al	(396.152 nm)	≤ 1.50	0.36
Ba	(493.406 nm)	≤ 1.50	0.74
K	(766.491 nm)	≤ 1.50	0.25
Cu	(324.754 nm)	≤ 1.50	0.71
Al	(396.152 nm)	≤ 1.50	0.44
Ba	(493.406 nm)	≤ 1.50	0.73
K	(766.491 nm)	≤ 1.50	0.97

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เอกสารไม่ควบคุม

Report Summary	
Instrument Model	Agilent 5100/5110 VDV ICP-OES
Instrument ID	G8011A/G8015A
Instrument Serial Number	MY18030001
Software Version	7.3.1.9007
Firmware Version	3442
Tested By	Nukoon L.
Test Completed On	12/8/2021 1:34:10 PM
Result Summary	
Subsystem Communications Test	Pass
Air Flow Test	Pass
Water Flow Test	Pass
Gas Flows Test	Pass
RF Generator Test	Pass
Camera Test	Pass
Optics Test	Skipped
Advanced Valve System Test	Skipped
Resolution Test	Skipped
Sensitivity Test	Skipped
Precision Test	Skipped

Subsystem Communications Test			Pass
Air Flow Test			Pass
30% Air Flow (relative speed)	75% Air Flow (relative speed)		
15.00	19.00		
Water Flow Test			Pass
RF Water Flow (L/min)	Camera Water Flow (L/min)	Water Inlet Temperature (°C)	
1.98	1.36	17.15	

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เอกสารไม่ควบคุม

Gas Flows Test			Pass		
Nebulizer Target Flow	Actual Flow	Back Pressure	Auxiliary Target Flow	Actual Flow	Back Pressure
0.70	0.70	203.80	2.00	1.99	108.68
Makeup Target Flow	Actual Flow	Back Pressure	Plasma Target Flow	Actual Flow	Back Pressure
2.00	2.00	113.89	18.00	17.93	24.24
RF Generator Test			Pass		
RF Power Supply Test	Passed				
RF Power Supply (V)	141.475				
RF Oscillator Test	Passed				
RF Oscillator Frequency (MHz)	26.674				
Work Coil Current (A)	45.931				
RF Power Supply Current (A)	2.000				
Camera Test			Pass		
	Integration Time (ms)	Standard Deviation	Status		
Electronic Offset Test	1000	5.281	Passed		
Dark Current Test	9000	0.734	Passed		
Array Test	5	0.024	Passed		
Linearity Test		0.118	Passed		

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เอกสารไม่ควบคุม



Certificate of Calibration

DX-120 : Anion (ID#042)

This certificate is to verify that instrument below are calibrated
by Archemica Lab Co.,Ltd.

DX-120

S/N : 03010223

for

UAE

Operator Sign

Test Engineer

เอกสารไม่ควบคุม

Qualification Report

PM Check list ,CM_OQ and PQ
DX-120 : Anion (ID#042)
For
UAE
(2nd Contract)

เอกสารไม่ควบคุม

Preventive Maintenance Check List

เอกสารไม่ควบคุม



Preventive Maintenance Checklist

Dionex Ion Chromatography Preventive Maintenance Report

Customer Organization	Name/ Department
UAE (2 nd Contract)	Khun Suwan
Engineer Name	Date
Mr Channerong Khiao-un	8-Dec-2021

Instrument Detail

Instrument Model	Application
DX-120 (ID#042)	Anion
Instrument components	Serial Number
DX-120	03010223

Consumable Detail

Columns	Guard Columns	Suppressors	Concentrators	Etc.
AS22	AG22	ASRS 300	-	-

Remark:

Perform By:

เอกสารไม่ควบคุม



Preventive Maintenance Checklist

General Inspection Checklist

Item	Description	Result		Action Taken	N.A.
		Pass	Fail		
1	Power line 220 Vac	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
2	Pneumatic Line	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
3	Pressure outlet 80-100 psi	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
4	Barbed fitting and tea fitting	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
5	Crimped and blocked tubing	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
6	Rheodyne Valve for Leak	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check&Clean	<input type="checkbox"/>
7	Safety valve or leak	<input type="checkbox"/>	<input type="checkbox"/>	-	<input checked="" type="checkbox"/>
8	Inspect detector	<input type="checkbox"/>	<input type="checkbox"/>	-	<input checked="" type="checkbox"/>
9	Inspect port face	<input type="checkbox"/>	<input type="checkbox"/>	-	<input checked="" type="checkbox"/>
10	Inspect pressure bottle	<input type="checkbox"/>	<input type="checkbox"/>	-	<input checked="" type="checkbox"/>
11	Inspect filling and bottle	<input type="checkbox"/>	<input type="checkbox"/>	-	<input checked="" type="checkbox"/>
12	Suppressor for leak	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
13	Cell for leak	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
14	Electronic cable connected	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
15	On/Off selection valve for leak	<input type="checkbox"/>	<input type="checkbox"/>	-	<input checked="" type="checkbox"/>
16	Inspect all fitting and line	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
17	E-jet reservoir	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
18	Inspect cap o-ring	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
19	Inspect air for leak	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
20	Fluor seal has been replaced	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
21	Back up seal has been replaced	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
22	Pump Lubricate	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
23	Front panel test	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
24	Low limit alarm	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
25	High limit alarm	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
26	Conductivity electronic test 160-4-1 uS	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
27	Check noise for suppressor (pk to pk <0.005uS)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
28	Check column	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
29	Check suppressor	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check&Clean	<input type="checkbox"/>
30	Check pump	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
31	Check cell	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
32	Check leak sensor	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
33	Flow rate	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
34	System pressure	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>
35	Determine background	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Check	<input type="checkbox"/>

เอกสารไม่ควบคุม

Chromeleon Operational Qualification (CM_OQ)

เอกสารไม่ควบคุม

Seq: USER-1360978085_local_ArchemicalService Contract(202112nd Con 8-Dec-2021)CM_OQ 8-Dec-2021 CM_OQ
Page 1 of 15
Smp: Parabene Runtime: 12/8/2021 10:02:07 AM



Chromeleon Operational Qualification

General Information

Computer Name (Server): LAB-IC
Computer Name (Client): LAB-IC
Version Number: 6.80 SR12 Build 3578 (207189)
Operator: Mr.Channarong Khiao-Lin

General System Suitability Test: Test passed

Comparison Formats:

All Parameters: (Exceptions see below)	Significant Digits: (They must match exactly)	10
Time Related Frac. Coll. Parameters: (The parameters are marked with *)	Max. Deviation:	0.02 s

เอกสารไม่ควบคุม

Seq: USER-1360978085_local_ArchemicalService Contract(202112nd Con 8-Dec-2021)CM_OQ 8-Dec-2021 CM_OQ
Page 2 of 15
Smp: Parabene Runtime: 12/8/2021 10:02:07 AM



Chromeleon Operational Qualification, Part 1 Verification of Selected Results

Calibration Type: LOF
Integration Type: Area
Standard Method: External
Calibration Mode: Toile
Auto Recalibrate: ON

Report Variable	Peak Name	Status
Offset (s)	n.s.	ok
	n.s.	ok
	n.s.	ok
Slope (s)	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok
Correlation Coeff.	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok
Variance	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok
Std. Deviation	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok
Rel. Std. Dev.	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok
Variance Coeff.	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok

เอกสารไม่ควบคุม



Chromeleon Operational Qualification, Part 1

Verification of Selected Results

Report Variable	Peak Name	Status
Calibration Point X	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok
Calibration Point Y	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok
Amount [ng]	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok
Resolution (EP)	Methylparabene	ok
	Ethylparabene	ok
Resolution (USP)	Methylparabene	ok
	Ethylparabene	ok
Peak Asymmetry (EP/USP)	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok
Peak Asymmetry (AMA)	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok

เอกสารไม่ควบคุม



Chromeleon Operational Qualification, Part 1

Verification of Selected Results

Report Variable	Peak Name	Status
Theoretical Plates (EP)	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok
Theoretical Plates (USP)	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok
Theoretical Plates (JP)	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok

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Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

Calibration Type: LOFF
Integration Type: Area
Standard Method: External
Calibration Mode: Total
Auto Recalibrate: ON

Variable Category	Report Variable	Peak Name	Status
Sample	No.		ok
	Name		ok
	Sample Type		ok
	Position		ok
	Status		ok
	Inj.Vol.		ok
	Dil Fac		ok
	Weight		ok
	Amount		ok
	Program		ok
	Quantification Method		ok
Chromatogram	Channel		ok
	No. of Peaks		ok
	Start Time		ok
	Signal Min.		ok
	Signal Max.		ok
	Signal Dimension		ok
Peak Results	No.	Methylparabene	ok
	No.	Ethylparabene	ok
	No.	Propylparabene	ok
	Peak Name	Methylparabene	ok
	Peak Name	Ethylparabene	ok
	Peak Name	Propylparabene	ok
	Ret.Time	Methylparabene	ok
	Ret.Time	Ethylparabene	ok
	Ret.Time	Propylparabene	ok
	Ret.Time	Propylparabene	ok

เอกสารไม่ควบคุม



Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

Variable Category	Report Variable	Peak Name	Status
Peak Results	Ret.Dev.(abs)	Methylparabene	ok
	Ret.Dev.(abs)	Ethylparabene	ok
	Ret.Dev.(abs)	Propylparabene	ok
	Ret.Dev.(rel)	Methylparabene	ok
	Ret.Dev.(rel)	Ethylparabene	ok
	Ret.Dev.(rel)	Propylparabene	ok
	Area	Methylparabene	ok
	Area	Ethylparabene	ok
	Area	Propylparabene	ok
	Rel.Area (Total)	Methylparabene	ok
	Rel.Area (Total)	Ethylparabene	ok
	Rel.Area (Total)	Propylparabene	ok
	Height	Methylparabene	ok
	Height	Ethylparabene	ok
	Height	Propylparabene	ok
	Rel.Height (Total)	Methylparabene	ok
	Rel.Height (Total)	Ethylparabene	ok
	Rel.Height (Total)	Propylparabene	ok
	Amount	Methylparabene	ok
	Amount	Ethylparabene	ok
	Amount	Propylparabene	ok
	Concentration	Methylparabene	ok
	Concentration	Ethylparabene	ok
	Concentration	Propylparabene	ok
	Rel.Amount	Methylparabene	ok
	Rel.Amount	Ethylparabene	ok
	Rel.Amount	Propylparabene	ok
	Peak Width (0%)	Methylparabene	ok
	Peak Width (0%)	Ethylparabene	ok
	Peak Width (0%)	Propylparabene	ok
	Peak Width (5%)	Methylparabene	ok
	Peak Width (5%)	Ethylparabene	ok
	Peak Width (5%)	Propylparabene	ok
	Peak Width (10%)	Methylparabene	ok
	Peak Width (10%)	Ethylparabene	ok
	Peak Width (10%)	Propylparabene	ok

เอกสารไม่ควบคุม



Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

Variable Category	Report Variable	Peak Name	Status
Peak Results	Peak Width (50%)	Methylparabene	ok
	Peak Width (50%)	Ethylparabene	ok
	Peak Width (50%)	Propylparabene	ok
	Left Width (0%)	Methylparabene	ok
	Left Width (0%)	Ethylparabene	ok
	Left Width (0%)	Propylparabene	ok
	Right Width (0%)	Methylparabene	ok
	Right Width (0%)	Ethylparabene	ok
	Right Width (0%)	Propylparabene	ok
	Peak Start	Methylparabene	ok
	Peak Start	Ethylparabene	ok
	Peak Start	Propylparabene	ok
	Peak Stop	Methylparabene	ok
	Peak Stop	Ethylparabene	ok
	Peak Stop	Propylparabene	ok
	Peak Start Value	Methylparabene	ok
	Peak Start Value	Ethylparabene	ok
	Peak Start Value	Propylparabene	ok
	Peak Stop Value	Methylparabene	ok
	Peak Stop Value	Ethylparabene	ok
	Peak Stop Value	Propylparabene	ok
	BL-Value Peak Start	Methylparabene	ok
	BL-Value Peak Start	Ethylparabene	ok
	BL-Value Peak Start	Propylparabene	ok
	BL-Value Peak Stop	Methylparabene	ok
	BL-Value Peak Stop	Ethylparabene	ok
	BL-Value Peak Stop	Propylparabene	ok
	Type	Methylparabene	ok
	Type	Ethylparabene	ok
	Type	Propylparabene	ok
	Resolution(EP)	Methylparabene	ok
	Resolution(EP)	Ethylparabene	ok
	Resolution(USP)	Methylparabene	ok
	Resolution(USP)	Ethylparabene	ok
	Asymmetry(EP)	Methylparabene	ok
	Asymmetry(EP)	Ethylparabene	ok
	Asymmetry(EP)	Propylparabene	ok

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Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

Variable Category	Report Variable	Peak Name	Status
Peak Results	Asymmetry(AIA)	Methylparabene	ok
	Asymmetry(AIA)	Ethylparabene	ok
	Asymmetry(AIA)	Propylparabene	ok
	Theoretical Plates(EP)	Methylparabene	ok
	Theoretical Plates(EP)	Ethylparabene	ok
	Theoretical Plates(EP)	Propylparabene	ok
	Theoretical Plates(USP)	Ethylparabene	ok
	Theoretical Plates(USP)	Propylparabene	ok
	Theoretical Plates(USP)	Ethylparabene	ok
	Theoretical Plates(USP)	Propylparabene	ok
	Theoretical Plates(JP)	Ethylparabene	ok
	Theoretical Plates(JP)	Propylparabene	ok
Peak Calibration	Cal.Mode	Methylparabene	ok
	Cal.Mode	Ethylparabene	ok
	Cal.Mode	Propylparabene	ok
	Auto.Recal.	Methylparabene	ok
	Auto.Recal.	Ethylparabene	ok
	Auto.Recal.	Propylparabene	ok
	Cal.Type	Methylparabene	ok
	Cal.Type	Ethylparabene	ok
	Cal.Type	Propylparabene	ok
	Weights	Methylparabene	ok
	Weights	Ethylparabene	ok
	Offset	Methylparabene	ok
	Offset	Ethylparabene	ok
	Offset	Propylparabene	ok
	Slope	Methylparabene	ok
	Slope	Ethylparabene	ok
	Slope	Propylparabene	ok
	RF-Value	Methylparabene	ok
	RF-Value	Ethylparabene	ok
	RF-Value	Propylparabene	ok
	No. of Points	Methylparabene	ok
	No. of Points	Ethylparabene	ok

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Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

Variable Category	Report Variable	Peak Name	Status
Peak Calibration	No. of Points	Propylparabene	ok
	No. of Points(disabled)	Methylparabene	ok
	No. of Points(disabled)	Ethylparabene	ok
	No. of Points(disabled)	Propylparabene	ok
	Variance	Methylparabene	ok
	Variance	Ethylparabene	ok
	Variance	Propylparabene	ok
	Var.Coeff	Methylparabene	ok
	Var.Coeff	Ethylparabene	ok
	Var.Coeff	Propylparabene	ok
	Std.Dev.	Methylparabene	ok
	Std.Dev.	Ethylparabene	ok
	Std.Dev.	Propylparabene	ok
	Rel.Std.Dev.	Methylparabene	ok
	Rel.Std.Dev.	Ethylparabene	ok
	Rel.Std.Dev.	Propylparabene	ok
	Corr.Coeff.	Methylparabene	ok
	Corr.Coeff.	Ethylparabene	ok
	Corr.Coeff.	Propylparabene	ok
	Coeff.Det.	Methylparabene	ok
	Coeff.Det.	Ethylparabene	ok
	Coeff.Det.	Propylparabene	ok
	Adj. Coeff.Det.	Methylparabene	ok
	Adj. Coeff.Det.	Ethylparabene	ok
	Adj. Coeff.Det.	Propylparabene	ok
	X	Methylparabene	ok
	X	Ethylparabene	ok
	X	Propylparabene	ok
	Y	Methylparabene	ok
	Y	Ethylparabene	ok
	Y	Propylparabene	ok
	W	Methylparabene	ok
	W	Ethylparabene	ok
	W	Propylparabene	ok
	FIX	Methylparabene	ok
	FIX	Ethylparabene	ok
	FIX	Propylparabene	ok

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Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

Variable Category	Report Variable	Peak Name	Status
Peak Calibration	Residual for Cal.Point X	Methylparabene	ok
	Residual for Cal.Point X	Ethylparabene	ok
	Residual for Cal.Point X	Propylparabene	ok
	Calibration Point Status	Methylparabene	ok
	Calibration Point Status	Ethylparabene	ok
	Calibration Point Status	Propylparabene	ok
	Amount	Methylparabene	ok
	Amount	Ethylparabene	ok
	Amount	Propylparabene	ok
	Amount	Propylparabene	ok
Peak Table	Peak Tab. Cal.Type	Methylparabene	ok
	Peak Tab. Peak Type	Methylparabene	ok
	Peak Tab. Left Limit	Methylparabene	ok
	Peak Tab. Right Limit	Methylparabene	ok
	Peak Tab. Group	Methylparabene	ok
	Peak Tab. Resp.Factor	Methylparabene	ok
	Peak Tab. Amount	Methylparabene	ok
	Peak Tab. Amnt.Dim	Methylparabene	ok

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Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

Variable Category	Report Variable	Peak Name	Status
Peak Purity	PPI	Methylparabene	ok
	PPI	Ethylparabene	ok
	PPI	Propylparabene	ok
	RSD PPI	Methylparabene	ok
	RSD PPI	Ethylparabene	ok
	RSD PPI	Propylparabene	ok
	Match	Methylparabene	ok
	Match	Ethylparabene	ok
	Match	Propylparabene	ok
	RSD Match	Methylparabene	Deviation
	RSD Match	Ethylparabene	Deviation
	RSD Match	Propylparabene	Deviation
	Rel.Max at	Methylparabene	ok
	Rel.Max at	Ethylparabene	ok
	Rel.Max at	Propylparabene	ok

Test Result: Failed

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Chromeleon Operational Qualification, Part 3

Post-Acquisition Steps: Comparison with Expected Results

Calibration Type: LOFF
Integration Type: P100
Standard Method: External
Calibration Mode: Total
Auto Recalibrate: ON

Channel Name	Report Variable	Peak Name	Status
Extract UV Channel: EXT230NM	Area	Methylparabene	ok
	Area	Ethylparabene	ok
	Area	Propylparabene	ok
	Height	Methylparabene	ok
	Height	Ethylparabene	ok
	Height	Propylparabene	ok
	Base Peak Width	Methylparabene	ok
	Base Peak Width	Ethylparabene	ok
	Base Peak Width	Propylparabene	ok
	Base Peak Width	Propylparabene	ok
EXT290NM	Area	Methylparabene	ok
	Area	Ethylparabene	ok
	Area	Propylparabene	ok
	Height	Methylparabene	ok
	Height	Ethylparabene	ok
	Height	Propylparabene	ok
	Base Peak Width	Methylparabene	ok
	Base Peak Width	Ethylparabene	ok
	Base Peak Width	Propylparabene	ok
	Base Peak Width	Propylparabene	ok
Smooth Data:	UV_VIS_1_MA_005_001	Noise (1.9-2.4 min)	ok
	UV_VIS_1_GL_031_001	Noise (1.9-2.4 min)	ok
	EXT290NM_SG_005_010	Noise (1.9-2.4 min)	ok

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Chromeleon Operational Qualification, Part 3

Post-Acquisition Steps: Comparison with Expected Results

Channel Name	Report Variable	Peak Name	Status
Arith. Comb. of Channels:			
ADD_UV_VIS_1_UV_VIS_1	Area	Methylparabene	ok
ADD_UV_VIS_1_UV_VIS_1	Area	Ethylparabene	ok
ADD_UV_VIS_1_UV_VIS_1	Area	Propylparabene	ok
MUL_UV_VIS_1_UV_VIS_1	Area	Methylparabene	ok
MUL_UV_VIS_1_UV_VIS_1	Area	Ethylparabene	ok
MUL_UV_VIS_1_UV_VIS_1	Area	Propylparabene	ok

Test Result: Passed

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Chromeleon Operational Qualification, Part 4

System Suitability Test: Comparison with Expected Results

Variable Category	Report Variable	Status
SST	Test No.	ok
	Test Name	ok
	Sample Condition	ok
	Sample Condition Result	ok
	Test Condition	ok
	Peak Condition	ok
	Aggregate Condition	ok
	Compare Operator	ok
	Compare Value	ok
	Result of Compare Value	ok
	Channel	ok
	Aggregated Samples	ok
	List of Aggr. Smp.	ok
	Result List for Aggr. Smp.	ok
	Result of Test Condition or Aggregate	ok
	N.A.	ok
	Test Result	ok
	Fail-Action	ok

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Chromeleon Operational Qualification, Part 5

Fraction Collection: Comparison with Expected Results

Calibration Type: LO#
Integration Type: Area
Standard Method: External
Calibration Mode: Total
Auto Recalibrate: ON

Variable Category	Report Variable	Status
Fraction Report	Fract. No.	ok
	Fract. Starttime *	ok
	Fract. Endtime *	ok
	No. of Tubes	ok
	Position	ok
	Peak Name	ok
Tube Report	No. of Peaks	ok
	Position	ok
	Tube Starttime *	ok
	Tube Endtime *	ok
	Max. Tube Volume	ok
	Peak Name	ok
	No. of Peaks	ok
	Fract. No.	ok
	Fract. Starttime *	ok
	Fract. Endtime *	ok
	No. of Tubes	ok
	No. of Peaks	ok

Test Result: Passed

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Performance Qualification (PQ)

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Performance Qualification

Instruments:

Instrument Name	Model	Supplier	Serial Number	Module/Firmware Version
Pump	DX120	Dionex	03010223	3.03
Detector	DX120	Dionex	03010223	3.03
Autosampler	AS40 or man. inj.	Dionex	n.a.	0.00
Eluent Generator	n.a.	Dionex	n.a.	0.00
Chromeleon	6.80 SR12 Build 3578 (207169)	Dionex	33308	n.a.

Accessories:

Name	Description	Lot / Serial Number	Expire Date
Backpressure Tubing	0.13 mm (0.005") ID PEEK, 13 m (512")	n.a.	n.a.
Blank	Water	n.a.	n.a.
Sample 1	Nitrate, 5 ppm	210719	Jul-2022
Sample 2	Nitrate, 10 ppm	210719	Jul-2022
Sample 3	Nitrate, 25 ppm	210719	Jul-2022
Sample 4	Nitrate, 50 ppm	210719	Jul-2022
Sample 5	Nitrate, 100 ppm	210719	Jul-2022
Sample 6	Nitrate, 1000 ppm	210719	Jul-2022
Eluent	Water	n.a.	n.a.
Autosampler Reservoir A	Water	n.a.	n.a.

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Limits:

Test	Customized Limits	Dionex Recommended Limits
DX120 Conductivity Noise (nS)	2	2
DX120 Conductivity Drift (nS/hr)	20	20
Injector Precision (Area %RSD)	1.0	1.0
Injector Carry Over (Area %)	0.1	0.1
DX120 Detector Linearity (Corr.)	0.999	0.999
DX120 Detector Linearity (%RSD)	5	5

Additional Information:

Customer/Company:	UAE Consultant Co., Ltd.	Date:	8-Dec-2021
Qualification Executor:	Mr.Channarong / Archemica	Period between Qualifications:	6 months
		Next Qualification:	Jun-2022

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Performance Qualification

Detector Noise and Drift

Instruments:

Instrument Name	Model	Supplier	Serial Number	Moduleware Version
Pump	DX120	Dionex	03010223	3.03
Detector	DX120	Dionex	03010223	3.03
Autosampler	AS40 or man. inj.	Dionex	n.a.	0.00
Eluent Generator	n.a.	Dionex	n.a.	0.00

Accessories

Name	Description
Backpressure Tubing	0.13 mm (0.005") ID PEEK, 13 m (512")
Eluent	Water

Additional Information

Customer/Company:	UAE Consultant Co.,Ltd.	Date:	8-Dec-2021
Qualification Executor:	Mr.Channarong / Archemica	Next Qualification:	Jun-2022

Test Results Summary

Test	Result
DX120 Conductivity Noise (nS)	PASS
DX120 Conductivity Drift (nS/hr)	PASS



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Data for detector noise

Segment number	Noise, nS
1	2.698
2	2.231
3	1.111
4	2.130
5	2.284
6	0.960
7	2.415
8	2.031
9	2.138
10	2.622
11	0.718
12	1.270
13	1.671
14	1.444
15	1.699
16	2.892
17	1.850
18	1.950
19	1.379
20	2.205
Average, nS	1.885
Limit, nS	2
Result	PASS

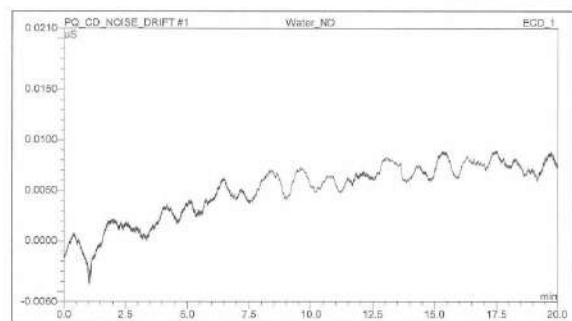
Data for detector drift

20 Minute drift, nS	Drift, nS/hr	Limit, nS/hr	Result
0.427	1.280	20.000	PASS



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Chromatogram of Detector Noise and Drift



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Performance Qualification

Injector Precision

Instruments:

Instrument Name	Model	Supplier	Serial Number	Moduleware Version
Pump	DX120	Dionex	03010223	3.03
Detector	DX120	Dionex	03010223	3.03
Autosampler	AS40 or man. inj.	Dionex	n.a.	0.00
Eluent Generator	n.a.	Dionex	n.a.	0.00

Accessories

Name	Description
Backpressure Tubing	0.13 mm (0.005") ID PEEK, 13 m (512")
Sample 5	Nitrate, 100 ppm
Eluent	Water

Additional Information

Customer/Company:	UAE Consultant Co.,Ltd.	Date:	8-Dec-2021
Qualification Executor:	Mr.Channarong / Archemica	Next Qualification:	Jun-2022

Test Results Summary

Test	Result
Injector Precision (Area)	PASS



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Data for Injector Precision test

Name	Area uS*min Nitrate ECD_1
Inj Precision_1	1.665
Inj Precision_2	1.688
Inj Precision_3	1.691
Inj Precision_4	1.698
Inj Precision_5	1.699
Inj Precision_6	1.699
Inj Precision_7	1.689
Inj Precision_8	1.711
Inj Precision_9	1.711
Inj Precision_10	1.700
Average:	1.695
Std. Dev:	0.013
% RSD:	0.783 %
Limit:	1.0 %
Result:	PASS



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Performance Qualification

Injector Carry Over

Instruments:

Instrument Name	Model	Supplier	Serial Number	Moduleware Version
Pump	DX120	Dionex	03010223	3.03
Detector	DX120	Dionex	03010223	3.03
Autosampler	AS40 or man. inj.	Dionex	n.a.	0.00
Eluent Generator	n.a.	Dionex	n.a.	0.00

Accessories

Name	Description
Backpressure Tubing	0.13 mm (0.005") ID PEEK, 13 m (512")
Sample 6	Nitrate, 1000 ppm
Blank	Water
Eluent	Water

Additional Information

Customer/Company:	UAE Consultant Co.,Ltd.	Date:	8-Dec-2021
Qualification Executor:	Mr.Channarong / Archemica	Next Qualification:	Jun-2022

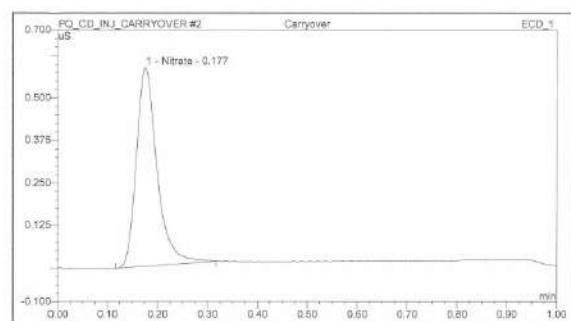
Test Results Summary

Test	Result
Injector Carry Over (Area %)	PASS



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Chromatogram for Carry Over test



Data for Carry Over test

Name	Ret.Time (detected) min Nitrate ECD_1	Area uS*min Nitrate ECD_1
High Level	0.18	30.991
Carryover	0.18	0.028
Water	0.18	0.022
Carry over:		0.070 %
Limit:		0.1 %
Result:		PASS



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Performance Qualification

Detector Linearity

Instruments:

Instrument Name	Model	Supplier	Serial Number	Moduleware Version
Pump	DX120	Dionex	03010223	3.03
Detector	DX120	Dionex	03010223	3.03
Autosampler	AS40 or man. inj.	Dionex	n.a.	0.00
Eluent Generator	n.a.	Dionex	n.a.	0.00

Accessories

Name	Description
Backpressure Tubing	0.13 mm (0.005") ID PEEK, 13 m (512")
Sample 1	Nitrate, 5 ppm
Sample 2	Nitrate, 10 ppm
Sample 3	Nitrate, 25 ppm
Sample 4	Nitrate, 50 ppm
Sample 5	Nitrate, 100 ppm
Eluent	Water

Additional Information

Customer/Company:	UAE Consultant Co.,Ltd.	Date:	8-Dec-2021
Qualification Executor:	Mr.Channarong / Archemica	Next Qualification:	Jun-2022

Test Results Summary

Test	Result
DX120 Detector Linearity	PASS

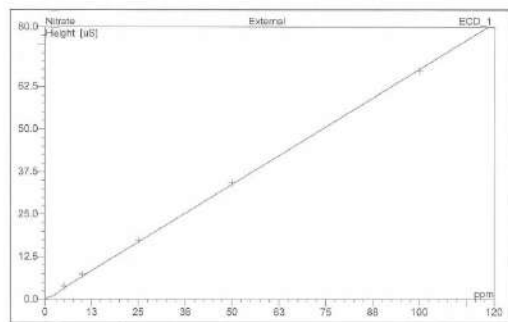


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Data for Detector Linearity

Name	Amount ppm Nitrate ECD_1	Height uS Nitrate ECD_1
Detector linearity_1	5,000	3.952
Detector linearity_2	10,000	7.384
Detector linearity_3	25,000	17.462
Detector linearity_4	50,000	34.143
Detector linearity_5	100,000	67.127

Linearity Plot



Calibration Type	Number of Points	Offset	Slope
Lin	5	0.000	0.675

	Correlation Coefficient	% RSD
Linearity:	1.000	2.260

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CERTIFICATE

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SCIENTIFIC

Certificate of Completion

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Certificate of Analysis

Better Separations Through
Better Chemistry

Dionex Nitrate OQ/PQ IC Standards Kit (Set of 6)

Product Number 060254
Certificate of Analysis

Lot Number 210719

Expiration of Certification
July 2022

The Dionex Nitrate Standard was developed to aid the analysis of anions by Ion Chromatography (IC). The single-ion standard was prepared by the dissolution of high-purity salt in ≥ 18.2 megohm deionized water, which was tested by IC for ionic contaminants. The bottle label states the nominal concentration value of the ionic component for informational purposes only. The actual ion concentration value was determined by Ion Chromatography. The IC system was standardized using the National Institute of Standards & Technology (NIST), Standard Reference Material, SRM 3185 (Nitrate Standard Solution). Actual concentration values determined for the single-ion is listed below.

Dionex Nitrate Standard

Vial #	Concentration (mg/L)
1	5.07 \pm 0.03
2	9.95 \pm 0.07
3	24.49 \pm 0.10
4	49.16 \pm 0.13
5	99.0 \pm 1
6	993 \pm 4

The concentration value is based a proven reliable method of analysis. The estimated uncertainties are two standard deviations of the concentration value. The concentration value is warranted to be stable for one year from the date of manufacture.

The preparation and analyses of the Dionex Nitrate Standard was performed with extreme care by Thermo Scientific Corporation Consumables Manufacturing Department in Sunnyvale California.

Document No. 078409-01 20-Dec-2011

thermo.com/dionex
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List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Remark
Ambient								
20	High Volume Air Sample	Particulate Matter < 10 µm (PM ₁₀)	Thermo Scientific	IP10-1	Tisch Environmental,Inc.	Ref. No.158M	28 Jun 21	27 Jun 23
21	High Volume Air Sample	Particulate Matter < 10 µm (PM ₁₀)	Thermo Scientific	IP10-1	Tisch Environmental,Inc.	Ref. No.158M	28 Jun 21	27 Jun 23
22	High Volume Air Sample	Particulate Matter < 10 µm (PM ₁₀)	Thermo Scientific	IP10-1	Tisch Environmental,Inc.	Ref. No.158M	28 Jun 21	27 Jun 23
23	High Volume Air Sample	Particulate Matter < 10 µm (PM ₁₀)	Thermo Scientific	IP10-1	Tisch Environmental,Inc.	Ref. No.158M	28 Jun 21	27 Jun 23
24	Low Volume Air Sampler Particulate Matter (PM _{2.5})	Particulate Matter (PM _{2.5})	Thermo Scientific	2000W 20790 1901	NIST Traceable Calibration Facility	Ref. No.159622	7 Sep 22	6 Sep 23
25	Low Volume Air Sampler Particulate Matter (PM _{2.5})	Particulate Matter (PM _{2.5})	Thermo Scientific	2000W 20791 1902	NIST Traceable Calibration Facility	Ref. No.159622	7 Sep 22	6 Sep 23
26	Low Volume Air Sampler Particulate Matter (PM _{2.5})	Particulate Matter (PM _{2.5})	Thermo Scientific	2000W 20792 1902	NIST Traceable Calibration Facility	Ref. No.159622	7 Sep 22	6 Sep 23
27	Low Volume Air Sampler Particulate Matter (PM _{2.5})	Particulate Matter (PM _{2.5})	Thermo Scientific	2000W 20793 1902	NIST Traceable Calibration Facility	Ref. No.159622	7 Sep 22	6 Sep 23
28	Low Volume Air Sampler Particulate Matter (PM _{2.5})	Particulate Matter (PM _{2.5})	Thermo Scientific	2000W 20794 1902	NIST Traceable Calibration Facility	Ref. No.159622	7 Sep 22	6 Sep 23
29	Low Volume Air Sampler Particulate Matter (PM _{2.5})	Particulate Matter (PM _{2.5})	Thermo Scientific	2000W 20833 1910	NIST Traceable Calibration Facility	Ref. No.159622	7 Sep 22	6 Sep 23
30	Low Volume Air Sampler Particulate Matter (PM _{2.5})	Particulate Matter (PM _{2.5})	Thermo Scientific	2000W 20855 1910	NIST Traceable Calibration Facility	Ref. No.159622	7 Sep 22	6 Sep 23

List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Remark
Ambient								
1	Office Transfer Standard Calibrator	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Thermo Scientific	G25A 158M	Tisch Environmental,Inc.	05072022	5 Jul 22	4 Jul 24
2	Li-Like Manometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Dwyer	1221-36-W/M	Technology Promotion Association (Thailand-Japan)	22F800	12 Mar 22	11 Mar 23
3	Flow Meter	Particulate Matter (PM _{2.5})	Mesa Labs	DeltaCal DC-1 159622	Innovative Instrument Co.,Ltd.	22-AF14-140	7 Sep 22	6 Sep 23
4	AeroRad Barometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀) Particulate Matter (PM _{2.5}) Mercury Load Cadmium Hydrogen Chloride	Balugo, Germany	-	Technology Promotion Association (Thailand-Japan)	2292728	22 Jul 22	21 Jul 23
5	Dia Thermo-Hygrometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀) Particulate Matter (PM _{2.5}) Mercury Load Cadmium Hydrogen Chloride	Balugo, Germany	-	Technology Promotion Association (Thailand-Japan)	22H1566	27 Jul 22	26 Jul 23
6	High Volume Air Sampler	Total Suspended Particulate (TSP)	Thermo Scientific	G2312-10105-1 2010-06	Tisch Environmental,Inc.	Ref. No.158M	28 Jun 21	27 Jun 23
7	High Volume Air Sampler	Total Suspended Particulate (TSP)	Thermo Scientific	G2312-10105-1 2010-07	Tisch Environmental,Inc.	Ref. No.158M	28 Jun 21	27 Jun 23

List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Remark
Ambient								
31	Low Volume Air Sampler Particulate Matter (PM _{2.5})	Particulate Matter (PM _{2.5})	Thermo Scientific	2000W 20836 1910	NIST Traceable Calibration Facility	Ref. No.159622	7 Sep 22	6 Sep 23
32	Low Volume Air Sampler Particulate Matter (PM _{2.5})	Particulate Matter (PM _{2.5})	Thermo Scientific	2000W 20837 1910	NIST Traceable Calibration Facility	Ref. No.159622	7 Sep 22	6 Sep 23
33	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo	42C	UAE Consultant Co.,Ltd.	19942022	19 Apr 22	18 Apr 23
34	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Fisher Scientific	42C 0517512000	UAE Consultant Co.,Ltd.	07042022	7 Apr 22	6 Apr 23
35	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Electron	42C 0517512001	UAE Consultant Co.,Ltd.	07042022	7 Apr 22	6 Apr 23
36	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42B	UAE Consultant Co.,Ltd.	07042022	7 Apr 22	6 Apr 23
37	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Environmental Instrument	42C 42C-67174-356	UAE Consultant Co.,Ltd.	19942022	19 Apr 22	18 Apr 23
38	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42 1180540004	UAE Consultant Co.,Ltd.	02052022	2 May 22	1 May 23
39	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42 1182920006	UAE Consultant Co.,Ltd.	19942022	19 Apr 22	18 Apr 23
40	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42 1182920007	UAE Consultant Co.,Ltd.	21062022	21 Jun 22	20 Jun 23
41	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42 1182920008	UAE Consultant Co.,Ltd.	17052022	17 May 22	16 May 23
42	Standard Gases (Mercur)	Nitrogen Dioxide	Aligas	EB014362 2019596	Aligas an Air Liquide company	04NIPPE1540103	21 Jun 21	21 Jun 24

List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Remark
Ambient								
8	High Volume Air Sampler	Total Suspended Particulate (TSP)	Thermo Scientific	G2312-10105-1 2010-08	Tisch Environmental,Inc.	Ref. No.158M	28 Jun 21	27 Jun 23
9	High Volume Air Sampler	Total Suspended Particulate (TSP)	Thermo Scientific	G2312-10105-1 2010-09	Tisch Environmental,Inc.	Ref. No.158M	28 Jun 21	27 Jun 23
10	High Volume Air Sampler	Total Suspended Particulate (TSP)	Thermo Scientific	G2312-10105-1 2010-10	Tisch Environmental,Inc.	Ref. No.158M	28 Jun 21	27 Jun 23
11	High Volume Air Sampler	Total Suspended Particulate (TSP)	Thermo Scientific	G2312-10105-1 2010-16	Tisch Environmental,Inc.	Ref. No.158M	28 Jun 21	27 Jun 23
12	High Volume Air Sampler	Total Suspended Particulate (TSP)	Thermo Scientific	G2312-10105-1 2010-17	Tisch Environmental,Inc.	Ref. No.158M	28 Jun 21	27 Jun 23
13	High Volume Air Sampler	Total Suspended Particulate (TSP)	Thermo Scientific	G2312-10105-1 2010-18	Tisch Environmental,Inc.	Ref. No.158M	28 Jun 21	27 Jun 23
14	High Volume Air Sampler	Total Suspended Particulate (TSP)	Thermo Scientific	G2312-10105-1 2010-19	Tisch Environmental,Inc.	Ref. No.158M	28 Jun 21	27 Jun 23
15	High Volume Air Sample	Particulate Matter < 10 µm (PM ₁₀)	Thermo Scientific	IP10-1	Tisch Environmental,Inc.	Ref. No.158M	28 Jun 21	27 Jun 23
16	High Volume Air Sample	Particulate Matter < 10 µm (PM ₁₀)	Thermo Scientific	IP10-1	Tisch Environmental,Inc.	Ref. No.158M	28 Jun 21	27 Jun 23
17	High Volume Air Sample	Particulate Matter < 10 µm (PM ₁₀)	Thermo Scientific	IP10-1	Tisch Environmental,Inc.	Ref. No.158M	28 Jun 21	27 Jun 23
18	High Volume Air Sample	Particulate Matter < 10 µm (PM ₁₀)	Thermo Scientific	IP10-1 2010-04	Tisch Environmental,Inc.	Ref. No.158M	28 Jun 21	27 Jun 23
19	High Volume Air Sample	Particulate Matter < 10 µm (PM ₁₀)	Thermo Scientific	IP10-1 2010-05	Tisch Environmental,Inc.	Ref. No.158M	28 Jun 21	27 Jun 23

List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Ambient									
43	Sulphur Dioxide Analyzer	Sulphur Dioxide	Thermo Scientific	431 1200906876	UAE Consultant Co.Ltd.	03040222	3 May 22	2 May 23	-
44	Sulphur Dioxide Analyzer	Sulphur Dioxide	Thermo Scientific	431	UAE Consultant Co.Ltd.	03040222	3 May 22	2 May 23	-
45	Sulphur Dioxide Analyzer	Sulphur Dioxide	Thermo Scientific	431 1201778111	UAE Consultant Co.Ltd.	03040222	3 May 22	2 May 23	-
46	Sulphur Dioxide Analyzer	Sulphur Dioxide	Thermo Scientific	431 1201778113	UAE Consultant Co.Ltd.	22040222	22 Apr 22	21 Apr 23	-
47	Sulphur Dioxide Analyzer	Sulphur Dioxide	Thermo Scientific	431 1201778116	UAE Consultant Co.Ltd.	08040222	8 Apr 22	7 Apr 23	-
48	Sulphur Dioxide Analyzer	Sulphur Dioxide	Thermo Scientific	431 1189290014	UAE Consultant Co.Ltd.	03040222	3 May 22	2 May 23	-
49	Sulphur Dioxide Analyzer	Sulphur Dioxide	Thermo Scientific	431 118946065	UAE Consultant Co.Ltd.	03040222	3 May 22	2 May 23	-
50	Sulphur Dioxide Analyzer	Sulphur Dioxide	Thermo Scientific	431 1191503040	UAE Consultant Co.Ltd.	08040222	8 Apr 22	7 Apr 23	-
51	Sulphur Dioxide Analyzer	Sulphur Dioxide	Thermo Scientific	431 1201778112	UAE Consultant Co.Ltd.	08040222	8 Apr 22	7 Apr 23	-
52	Standard Gases (Mixture)	Sulphur Dioxide	Argas	EB0143262 2019P5G	Argas an Air Liquide company	EQ009FELSA0103	21 Jun 21	21 Jun 24	-
53	Wind Speed/Wind Direction	WSWD	Scarlet Tech Ltd.	WL-21 2111D70004	Scarlet Tech Ltd.	22020222	22 Feb 22	21 Feb 23	-
54	Wind Speed/Wind Direction	WSWD	Scarlet Tech Ltd.	WL-21 2111D70041	Scarlet Tech Ltd.	24030222	25 Mar 22	24 Mar 23	-

List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Ambient									
55	Wind Speed/Wind Direction	WSWD	Scarlet Tech Ltd.	WL-21 2111D70052	Scarlet Tech Ltd.	25030222	25 Mar 22	24 Mar 23	-
56	Wind Speed/Wind Direction	WSWD	Scarlet Tech Ltd.	WL-21 2111D70058	Scarlet Tech Ltd.	24030222	25 Mar 22	24 Mar 23	-
57	Wind Speed/Wind Direction	WSWD	Scarlet Tech Ltd.	WL-21 2111D70065	Scarlet Tech Ltd.	25030222	25 Mar 22	24 Mar 23	-
58	Wind Speed/Wind Direction	WSWD	Scarlet Tech Ltd.	WL-21 2111D70072	Scarlet Tech Ltd.	25030222	25 Mar 22	24 Mar 23	-
59	Wind Speed/Wind Direction	WSWD	Scarlet Tech Ltd.	WL-21 2111D70102	Scarlet Tech Ltd.	25030222	25 Mar 22	24 Mar 23	-
60	Wind Speed/Wind Direction	WSWD	LSI ASTEM	E-LOC815 20080020	The Meteorological Department	27622	2 Aug 22	1 Aug 23	-
61	Wind Speed/Wind Direction	WSWD	LSI ASTEM	05103-5 30095375	The Meteorological Department	26322	14 Jul 22	13 Jul 23	-



RECALIBRATION
DUE DATE:
July 5, 2023

Certificate of Calibration

Calibration Certification Information			
Cal. Date:	July 5, 2022	Rootmeter S/N:	438320
Operator:	Jim Tisch	Ta:	297 °K
Calibration Model #:	G25A	Pa:	750.1 mm Hg
Calibrator S/N:	158M		

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.3240	3.2	2.08
2	3	4	1	0.9480	6.4	4.08
3	5	6	1	0.8480	7.9	5.00
4	7	8	1	0.8060	8.7	5.50
5	9	10	1	0.6670	12.7	8.00

Data Tabulation					
Vstd (m3)	Qstd (x-axis)	$\sqrt{\Delta H \left(\frac{Pa}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)}$ (y-axis)	Va	Qa (x-axis)	$\sqrt{\Delta H \left(\frac{Ta}{Pa} \right)}$ (y-axis)
0.9860	0.7447	1.4073	0.9957	0.7521	0.8899
0.9818	1.0357	1.9902	0.9915	1.0459	1.2585
0.9798	1.1554	2.2251	0.9895	1.1668	1.4071
0.9788	1.2143	2.3337	0.9884	1.2263	1.4757
0.9735	1.4595	2.8146	0.9831	1.4735	1.7799
QSTD		m = 1.96745	QA		m = 1.23199
		b = -0.05315			b = -0.03361
		r = 0.99995			r = 0.99995

Calculations			
Vstd =	$\Delta Vol / ((Pa - Pstd) / Pstd) (Tstd / Ta)$	Va =	$\Delta Vol / ((Pa - \Delta P) / Pa)$
Qstd =	Vstd / ΔTime	Qa =	Va / ΔTime
For subsequent flow rate calculations:			
Qstd =	$1/m \left(\sqrt{\Delta H \left(\frac{Pa}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)} - b \right)$	Qa =	$1/m \left(\sqrt{\Delta H \left(\frac{Ta}{Pa} \right)} - b \right)$

Standard Conditions	
Tstd:	298.15 °K
Pstd:	760 mm Hg
Key	
ΔH:	calibrator manometer reading (in H2O)
ΔP:	rootmeter manometer reading (mm Hg)
Ta:	actual absolute temperature (°K)
Pa:	actual barometric pressure (mm Hg)
b:	intercept
m:	slope

RECALIBRATION
US EPA recommends annual recalibration per 1998 40 Code of Federal Regulations Part 50 to S1, Appendix B to Part 50, Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere, 9.2.17, page 30

Tisch Environmental, Inc.
145 South Miami Avenue
Village of Cleves, OH 45002

www.tisch-env.com
Toll FREE: (877)263-7610
Tel: (937)263-7009

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
5344 PATANAKARN ROAD SOI 18, SUANLIANG, SUANLIANG, BANGKOK 10250
TEL. 0-2717-9608-21 FAX. 0-2718-4844

Certificate of Calibration

Certificate No.: 22P800
Page: 1 of 2

Equipment: U-Tube Manometer
Manufacturer: Dwyer
Model: 1221-36-W/M
Serial No.: -
ID No.: UAE.EPM.022/2560

Condition As-Received: Used Item

Received Date: 03 March 2022

Calibration Date: 12 March 2022

Reference: 2203-0131WSC

Ambient Temperature: (23 ± 2) °C

Relative Humidity: (50 ± 15) %

Atmospheric Pressure: 1010 mbar

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.

Submitted by: United Analyst and Engineering Consultant Co., Ltd.

81 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Phraekhanong, Bangkok 10260

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to in-house calibration procedure CP-P04, using "DKD-R 6-1: Calibration of Pressure Gauges, Edition 03/2014" as a guidelines.

Condition of this result of calibration

1.Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Pressure Calibrator	PC106P	1189	MP-0110-21	09 Aug 2022

2.This result of calibration was made on requested at the point specified by customer.

3.Scale and conversion factor is 1 kPa = 4.0146393 inH2O

4.This instrument was used clean air as pressure media.

5.This instrument was calibrated by applied pressure to high-port (+) side and low-port (-) side open to atmospheric pressure.

6.This instrument was installed in vertical orientation and top of the pressure port was used as the reference level.

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

8.This Certification is traceable to the International System of Unit maintained at:-

-National Institute of Metrology Thailand (NIMT)

Calibrated by: Suwit Aussanee
Issue Date: 14 March 2022

Approved Signatory:



Atapol Panuach

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B 0282413



Cert.No : 22P500
Page: 2 of 2

Result of calibration: Without adjustment
Function: Pressure Measurement
Increasing Pressure

Range: 0 inH₂O to 36 inH₂O
Scale Interval: 0.1 inH₂O (The Fifth Estimate)

UUC Indication				
Applied Pressure (inH ₂ O)	High-port side (inH ₂ O)	Low-port side (inH ₂ O)	ΔP (inH ₂ O)	Error (inH ₂ O)
0.00	0.00	0.00	0.00	0.00
2.00	1.00	-1.00	2.00	0.00
4.00	2.00	-2.00	4.00	0.00
6.00	3.00	-3.00	6.00	0.00
8.00	4.00	-4.00	8.00	0.00
10.00	5.00	-5.00	10.00	0.02
12.00	6.00	-6.00	12.00	0.02
14.00	7.00	-7.00	14.00	0.04
16.00	8.00	-8.00	16.00	0.04
18.00	9.00	-9.00	18.00	0.04
20.00	10.00	-10.00	20.00	0.04
22.00	11.00	-11.00	22.00	0.02
24.00	12.00	-12.00	24.00	0.02
26.00	13.00	-13.00	26.00	0.02
28.00	14.00	-14.00	28.00	0.04
30.00	15.00	-15.00	30.00	0.04
32.00	16.00	-16.00	32.00	0.04
34.00	16.98	-17.02	34.00	0.04
35.80	17.98	-17.82	35.80	0.18

The uncertainty of measurement was ± 0.11 inH₂O

* UUC = Unit Under Calibration

* ΔP = High-port side - Low-port side

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

-o-o-

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a 1099526

Certificate of Calibration

Customer : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Name :
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Prakanong,
Bangkok 10260

Certificate No : 22-AFM-140
Request No : Req-2022-1607

Unit Under Calibration Details

Measurement Item : Air Flow meter
Manufacturer : BGI
Model : Delta Cal DC1
Serial Number : 159822
ID : UAE.EFM.039/2581
Location of Calibration : LAB 4 AIR VELOCITY METER

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 20 %RH
Barometric Pressure : 1013 kPa ± 10 kPa
Received Date : 22 August 2022
Calibration Date : 7 September 2022
Calibration Procedure : In-house method CP-AFM-B1 by Comparison technique with Standard Primary Flow Calibrator

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Air Flow Meter	Calibrator 5 High Flow	1850/012012	Senskyne	15 June 2023

Traceability :

This certificate provides traceability of measurement to recognized national standard, and to the realization of the international System of Units (SI).

Note :

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k=2$, providing a level of confidence approximately 95 %.

Calibration

Issue Date : 7 September 2022

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-708-AFM-01 Rev.00 Issue date 01/07/19

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Certificate No : 22-AFM-140
Request No : Req-2022-1607

Result of Calibration :

Flow Setting	STD Flow Reading	UUC Flow Reading	Correction Flow	Uncertainty
(LPM)	(LPM)	(LPM)	(LPM)	(LPM)
14.3	14.30	14.37	-0.07	0.21
15.0	15.00	15.09	-0.09	0.22
15.8	15.80	15.88	-0.08	0.23
16.6	16.60	16.67	-0.07	0.24
18.3	18.30	18.40	-0.10	0.26

Note

STD : Standard

UUC : Unit Under Calibration

Calibration media : Air

* Indicates non accredited

End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-708-AFM-01 Rev.00 Issue date 01/07/19

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Certificate of Calibration

Customer : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Name :
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Prakanong,
Bangkok 10260

Certificate No : 22-TPM-379
Request No : Req-2022-1607
Page : 1/2

Unit Under Calibration Details

Calibration Parameter : Temperature
Instrument Name : Air Flow meter
Manufacturer : BGI
Model : Delta Cal DC1
Serial Number : 159822
Resolution : 0.1 °C
ID Number : UAE.EFM.039/2561

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 15 %RH
Received Date : 22 August 2022
Calibrated Date : 7 September 2022
Calibration Procedure : In-house method CP-TPM-01 by Comparison with Standard Thermometer.

Reference Standard :

Digital Thermometer with Sensor, Manufacturer: GINGO/GINGO, Model: GT11/RTD100, SN: 08008037, ID: 02-TPM Which was calibrated on 10 March 2022, Calibration Certificate No.: QR22-0578

Traceability :

This Certificate is traceable to SI Unit through Quality Reborn Co., Ltd., NSC-ONSC Accreditation No.: Calibration 0292

Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k=2$, providing a level of confidence approximately 95 %.

Approved By :

Issue Date : 7 September 2022

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-708-TPM-01 Rev.01 Issue date 13/07/20

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Calibration Note

UUC Adjustment : Not Adjust

Certificate No : 22-1794-179

Request No : Rev-2022-1907

Page : 2/2

Result of Calibration :

UUC Sensor	Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (°C)
Ta	20.004	20.0	0.0	0.14
	25.003	24.9	+0.1	0.14
	30.001	30.0	0.0	0.14
	35.002	34.9	+0.1	0.14
	40.002	39.8	+0.2	0.14
	45.005	45.0	0.0	0.14
Tt	20.004	20.1	+0.1	0.14
	25.003	24.9	+0.1	0.14
	30.001	29.9	+0.1	0.14
	35.002	34.9	+0.1	0.14
	40.002	39.9	+0.1	0.14
	45.005	45.2	+0.2	0.14

End of Certificate

Calibrated By :

The results related only to the item calibrated. The certificate shall not be reproduced, except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-708-TPM-01 Rev.03 Issue date 15/02/20

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
5344 PATTANAKARN ROAD SOI 18, SUANLIANG, SUANLIANG, BANGKOK 10250
TEL: 0-2713-3000-34 FAX: 0-2719-9484



Certificate of Calibration

Certificate No. : 22P2728
Page : 1 of 2

Equipment : Aneroid Barometer

Manufacturer : Barigo

Model : -

Serial No. : -

ID No. : UAE-ANV.152/2550

Condition As-Received : Used Item

Received Date : 20 July 2022

Calibration Date : 22 July 2022

Reference : 2207-0584WSC

Ambient Temperature : (23 ± 2) °C

Relative Humidity : (50 ± 15) %

Atmospheric Pressure : 1010 mbar

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.

Submitted by : United Analyst and Engineering Consultant Co., Ltd.

81 Soi Udomsuk 41, Sukhumvit Road, Bangkok,
Phrakhanong, Bangkok 10260

Procedure used : The calibration was conducted by direct comparison method against Pressure Measuring Instruments
Standard according to in-house calibration procedure CP-10, using " DKD-R 6-1 ; Calibration of Pressure
Gauges, Edition 03/2014 " as a guidelines.

Condition of this result of calibration

1. Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard Barometer	DPH42	1422505046	MP-0076-22	02 May 2023

2. This instrument was installed in vertical orientation and center of the dial was used as the reference level.

3. This result of calibration was made on requested at the point specified by customer.

4. This result of calibration instrument was in absolute pressure.

5. This instrument was used clean air as pressure media.

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

7. This Certification is traceable to the International System of Unit maintained at:-

-National Institute of Metrology Thailand (NIMT)

Calibrated by : Suwit Aussamee

Issue Date : 25 July 2022

Approved

Atsapol Panaratch

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B 0293209



Cert.No. : 22P2728
Page : 2 of 2

Result of calibration:- Without adjustment

Function:- Absolute Pressure Measurement

Range: 960 hPa to 1030 hPa
Scale Interval: 1 hPa (The Fifth Estimate)

Applied Pressure (hPa)	960.27	967.48	978.89	989.95	999.85	1009.89	1020.99	1031.06
UUC* Indication (hPa)	960.0	970.0	980.0	990.0	1000.0	1010.0	1020.0	1030.0
Error (hPa)	3.73	2.54	1.11	0.44	0.15	0.11	-0.59	-1.06

Decreasing Pressure

Applied Pressure (hPa)	1031.19	1020.73	1009.91	999.92	989.72	979.13	967.71	956.54
UUC* Indication (hPa)	1030.0	1020.0	1010.0	1000.0	990.0	980.0	970.0	960.0
Error (hPa)	-1.19	-0.73	0.56	0.08	0.28	0.87	2.29	3.38

The uncertainty of measurement was ± 0.30 hPa

* UUC = Unit Under Calibration

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

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
5344 PATTANAKARN ROAD SOI 18, SUANLIANG, SUANLIANG, BANGKOK 10250
TEL: 0-2713-3000-34 FAX: 0-2719-9484



Certificate of Calibration

Certificate No. : 22H1508
Page : 1 of 2

Equipment : Dial Thermo-Hygrometer

Manufacturer : Barigo

Model : -

Serial No. : -

ID No. : UAE-ANV.004/2548

Condition As-Received : Used Item

Received Date : 20 July 2022

Calibration Date : 22 July 2022

Reference : 2207-0586WSC

Ambient Temperature : (25 ± 3) °C

Relative Humidity : (50 ± 20) %

Submitted by : United Analyst and Engineering Consultant Co., Ltd.

81 Soi Udomsuk 41, Sukhumvit Road, Bangkok,
Phrakhanong, Bangkok 10260

Procedure used : Calibration were conducted using in-house calibration procedure CP-H02 according to comparison
with standard chilled mirror sensor for humidity measurement function and comparison with standard
temperature probe for temperature measurement function into humidity / temperature chamber.

Condition of this result of calibration

1. Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard Chilled Mirror Hygrometer Sensor	Dew Prime II	31863	19714	17 Sep 2022
2) Standard Humidity/Temperature Meter	400	10240757	TH-0125-21	13 Dec 2022

2. The 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 maintained at:-

-National Institute of Standards and Technology (NIST) , The United States of America

-National Institute of Metrology Thailand (NIMT)

Calibrated by : Somchai Dummer

Issue Date : 03 August 2022

Approved Signatory :

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B 0293722



Cert. No.: 22H1586
Page: 2 of 2

Result of Calibration:

Function:

Before Adjustment

Humidity measurement.

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Error (%R.H.)	Uncertainty of Measurement (±%R.H.)
25.0	40.1	38	-2.1	1.6
25.0	60.0	57	-3.0	1.8
25.0	80.0	74	-6.0	2.0

Result of Calibration:

Function:

After Adjustment

Humidity measurement.

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Error (%R.H.)	Uncertainty of Measurement (±%R.H.)
25.0	40.1	40	-0.1	1.6
25.0	60.0	60	0.0	1.8
25.0	80.0	77	-3.0	2.0

Result of Calibration:

Function:

Without Adjustment

Temperature measurement.

Reference Temperature (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (±°C)
20.00	20.5	20.5	0.50	0.72
25.04	25.0	25.0	-0.04	0.72
30.01	30.0	30.0	-0.01	0.72
35.04	34.5	34.5	-0.54	0.72
39.98	39.0	39.0	-0.98	0.72

UUC* : Unit Under Calibration

The reported uncertainty of measurement was based on standard uncertainty multiplied by coverage factor $k = 2.00$, providing confidence level approximately 95%.

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United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phraekhanong, Bangkok 10260
Tel. 0 2763 2828 Fax 0 2763 2800 www.uaeconsultant.com E-mail: uae@uaeconsultant.com

MULTI-POINT GAS TEST REPORT

Test Date : Apr 19, 2022

Equipment : Gas Analyzer (NO₂) Model : 42C
Manufacturer : Thermo Electron Corporation Serial Number : 42C-0508011076

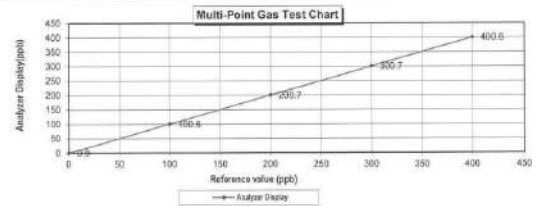
Standard Gas Concentration

Sulphur Dioxide (SO₂) 45.75 PPM Manufacturer : Thermo Scientific
Nitric Oxide (NO) 45.35 PPM Model : 146
Methane (CH₄) - PPM Serial Number : 1180540071
Carbon Monoxide (CO) 1007
Cylinder No. : CC159599
Expiration Date : Jul 30, 2022

Multi-point gas test data

Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1 Zero	0.0	0.0	0.00	0.00
Level 2 20.00%	100.0	100.6	0.60	0.60
Level 3 40.00%	200.0	200.7	0.70	0.35
Level 4 60.00%	300.0	300.7	0.70	0.23
Level 5 80.00%	400.0	400.6	0.60	0.15

Remark : Measuring Range 500.0 ppb
Acceptable Limit ± 5%
Average Difference (%) 0.45



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United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phraekhanong, Bangkok 10260
Tel. 0 2763 2828 Fax 0 2763 2800 www.uaeconsultant.com E-mail: uae@uaeconsultant.com

MULTI-POINT GAS TEST REPORT

Test Date : Apr 7, 2022

Equipment : Gas Analyzer (NO₂) Model : 42C
Manufacturer : Thermo Electron Corporation Serial Number : 0517512000

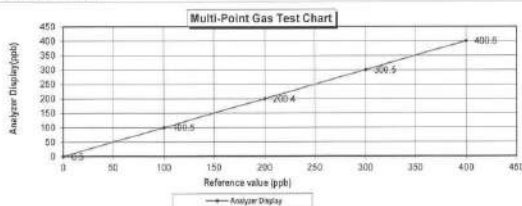
Standard Gas Concentration

Sulphur Dioxide (SO₂) 44.75 PPM Manufacturer : Thermo Scientific
Nitric Oxide (NO) 45.35 PPM Model : 146
Methane (CH₄) - PPM Serial Number : 1180540071
Carbon Monoxide (CO) 1007
Cylinder No. : CC159599
Expiration Date : Jul 30, 2022

Multi-point gas test data

Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1 Zero	0.0	0.0	0.00	0.00
Level 2 20.00%	100.0	100.5	0.50	0.50
Level 3 40.00%	200.0	200.4	0.40	0.20
Level 4 60.00%	300.0	300.5	0.50	0.17
Level 5 80.00%	400.0	400.6	0.60	0.15

Remark : Measuring Range 500.0 ppb
Acceptable Limit ± 5%
Average Difference (%) 0.30



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United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phraekhanong, Bangkok 10260
Tel. 0 2763 2828 Fax 0 2763 2800 www.uaeconsultant.com E-mail: uae@uaeconsultant.com

MULTI-POINT GAS TEST REPORT

Test Date : Apr 7, 2022

Equipment : Gas Analyzer (NO₂) Model : 42C
Manufacturer : Thermo Electron Corporation Serial Number : 0517512001

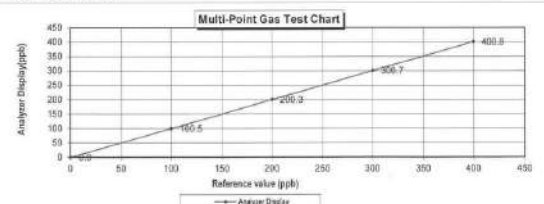
Standard Gas Concentration

Sulphur Dioxide (SO₂) 44.75 PPM Manufacturer : Thermo Scientific
Nitric Oxide (NO) 45.35 PPM Model : 146
Methane (CH₄) - PPM Serial Number : 1180540071
Carbon Monoxide (CO) 1007
Cylinder No. : CC159599
Expiration Date : Jul 30, 2022

Multi-point gas test data

Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1 Zero	0.0	0.0	0.00	0.00
Level 2 20.00%	100.0	100.5	0.50	0.50
Level 3 40.00%	200.0	200.3	0.30	0.15
Level 4 60.00%	300.0	300.7	0.70	0.23
Level 5 80.00%	400.0	400.6	0.60	0.20

Remark : Measuring Range 500.0 ppb
Acceptable Limit ± 5%
Average Difference (%) 0.40



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MULTI-POINT GAS TEST REPORT

Test Date : Apr 7, 2022

Equipment : Gas Analyzer (NO₂) Model : 42i
Manufacturer : Thermo Scientific Serial Number : CM08130002

Standard Gas Concentration

Sulphur Dioxide (SO₂) 44.75 PPM
Nitric Oxide (NO) 45.35 PPM
Methane (CH₄) - PPM
Carbon Monoxide (CO) 1007 PPM
Cylinder No. : CC159599
Expiration Date : Jul 30, 2022

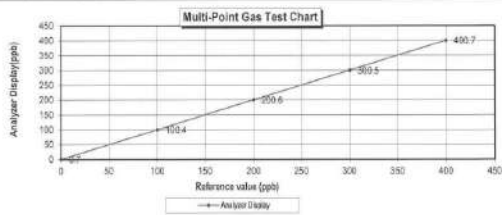
Dilutor Detail

Manufacturer : Thermo Scientific
Model : 146i
Serial Number : 1180540071

Multi-point gas test data

	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.7	0.70	0.70
Level 2	20.00%	100.0	100.4	0.40	0.40
Level 3	40.00%	200.0	200.6	0.60	0.30
Level 4	60.00%	300.0	300.5	0.50	0.17
Level 5	80.00%	400.0	400.7	0.70	0.17

Remark : Measuring Range 500.0 ppb
Acceptable Limit $\pm 5\%$



MULTI-POINT GAS TEST REPORT

Test Date : Apr 19, 2022

Equipment : Gas Analyzer (NO₂) Model : 42C
Manufacturer : Thermo Environmental Instruments Serial Number : 42C-67174-356

Standard Gas Concentration

Sulphur Dioxide (SO₂) 44.75 PPM
Nitric Oxide (NO) 45.35 PPM
Methane (CH₄) - PPM
Carbon Monoxide (CO) 1007 PPM
Cylinder No. : CC159599
Expiration Date : Jul 30, 2022

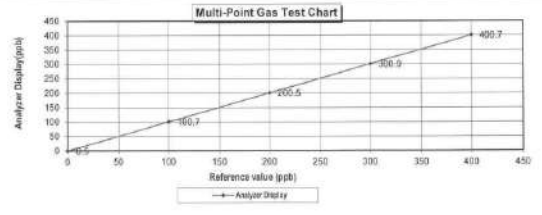
Dilutor Detail

Manufacturer : Thermo Scientific
Model : 146i
Serial Number : 1180540071

Multi-point gas test data

	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.5	0.50	0.50
Level 2	20.00%	100.0	100.7	0.70	0.70
Level 3	40.00%	200.0	200.5	0.50	0.25
Level 4	60.00%	300.0	300.9	0.90	0.30
Level 5	80.00%	400.0	400.7	0.70	0.17

Remark : Measuring Range 500.0 ppb
Acceptable Limit $\pm 5\%$



MULTI-POINT GAS TEST REPORT

Test Date : May 2, 2022

Equipment : Gas Analyzer (NO₂) Model : 42i
Manufacturer : Thermo Scientific Serial Number : 1180540064

Standard Gas Concentration

Sulphur Dioxide (SO₂) 44.75 PPM
Nitric Oxide (NO) 45.35 PPM
Methane (CH₄) - PPM
Carbon Monoxide (CO) 1007 PPM
Cylinder No. : CC159599
Expiration Date : Jul 30, 2022

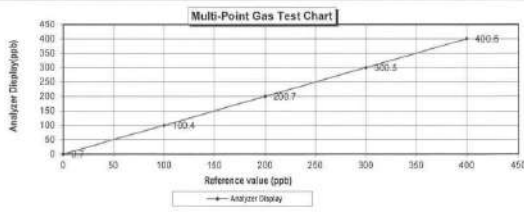
Dilutor Detail

Manufacturer : Thermo Scientific
Model : 146i
Serial Number : 1180540071

Multi-point gas test data

	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.7	0.70	0.70
Level 2	20.00%	100.0	100.4	0.40	0.40
Level 3	40.00%	200.0	200.7	0.70	0.35
Level 4	60.00%	300.0	300.5	0.50	0.17
Level 5	80.00%	400.0	400.6	0.60	0.15

Remark : Measuring Range 500.0 ppb
Acceptable Limit $\pm 5\%$



MULTI-POINT GAS TEST REPORT

Test Date : Apr 19, 2022

Equipment : Gas Analyzer (NO₂) Model : 42i
Manufacturer : Thermo Scientific Serial Number : 1182920006

Standard Gas Concentration

Sulphur Dioxide (SO₂) 44.75 PPM
Nitric Oxide (NO) 45.35 PPM
Methane (CH₄) - PPM
Carbon Monoxide (CO) 1007 PPM
Cylinder No. : CC159599
Expiration Date : Jul 30, 2022

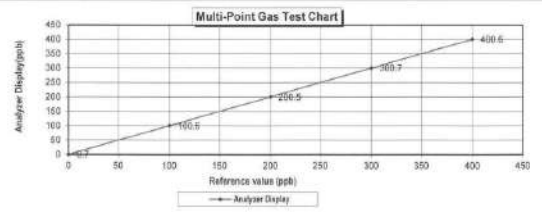
Dilutor Detail

Manufacturer : Thermo Scientific
Model : 146i
Serial Number : 1180540071

Multi-point gas test data

	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.7	0.70	0.70
Level 2	20.00%	100.0	100.6	0.60	0.60
Level 3	40.00%	200.0	200.5	0.50	0.25
Level 4	60.00%	300.0	300.7	0.70	0.23
Level 5	80.00%	400.0	400.6	0.60	0.15

Remark : Measuring Range 500.0 ppb
Acceptable Limit $\pm 5\%$



MULTI-POINT GAS TEST REPORT

Test Date : June 21, 2022

Equipment : Gas Analyzer (NO₂) Model : 42i
Manufacturer : Thermo Scientific Serial Number : 1182920007

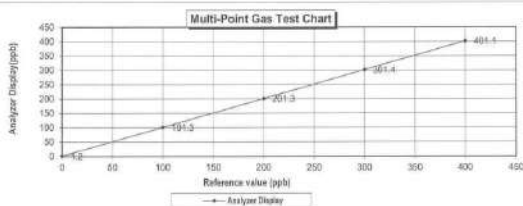
Standard Gas Concentration
Sulphur Dioxide (SO₂) 44.75 PPM
Nitric Oxide (NO) 45.35 PPM
Methane (CH₄) - PPM
Carbon Monoxide (CO) 1007 PPM
Cylinder No. : CC159599
Expiration Date : Jul 30, 2022

Dilutor Detail
Manufacturer : Thermo Scientific
Model : 146i
Serial Number : 1180540071

Multi-point gas test data

Level	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	1.20	1.20	1.20
Level 2	20.00%	100.0	101.3	1.30	1.28
Level 3	40.00%	200.0	201.3	1.30	0.65
Level 4	60.00%	300.0	301.4	1.40	0.46
Level 5	80.00%	400.0	401.1	1.10	0.27
Remark : Measuring Range	500.0 ppb		Average Difference (%)		0.77

Acceptable Limit $\pm 5\%$



MULTI-POINT GAS TEST REPORT

Test Date : May 17, 2022

Equipment : Gas Analyzer (NO₂) Model : 42i
Manufacturer : Thermo Scientific Serial Number : 1182920008

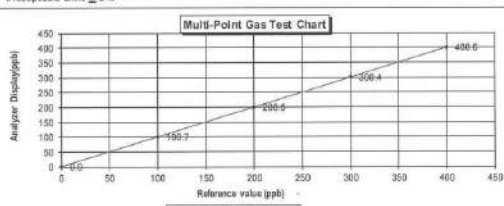
Standard Gas Concentration
Sulphur Dioxide (SO₂) 44.75 PPM
Nitric Oxide (NO) 45.35 PPM
Methane (CH₄) - PPM
Carbon Monoxide (CO) 1007 PPM
Cylinder No. : CC159599
Expiration Date : Jul 30, 2022

Dilutor Detail
Manufacturer : Thermo Scientific
Model : 146i
Serial Number : 1180540071

Multi-point gas test data

Level	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.9	0.90	0.90
Level 2	20.00%	100.0	100.7	0.70	0.70
Level 3	40.00%	200.0	200.5	0.50	0.25
Level 4	60.00%	300.0	300.4	0.40	0.13
Level 5	80.00%	400.0	400.6	0.60	0.15
Remark : Measuring Range	500.0 ppb		Average Difference (%)		0.43

Acceptable Limit $\pm 5\%$



CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Part Number: E04N199E15A01D3 Reference Number: 122-492135187-1
Cylinder Number: E00143282 Cylinder Volume: 144.4 CF
Laboratory: 124 - Durham (SAP) - NC Cylinder Pressure: 2016 PSIG
PGVP Number: B22021 Valve Outlet: 650
Gas Code: CO, NO, NO₂, SO₂, BALN Certification Date: Jun 21, 2021
Expiration Date: Jun 21, 2024

Declaration: performed in accordance with EPA Method 10 for Nitrogen Dioxide Calibration. This certificate is valid for the duration of the calibration. The cylinder has a total analysis uncertainty of $\pm 1.5\%$ (k=2) for the duration of the calibration. The cylinder has a total analysis uncertainty of $\pm 1.5\%$ (k=2) for the duration of the calibration. The cylinder has a total analysis uncertainty of $\pm 1.5\%$ (k=2) for the duration of the calibration.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NO ₂	45.00 PPM	45.04 PPM	G1	$\pm 1.4\%$ NIST Traceable	06/14/2021, 06/21/2021
NITRIC OXIDE	45.00 PPM	45.04 PPM	G1	$\pm 1.4\%$ NIST Traceable	06/14/2021, 06/21/2021
SULFUR DIOXIDE	45.00 PPM	45.04 PPM	G1	$\pm 1.4\%$ NIST Traceable	06/14/2021, 06/21/2021
CARBON MONOXIDE	1000 PPM	884.8 PPM	G1	$\pm 0.1\%$ NIST Traceable	06/14/2021

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NO ₂	2001120	CC159599	45.00 PPM NITRIC OXIDE/NITROGEN	$\pm 1.0\%$	Feb 02, 2025
NO ₂	13180	CC159599	45.00 PPM NITRIC OXIDE/NITROGEN	$\pm 2.0\%$	Feb 28, 2025
NO ₂	0942050112	CC159599	45.00 PPM NITRIC OXIDE/NITROGEN	$\pm 2.1\%$	Feb 18, 2025
NO ₂	15011043	CC159599	45.00 PPM NITRIC OXIDE/NITROGEN	$\pm 0.8\%$	Jun 17, 2022
NO ₂	14001110	CC159599	45.00 PPM NITRIC OXIDE/NITROGEN	$\pm 0.8\%$	Nov 15, 2025

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multi-point Calibration
Nielsen 6700 AHR0801321 CO	FTIR	Jun 03, 2021
Nielsen 6700 AHR0801321 NO	FTIR	Jun 03, 2021
Nielsen 6700 AHR0801321 NO ₂	FTIR	Jun 03, 2021
Nielsen 6700 AHR0801321 SO ₂	FTIR	Jun 03, 2021

Test Data Available Upon Request

NOTES: P10 1521102607

GRO-5 WT: 28.40kg

NET WT: 4.72kg



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MULTI-POINT GAS TEST REPORT

Test Date : May 3, 2022

Equipment : Gas Analyzer (SO₂) Model : 43i
Manufacturer : Thermo SCIENTIFIC Serial Number : 1200906876

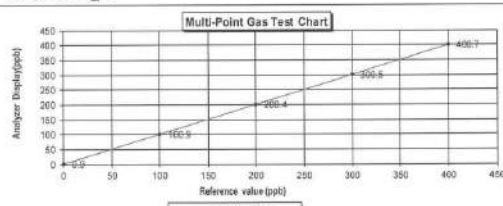
Standard Gas Concentration
Sulphur Dioxide (SO₂) 44.75 PPM
Nitric Oxide (NO) 45.35 PPM
Methane (CH₄) - PPM
Carbon Monoxide (CO) 1007 PPM
Cylinder No. : CC159599
Expiration Date : Jul 30, 2022

Dilutor Detail
Manufacturer : Thermo SCIENTIFIC
Model : 146i
Serial Number : 1180540071

Multi-point gas test data

Level	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.9	0.90	0.90
Level 2	20.00%	100.0	100.9	0.90	0.89
Level 3	40.00%	200.0	200.4	0.40	0.20
Level 4	60.00%	300.0	300.5	0.50	0.17
Level 5	80.00%	400.0	400.7	0.70	0.17
Remark : Measuring Range	500.0 ppb		Average Difference (%)		0.47

Acceptable Limit $\pm 5\%$



MULTI-POINT GAS TEST REPORT

Test Date : May 3, 2022

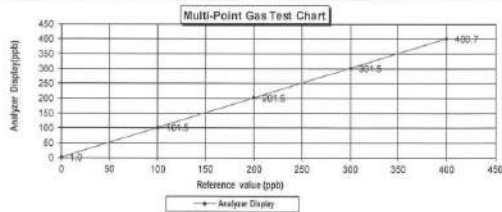
Equipment : Gas Analyzer (SO₂) Model : 43i
Manufacturer : Thermo SCIENTIFIC Serial Number : 1201778111

Standard Gas Concentration
Sulphur Dioxide (SO₂) 44.75 PPM
Nitric Oxide (NO) 45.35 PPM
Methane (CH₄) - PPM
Carbon Monoxide (CO) 1007 PPM
Cylinder No. : CC159599
Expiration Date : Jul 30, 2022

Dilutor Detail
Manufacturer : Thermo SCIENTIFIC
Model : 146i
Serial Number : 1180540071

Multi-point gas test data

Reference Value (ppb)			Analyzer Display (ppb)	Difference Error	Percent Error	% Error
Level 1	Zero	0.0	1.0	1.00	1.00	1.00
Level 2	20.00%	100.0	101.5	1.50	1.48	1.48
Level 3	40.00%	200.0	201.6	1.60	0.79	0.79
Level 4	60.00%	300.0	301.5	1.50	0.50	0.50
Level 5	80.00%	400.0	400.7	0.70	0.17	0.17
Remark : Measuring Range			500.0 ppb	Average Difference (%)		0.79



MULTI-POINT GAS TEST REPORT

Test Date : May 3, 2022

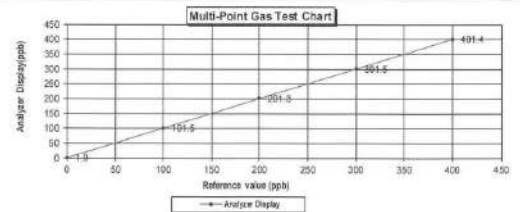
Equipment : Gas Analyzer (SO₂) Model : 43i
Manufacturer : Thermo SCIENTIFIC Serial Number : 1201778113

Standard Gas Concentration
Sulphur Dioxide (SO₂) 44.75 PPM
Nitric Oxide (NO) 45.35 PPM
Methane (CH₄) - PPM
Carbon Monoxide (CO) 1007 PPM
Cylinder No. : CC159599
Expiration Date : Jul 30, 2022

Dilutor Detail
Manufacturer : Thermo SCIENTIFIC
Model : 146i
Serial Number : 1180540071

Multi-point gas test data

Reference Value (ppb)			Analyzer Display (ppb)	Difference Error	Percent Error	% Error
Level 1	Zero	0.0	1.9	1.90	1.90	1.90
Level 2	20.00%	100.0	101.5	1.50	1.48	1.48
Level 3	40.00%	200.0	201.3	1.30	0.65	0.65
Level 4	60.00%	300.0	301.5	1.50	0.50	0.50
Level 5	80.00%	400.0	401.4	1.40	0.35	0.35
Remark : Measuring Range			500.0 ppb	Average Difference (%)		
				0.97		



MULTI-POINT GAS TEST REPORT

Test Date : Apr 22, 2022

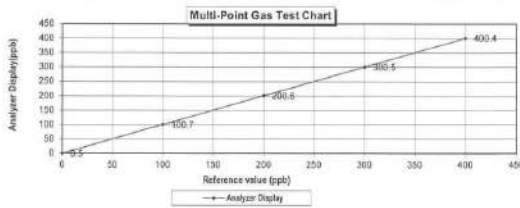
Equipment : Gas Analyzer (SO₂) Model : 43i
Manufacturer : Thermo SCIENTIFIC Serial Number : 1201778116

Standard Gas Concentration
Sulphur Dioxide (SO₂) 44.75 PPM
Nitric Oxide (NO) 45.35 PPM
Methane (CH₄) - PPM
Carbon Monoxide (CO) 1007 PPM
Cylinder No. : CC159599
Expiration Date : Jul 30, 2022

Dilutor Detail
Manufacturer : Thermo SCIENTIFIC
Model : 146i
Serial Number : 1180540071

Multi-point gas test data

Reference Value (ppb)			Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.5	0.50	0.50	0.50
Level 2	20.00%	100.0	100.7	0.70	0.70	0.70
Level 3	40.00%	200.0	200.6	0.60	0.30	0.30
Level 4	60.00%	300.0	300.5	0.50	0.17	0.17
Level 5	80.00%	400.0	400.4	0.40	0.10	0.10
Remark : Measuring Range			500.0 ppb	Average Difference (%)		0.35



MULTI-POINT GAS TEST REPORT

Test Date : Apr 8, 2022

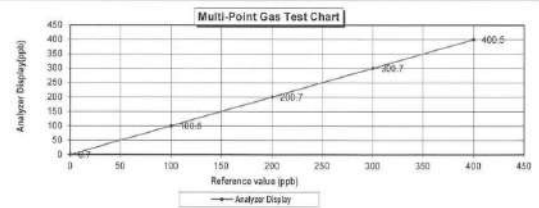
Equipment : Gas Analyzer (SO₂) Model : 43i
Manufacturer : Thermo Scientific Serial Number : 1182920014

Standard Gas Concentration
Sulphur Dioxide (SO₂) 44.75 PPM
Nitric Oxide (NO) 45.35 PPM
Methane (CH₄) - PPM
Carbon Monoxide (CO) 1007 PPM
Cylinder No. : CC159599
Expiration Date : Jul 30, 2022

Dilutor Detail
Manufacturer : Thermo SCIENTIFIC
Model : 146i
Serial Number : 1180540071

Multi-point gas test data

Reference Value (ppb)		Analyzer Display (ppb)	Difference Error	Percent Error	% Error
Level 1	Zero	0.0	0.7	0.70	0.70
Level 2	20.00%	100.0	100.6	0.60	0.60
Level 3	40.00%	200.0	200.7	0.70	0.35
Level 4	60.00%	300.0	300.7	0.70	0.23
Level 5	80.00%	400.0	400.5	0.50	0.12
Remark : Measuring Range			500.0 ppb		
			Average Difference (%)		
			0.40		





MULTI-POINT GAS TEST REPORT

Test Date : May 3, 2022

Equipment : Gas Analyzer (SO₂) Model : 43i
Manufacturer : Thermo SCIENTIFIC Serial Number : 1180540065

Standard Gas Concentration

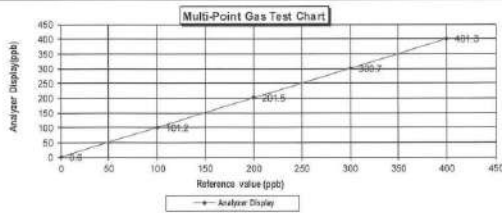
Sulphur Dioxide (SO₂) 44.75 PPM
Nitric Oxide (NO) 45.35 PPM
Methane (CH₄) - PPM
Carbon Monoxide (CO) 1007 PPM
Cylinder No. : CC159599
Expiration Date : Jul 30, 2022

Dilutor Detail

Manufacturer : Thermo SCIENTIFIC
Model : 146i
Serial Number : 1180540071

Multi-point gas test data

Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1 Zero	0.0	0.60	0.60	0.60
Level 2 20.00%	100.0	1.20	1.19	1.19
Level 3 40.00%	200.0	1.50	0.74	0.74
Level 4 60.00%	300.0	8.70	0.23	0.23
Level 5 80.00%	400.0	1.30	0.32	0.32
Remark : Measuring Range 500.0 ppb		Average Difference (%)		
Acceptable Limit $\pm 5\%$		0.62		



MULTI-POINT GAS TEST REPORT

Test Date : May 3, 2022

Equipment : Gas Analyzer (SO₂) Model : 43i
Manufacturer : Thermo Scientific Serial Number : 1191503040

Standard Gas Concentration

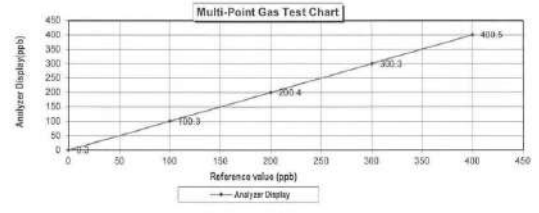
Sulphur Dioxide (SO₂) 44.75 PPM
Nitric Oxide (NO) 45.35 PPM
Methane (CH₄) - PPM
Carbon Monoxide (CO) 1007 PPM
Cylinder No. : CC159599
Expiration Date : Jul 30, 2022

Dilutor Detail

Manufacturer : Thermo SCIENTIFIC
Model : 146i
Serial Number : 1180540071

Multi-point gas test data

Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1 Zero	0.0	0.30	0.30	0.30
Level 2 20.00%	100.0	0.30	0.30	0.30
Level 3 40.00%	200.0	0.40	0.20	0.20
Level 4 60.00%	300.0	0.30	0.10	0.10
Level 5 80.00%	400.0	0.50	0.12	0.12
Remark : Measuring Range 500.0 ppb		Average Difference (%)		
Acceptable Limit $\pm 5\%$		0.20		



MULTI-POINT GAS TEST REPORT

Test Date : Apr 8, 2022

Equipment : Gas Analyzer (SO₂) Model : 43i
Manufacturer : Thermo SCIENTIFIC Serial Number : 1201778112

Standard Gas Concentration

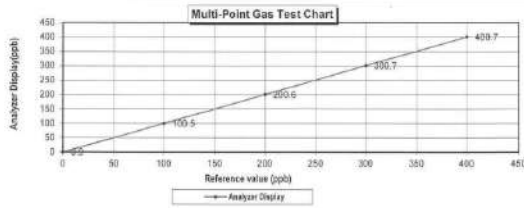
Sulphur Dioxide (SO₂) 44.75 PPM
Nitric Oxide (NO) 45.35 PPM
Methane (CH₄) - PPM
Carbon Monoxide (CO) 1007 PPM
Cylinder No. : CC159599
Expiration Date : Jul 30, 2022

Dilutor Detail

Manufacturer : Thermo SCIENTIFIC
Model : 146i
Serial Number : 1180540071

Multi-point gas test data

Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1 Zero	0.0	0.90	0.90	0.90
Level 2 20.00%	100.0	0.50	0.50	0.50
Level 3 40.00%	200.0	0.60	0.30	0.30
Level 4 60.00%	300.0	3.00	0.23	0.23
Level 5 80.00%	400.0	0.70	0.17	0.17
Remark : Measuring Range 500.0 ppb		Average Difference (%)		
Acceptable Limit $\pm 5\%$		0.42		



MULTI-POINT GAS TEST REPORT

Test Date : Apr 8, 2022

Equipment : Gas Analyzer (SO₂) Model : 43i
Manufacturer : Thermo SCIENTIFIC Serial Number : 1201778115

Standard Gas Concentration

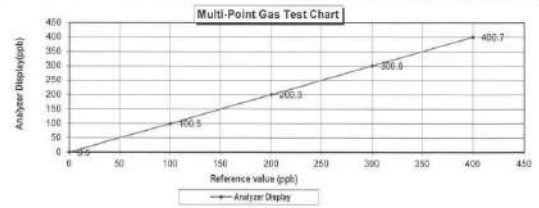
Sulphur Dioxide (SO₂) 44.75 PPM
Nitric Oxide (NO) 45.35 PPM
Methane (CH₄) - PPM
Carbon Monoxide (CO) 1007 PPM
Cylinder No. : CC159599
Expiration Date : Jul 30, 2022

Dilutor Detail

Manufacturer : Thermo SCIENTIFIC
Model : 146i
Serial Number : 1180540071

Multi-point gas test data

Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1 Zero	0.0	0.50	0.50	0.50
Level 2 20.00%	100.0	0.50	0.50	0.50
Level 3 40.00%	200.0	0.30	0.15	0.15
Level 4 60.00%	300.0	0.60	0.20	0.20
Level 5 80.00%	400.0	0.70	0.17	0.17
Remark : Measuring Range 500.0 ppb		Average Difference (%)		
Acceptable Limit $\pm 5\%$		0.30		





Airgas Specialty Gases
Airgas USA, LLC
One United Drive
Durham, NC 27703
airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: E64N19E1540103 Reference Number: 122-402135187-1
Cylinder Number: EBD143262 Cylinder Volume: 144.4 CF
Laboratory: 124 - Durham (SAP) - NC Cylinder Pressure: 2015 PSIG
P/GVP Number: B22621 Valve Outlet: 680
Gas Code: CO,NIO,NOX,SO2,BALN Certification Date: Jun 21, 2021
Expiration Date: Jun 21, 2024

Calibration performed in accordance with: EPA Method 18 for Air by Gas Calibration of Generic Calibration Standards (May 2021) document EPA 600/4-10-021, using the above procedures listed. Analytical Methodology does not require correction for analytical interference. This certificate has a 100% analytical uncertainty as stated above to the confidence level of 95%. There are no product operations which affect the use of this calibration module. All concentrations are in % by volume unless otherwise noted.
Do Not Use This Cylinder Below 100 psig (i.e. 6.7 barg) please.

ANALYTICAL RESULTS					
Component	Required Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Codes
NOX	46.08 PPM	43.89 PPM	G1	+/- 1.4% NIST Traceable	06/14/2021, 06/21/2021
NITRIC OXIDE	45.08 PPM	45.84 PPM	G1	+/- 1.4% NIST Traceable	06/14/2021, 06/21/2021
SULFUR DIOXIDE	43.08 PPM	44.68 PPM	G1	+/- 1.5% NIST Traceable	06/14/2021, 06/21/2021
CARBON MONOXIDE	1000 PPM	984.3 PPM	G1	+/- 0.7% NIST Traceable	06/14/2021
NITROGEN	Balance				

CALIBRATION STANDARDS				
Type	Lot ID	Cylinder No.	Concentration	Uncertainty Expiration Date
MTBA	20181120	CCT01064	48.82 PPM NITRIC OXIDE/NITROGEN	+/- 1.0% Feb 08, 2026
PMW	12385	D085036	8.91 PPM NITROGEN DIOXIDE/AIR	+/- 2.0% Feb 20, 2029
GW5	491429558102	C0355041	4.348 PPM NITROGEN DIOXIDE/NITROGEN	+/- 2.1 Feb 18, 2023
MTFM	18011043	C0470277	49.02 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8% Jun 17, 2022
MTFM	14082119	C0432177	596.9 PPM CARBON MONOXIDE/NITROGEN	+/-0.5% Nov 16, 2025

ANALYTICAL EQUIPMENT		
Instrument/Model/Model	Analytical Principle	Last Multi-point Calibration
Nicolet 8700 AHR0801323 CO	FTIR	Jun 03, 2021
Nicolet 8700 AHR0801335 NO	FTIR	Jun 03, 2021
Nicolet 8700 AHR0801399 NO2	FTIR	Jun 03, 2021
Nicolet 8700 AHR0801333 SO2	FTIR	Jun 03, 2021

Triled Data Available Upon Request

NOTES: PO #521002907

GROSS WT: 28.40kg

NET WT: 4.73kg



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The analytical test results reported on this certificate relate only to the cylinder number specified above. This concludes the test report.



Certificate of Calibration

WL-21 Wireless Anemometer

Scarlet Tech Ltd. hereby certifies that the WL-21 wireless anemometer listed below was thoroughly calibrated, tested and inspected following the standard calibration procedure (st-wl-21) and is within manufacturer's specification at the time when the calibration is done.

Client: Envir Service Co., Ltd.

Serial No.: 2111DT0004

Calibration Date: 2022/2/22

Calibration Expiry Date: 2023/2/21

The Result of Calibration

Velocity				
Measured Value (m/s)	Actual Value (m/s)	Deviation	Tolerance	Result
1.0	0.9	0.1	0.9 - 1.1	Pass
2.0	2	0	1.8 - 2.2	Pass
5.0	4.8	0.2	4.7 - 5.3	Pass
7.0	7.1	0.1	6.0 - 8.0	Pass
10.0	9.7	0.3	9.5 - 10.5	Pass
20.0	20	0	19.0 - 21.0	Pass

Wind Direction				
Measured Value	Actual Value	Deviation	Tolerance	Result
45°	48	3	42 - 48	Pass
135°	134	1	132 - 138	Pass
225°	227	2	222 - 228	Pass
315°	315	0	312 - 318	Pass
0°	1	1	357 - 3	Pass

Inspection Room Temp	Actual Value	Deviation	Tolerance	Result
22.5°C	22.1	0.4	21.5-23.5	

Atmospheric Pressure Inspection	Actual Value			
998	1000			

Environment conditions:

Air temperature: 24 °C

Relative humidity: 58 %

Static pressure: 118.3 kPa

This certificate may not be published
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4F-3, No. 347, 2nd Sec., Heping

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SCARLET | TECH

Certificate of Calibration

WL-21 Wireless Anemometer

Scarlet Tech Ltd. hereby certifies that the WL-21 wireless anemometer listed below was thoroughly calibrated, tested and inspected following the standard calibration procedure (st-wl-21) and is within manufacturer's specification at the time when the calibration is done.

Client: Envir Service Co., Ltd.

Serial No.: 2111DT0041

Calibration Date: 2022/3/25

Calibration Expiry Date: 2023/3/24

The Result of Calibration

Velocity				
Measured Value (m/s)	Actual Value (m/s)	Deviation	Tolerance	Result
1.0	1	0	0.9 - 1.1	Pass
2.0	1.8	0.2	1.8 - 2.2	Pass
5.0	5	0	4.7 - 5.3	Pass
7.0	7.2	0.2	6.0 - 8.0	Pass
10.0	9.9	0.1	9.5 - 10.5	Pass
20.0	20	0	19.0 - 21.0	Pass

Wind Direction				
Measured Value	Actual Value	Deviation	Tolerance	Result
45°	43	2	42 - 48	Pass
135°	135	0	132 - 138	Pass
225°	227	2	222 - 228	Pass
315°	318	3	312 - 318	Pass
0°	0	0	357 - 3	Pass

Inspection Room Temp	Actual Value	Deviation	Tolerance	Result
24.2°C	24.8	0.6	23.2-25.2	

Atmospheric Pressure Inspection	Actual Value	De		
998	1001	3		

Environment conditions:

Air temperature: 22 °C

Relative humidity: 62 %

Static pressure: 102.2 kPa

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Certificate of Calibration

WL-21 Wireless Anemometer

Scarlet Tech Ltd. hereby certifies that the WL-21 wireless anemometer listed below was thoroughly calibrated, tested and inspected following the standard calibration procedure (st-wl-21) and is within manufacturer's specification at the time when the calibration is done.

Client: Envir Service Co., Ltd.

Serial No.: 2111DT0052

Calibration Date: 2022/3/25

Calibration Expiry Date: 2023/3/24

The Result of Calibration

Velocity				
Measured Value (m/s)	Actual Value (m/s)	Deviation	Tolerance	Result
1.0	0.9	0.1	0.9 - 1.1	Pass
2.0	1.9	0.1	1.8 - 2.2	Pass
5.0	4.8	0.2	4.7 - 5.3	Pass
7.0	7.0	0	6.0 - 8.0	Pass
10.0	9.9	0.1	9.5 - 10.5	Pass
20.0	20.0	0	19.0 - 21.0	Pass

Wind Direction				
Measured Value	Actual Value	Deviation	Tolerance	Result
45°	45	0	42 - 48	Pass
135°	137	2	132 - 138	Pass
225°	223	2	222 - 228	Pass
315°	316	2	312 - 318	Pass
0°	1	1	357 - 3	Pass

Inspection Room Temp	Actual Value	Deviation	Tolerance	Result
24.2°C	24.0	0.2	23.2-25.2	

Atmospheric Pressure Inspection	Actual Value	D		
998	1000			

Environment conditions:

Air temperature: 22 °C

Relative humidity: 62 %

Static pressure: 102.2 kPa

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Certificate of Calibration

WL-21 Wireless Anemometer

Scarlet Tech Ltd. hereby certifies that the WL-21 wireless anemometer listed below was thoroughly calibrated, tested and inspected following the standard calibration procedure (st-wl-21) and is within manufacturer's specification at the time when the calibration is done.

Client: Envir Service Co., Ltd.

Serial No.: 2111DT0058

Calibration Date: 2022/3/25

Calibration Expiry Date: 2023/3/24

The Result of Calibration

Velocity				
Measured Value (m/s)	Actual Value (m/s)	Deviation	Tolerance	Result
1.0	1.0	0.0	0.9 - 1.1	Pass
2.0	1.9	0.1	1.8 - 2.2	Pass
5.0	5.0	0.0	4.7 - 5.3	Pass
7.0	7.2	0.2	6.0 - 8.0	Pass
10.0	9.8	0.2	9.5 - 10.5	Pass
20.0	20.0	0	19.0 - 21.0	Pass

Wind Direction				
Measured Value	Actual Value	Deviation	Tolerance	Result
45°	47	2	42 - 48	Pass
135°	135	0	132 - 138	Pass
225°	224	1	222 - 228	Pass
315°	315	0	312 - 318	Pass
0°	359	1	357 - 3	Pass

Inspection Room Temp	Actual Value	Deviation	Tolerance	Result
24.2°C	24.5	0.3		

Atmospheric Pressure Inspection	Actual Value	Deviation	Tolerance	Result
998	1000	2		

Environment conditions :

Air temperature: 22 °C
Relative humidity: 62 %
Static pressure: 102.2 kPa

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Certificate of Calibration

WL-21 Wireless Anemometer

Scarlet Tech Ltd. hereby certifies that the WL-21 wireless anemometer listed below was thoroughly calibrated, tested and inspected following the standard calibration procedure (st-wl-21) and is within manufacturer's specification at the time when the calibration is done.

Client: Envir Service Co., Ltd.

Serial No.: 2111DT0065

Calibration Date: 2022/3/25

Calibration Expiry Date: 2023/3/24

The Result of Calibration

Velocity				
Measured Value (m/s)	Actual Value (m/s)	Deviation	Tolerance	Result
1.0	1.0	0.0	0.9 - 1.1	Pass
2.0	2.0	0.0	1.8 - 2.2	Pass
5.0	4.8	0.2	4.7 - 5.3	Pass
7.0	7.1	0.1	6.0 - 8.0	Pass
10.0	9.8	0.2	9.5 - 10.5	Pass
20.0	19.8	0.2	19.0 - 21.0	Pass

Wind Direction				
Measured Value	Actual Value	Deviation	Tolerance	Result
45°	43	2	42 - 48	Pass
135°	136	1	132 - 138	Pass
225°	225	0	222 - 228	Pass
315°	315	0	312 - 318	Pass
0°	2	2	357 - 3	Pass

Inspection Room Temp	Actual Value	Deviation	Tolerance	Result
24.2°C	24.2	0.0	23.2-25.2	

Atmospheric Pressure Inspection	Actual Value	Deviation	Tolerance	Result
998	997	1		

Environment conditions :

Air temperature: 22 °C
Relative humidity: 62 %
Static pressure: 102.2 kPa

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Certificate of Calibration

WL-21 Wireless Anemometer

Scarlet Tech Ltd. hereby certifies that the WL-21 wireless anemometer listed below was thoroughly calibrated, tested and inspected following the standard calibration procedure (st-wl-21) and is within manufacturer's specification at the time when the calibration is done.

Client: Envir Service Co., Ltd.

Serial No.: 2111DT0072

Calibration Date: 2022/3/25

Calibration Expiry Date: 2023/3/24

The Result of Calibration

Velocity				
Measured Value (m/s)	Actual Value (m/s)	Deviation	Tolerance	Result
1.0	1.1	0.1	0.9 - 1.1	Pass
2.0	2.0	0.0	1.8 - 2.2	Pass
5.0	4.8	0.2	4.7 - 5.3	Pass
7.0	7.0	0.0	6.0 - 8.0	Pass
10.0	9.9	0.1	9.5 - 10.5	Pass
20.0	20.2	0.2	19.0 - 21.0	Pass

Wind Direction				
Measured Value	Actual Value	Deviation	Tolerance	Result
45°	45	0	42 - 48	Pass
135°	135	0	132 - 138	Pass
225°	227	2	222 - 228	Pass
315°	314	1	312 - 318	Pass
0°	359	1	357 - 3	Pass

Inspection Room Temp	Actual Value	Deviation	Tolerance	Result
24.2°C	24.2			

Atmospheric Pressure Inspection	Actual Value	Deviation	Tolerance	Result
998	1000			

Environment conditions :

Air temperature: 22 °C
Relative humidity: 62 %
Static pressure: 102.2 kPa

This certificate may not be published
obtaining permission in writing
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Certificate of Calibration

WL-21 Wireless Anemometer

Scarlet Tech Ltd. hereby certifies that the WL-21 wireless anemometer listed below was thoroughly calibrated, tested and inspected following the standard calibration procedure (st-wl-21) and is within manufacturer's specification at the time when the calibration is done.

Client: Envir Service Co., Ltd.

Serial No.: 2112DT0102

Calibration Date: 2022/3/25

Calibration Expiry Date: 2023/3/24

The Result of Calibration

Velocity				
Measured Value (m/s)	Actual Value (m/s)	Deviation	Tolerance	Result
1.0	1.0	0.0	0.9 - 1.1	Pass
2.0	2.0	0.0	1.8 - 2.2	Pass
5.0	4.9	0.1	4.7 - 5.3	Pass
7.0	7.3	0.3	6.0 - 8.0	Pass
10.0	9.9	0.1	9.5 - 10.5	Pass
20.0	20.1	0.1	19.0 - 21.0	Pass

Wind Direction				
Measured Value	Actual Value	Deviation	Tolerance	Result
45°	45	0	42 - 48	Pass
135°	134	1	132 - 138	Pass
225°	224	1	222 - 228	Pass
315°	314	1	312 - 318	Pass
0°	0	0	357 - 3	Pass

Inspection Room Temp	Actual Value	Deviation	Tolerance	Result
24.2°C	24.8	0.6	23.2-25.2	

Atmospheric Pressure Inspection	Actual Value	Deviation	Tolerance	Result
998	1000			

Environment conditions :

Air temperature: 22 °C
Relative humidity: 62 %
Static pressure: 102.2 kPa

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obtaining permission in writing
4F-3, No. 347, 2nd Sec., Heping E. Rd

เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue : 2 August, 2022

Certification No. : 276/22

Page : 1 of 2

Object : Wind speed and wind direction

Manufacturer : LSI

Type : Data Logger : E-LOG 305 wind speed and wind direction DNA 821

Serial No. : Data Logger : 20080020 wind speed and wind direction 20040192

ID No. : No.18/20

Customer : United Analyst and Engineering Consultant Co.,Ltd.

81 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Prakanong, Bangkok 10260.

Calibration Condition : Temperature : 25.1 °C Barometric Pressure : 1006.9 hPa

NATIONAL STANDARD WIND TUNNEL :

: Thermal Anemometer : 642 : S/N 91563

: HOOK GAGE NO 1425 Pitot Tube Theodor Friedrichs Type 0800.0000 serial 9023

N.I.S.T. Test Reference Number : 731/241460 : Standard Velocity at 20 ~ 30 m/sec

: Ultrasonic Anemometer : Model DA-650-3TV (sensor TR-90AH)

Serial Number 110730029 (sensor 120629586)



THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

The Result of Calibration

Certification No. 276/22

2 August, 2022

Page : 2 of 2

Standard	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure	Vacuum	Velocity	Velocity	Correction
Ultrasonic Anemometer	inches H2O	inches H2O	m/sec	m/sec	m/sec
1.00	-	-	-	1.0	0.00
3.02	-	-	-	3.0	0.02
5.00	-	-	-	5.0	0.00
7.04	-	-	-	6.9	0.14
9.02	-	-	-	8.9	0.12
11.01	-	-	-	10.9	0.11
13.01	-	-	-	12.9	0.11
15.01	-	-	-	14.8	0.21
17.02	-	-	-	16.8	0.22
20.02	-	-	-	19.8	0.22

Wind Aloft Plotting Board.	
U.S. DEPARTMENT OF COMMERCE WEATHER BUREAU	
WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	90
180	180
270	270



THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue : 14 July, 2022

Certification No. : 263/22

Page : 1 of 2

Object : Wind speed and wind direction

Manufacturer : Sensor : YOUNG

Basic Datalogger : NRG

Type : Sensor : 05103-45 Basic Datalogger : LR20

Serial No. : Sensor : 97947 Basic Datalogger : 30905375

Customer : United Analyst and Engineering Consultant Co.,Ltd.

81 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Prakanong, Bangkok 10260.

Calibration Condition : Temperature : 25.1 °C Barometric Pressure : 1004.8 hPa

NATIONAL STANDARD WIND TUNNEL :

: Micromanometer : Theodor Friedrichs FC214 Serial No. 9310119

: HOOK GAGE NO 1425 Pitot Tube Theodor Friedrichs Type 0800.0000 serial 9023

N.I.S.T. Test Reference Number : 731/241460 : Standard Velocity at 20 ~ 30 m/sec

: Ultrasonic Anemometer : Model DA-650-3TV (sensor TR-90AH)

Serial Number 110730029 (sensor 120629586)



THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

The Result of Calibration

Certification No. 263/22

14 July, 2022

Page : 2 of 2

Standard	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure	Vacuum	Velocity	Velocity	Correction
Ultrasonic Anemometer	inches H2O	inches H2O	m/sec	m/sec	m/sec
1.00	-	-	-	0.95	0.05
3.02	-	-	-	2.94	0.08
5.00	-	-	-	4.94	0.06
7.04	-	-	-	6.98	0.06
9.02	-	-	-	8.93	0.09
11.01	-	-	-	10.92	0.09
13.01	-	-	-	12.92	0.09
15.01	-	-	-	15.02	-0.01
17.02	-	-	-	17.01	0.01
20.02	-	-	-	20.16	-0.14

Wind Aloft Plotting Board.	
U.S. DEPARTMENT OF COMMERCE WEATHER BUREAU	
WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	90
180	180
270	270

Calibrate





MULTI-POINT GAS TEST REPORT

Test Date : Apr 19, 2022

Equipment : Gas Analyzer (NO_x) Model : 42C
Manufacturer : Thermo Electron Corporation Serial Number : 42C-0508011076

Standard Gas Concentration

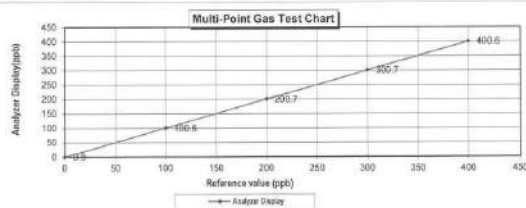
Sulphur Dioxide (SO₂) 45.75 PPM
Nitric Oxide (NO) 45.35 PPM
Methane (CH₄) - PPM
Carbon Monoxide (CO) 1007 PPM
Cylinder No. : CC159599
Expiration Date : Jul 30, 2022

Dilutor Detail

Manufacturer : Thermo Scientific
Model : 1461
Serial Number : 1180540071

Multi-point gas test data

	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	% Error
Level 1	Zero	0.0	0.50	0.90	0.90
Level 2	20.00%	100.0	100.5	0.60	0.60
Level 3	40.00%	200.0	200.7	0.70	0.35
Level 4	60.00%	300.0	300.7	0.70	0.23
Level 5	80.00%	400.0	400.6	0.60	0.15
Remark : Measuring Range	500.0 ppb		Average Difference (%)	0.45	
:Acceptable Limit $\pm 5\%$					



MULTI-POINT GAS TEST REPORT

Test Date : Apr 7, 2022

Equipment : Gas Analyzer (NO_x) Model : 42C
Manufacturer : Thermo Electron Corporation Serial Number : 0517512000

Standard Gas Concentration

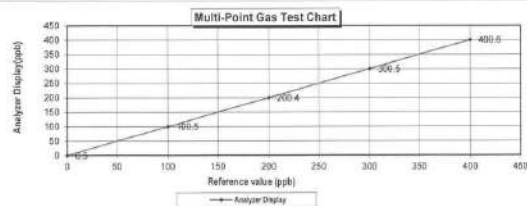
Sulphur Dioxide (SO₂) 44.75 PPM
Nitric Oxide (NO) 45.35 PPM
Methane (CH₄) - PPM
Carbon Monoxide (CO) 1007 PPM
Cylinder No. : CC159599
Expiration Date : Jul 30, 2022

Dilutor Detail

Manufacturer : Thermo Scientific
Model : 1461
Serial Number : 1180540071

Multi-point gas test data

	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	% Error
Level 1	Zero	0.0	0.50	0.50	0.50
Level 2	20.00%	100.0	100.5	0.50	0.50
Level 3	40.00%	200.0	200.4	0.40	0.20
Level 4	60.00%	300.0	300.5	0.50	0.17
Level 5	80.00%	400.0	400.6	0.60	0.15
Remark : Measuring Range	500.0 ppb		Average Difference (%)	0.30	
:Acceptable Limit $\pm 5\%$					



MULTI-POINT GAS TEST REPORT

Test Date : Apr 7, 2022

Equipment : Gas Analyzer (NO_x) Model : 42C
Manufacturer : Thermo Electron Corporation Serial Number : 0517512001

Standard Gas Concentration

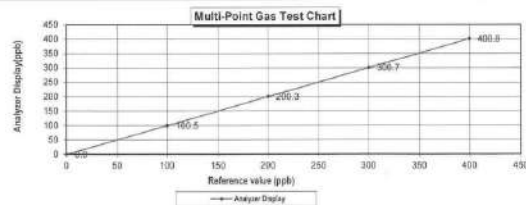
Sulphur Dioxide (SO₂) 44.75 PPM
Nitric Oxide (NO) 45.35 PPM
Methane (CH₄) - PPM
Carbon Monoxide (CO) 1007 PPM
Cylinder No. : CC159599
Expiration Date : Jul 30, 2022

Dilutor Detail

Manufacturer : Thermo Scientific
Model : 1461
Serial Number : 1180540071

Multi-point gas test data

	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	% Error
Level 1	Zero	0.0	0.50	0.90	0.90
Level 2	20.00%	100.0	100.5	0.50	0.50
Level 3	40.00%	200.0	200.3	0.30	0.15
Level 4	60.00%	300.0	300.7	0.70	0.23
Level 5	80.00%	400.0	400.6	0.60	0.20
Remark : Measuring Range	500.0 ppb		Average Difference (%)	0.40	
:Acceptable Limit $\pm 5\%$					



MULTI-POINT GAS TEST REPORT

Test Date : Apr 7, 2022

Equipment : Gas Analyzer (NO_x) Model : 421
Manufacturer : Thermo Scientific Serial Number : CM08130002

Standard Gas Concentration

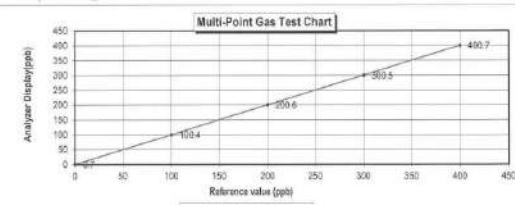
Sulphur Dioxide (SO₂) 44.75 PPM
Nitric Oxide (NO) 45.35 PPM
Methane (CH₄) - PPM
Carbon Monoxide (CO) 1007 PPM
Cylinder No. : CC159599
Expiration Date : Jul 30, 2022

Dilutor Detail

Manufacturer : Thermo Scientific
Model : 1461
Serial Number : 1180540071

Multi-point gas test data

	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	% Error
Level 1	Zero	0.0	0.7	0.70	0.70
Level 2	20.00%	100.0	100.4	0.40	0.40
Level 3	40.00%	200.0	200.6	0.60	0.30
Level 4	60.00%	300.0	300.5	0.50	0.17
Level 5	80.00%	400.0	400.7	0.70	0.17
Remark : Measuring Range	500.0 ppb		Average Difference (%)	0.35	
:Acceptable Limit $\pm 5\%$					





MULTI-POINT GAS TEST REPORT

Test Date : Apr 19, 2022

Equipment : Gas Analyzer (NO₂) Model : 42C
Manufacturer : Thermo Environmental Instruments Serial Number : 42C-67174-356

Standard Gas Concentration

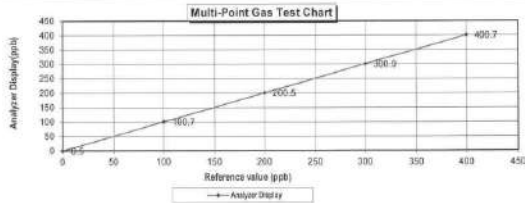
Sulphur Dioxide (SO₂) 44.75 PPM
Nitric Oxide (NO) 45.35 PPM
Methane (CH₄) - PPM
Carbon Monoxide (CO) 1007 PPM
Cylinder No. : CC159599
Expiration Date : Jul 30, 2022

Dilutor Detail

Manufacturer : Thermo Scientific
Model : 146i
Serial Number : 1180540071

Multi-point gas test data

	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.5	0.50	0.50
Level 2	20.00%	100.0	100.7	0.70	0.70
Level 3	40.00%	200.0	200.5	0.50	0.25
Level 4	60.00%	300.0	300.9	0.90	0.30
Level 5	80.00%	400.0	400.7	0.70	0.17
Remark : Measuring Range	500.0 ppb		Average Difference (%)	0.38	
:Acceptable Limit $\pm 5\%$					



MULTI-POINT GAS TEST REPORT

Test Date : May 2, 2022

Equipment : Gas Analyzer (NO₂) Model : 42i
Manufacturer : Thermo Scientific Serial Number : 1180540064

Standard Gas Concentration

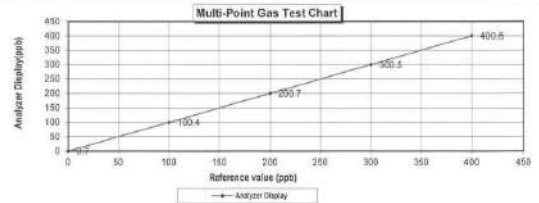
Sulphur Dioxide (SO₂) 44.75 PPM
Nitric Oxide (NO) 45.35 PPM
Methane (CH₄) - PPM
Carbon Monoxide (CO) 1007 PPM
Cylinder No. : CC159599
Expiration Date : Jul 30, 2022

Dilutor Detail

Manufacturer : Thermo Scientific
Model : 146i
Serial Number : 1180540071

Multi-point gas test data

	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.7	0.70	0.70
Level 2	20.00%	100.0	100.4	0.40	0.40
Level 3	40.00%	200.0	200.7	0.70	0.35
Level 4	60.00%	300.0	300.5	0.50	0.17
Level 5	80.00%	400.0	400.6	0.60	0.15
Remark : Measuring Range	500.0 ppb		Average Difference (%)	0.35	
:Acceptable Limit $\pm 5\%$					



MULTI-POINT GAS TEST REPORT

Test Date : Apr 19, 2022

Equipment : Gas Analyzer (NO₂) Model : 42i
Manufacturer : Thermo Scientific Serial Number : 1182920006

Standard Gas Concentration

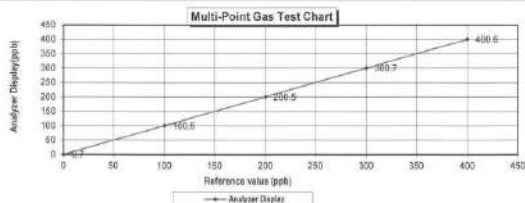
Sulphur Dioxide (SO₂) 44.75 PPM
Nitric Oxide (NO) 45.35 PPM
Methane (CH₄) - PPM
Carbon Monoxide (CO) 1007 PPM
Cylinder No. : CC159599
Expiration Date : Jul 30, 2022

Dilutor Detail

Manufacturer : Thermo Scientific
Model : 146i
Serial Number : 1180540071

Multi-point gas test data

	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.7	0.70	0.70
Level 2	20.00%	100.0	100.6	0.60	0.60
Level 3	40.00%	200.0	200.5	0.50	0.25
Level 4	60.00%	300.0	300.7	0.70	0.23
Level 5	80.00%	400.0	400.6	0.60	0.15
Remark : Measuring Range	500.0 ppb		Average Difference (%)	0.39	
:Acceptable Limit $\pm 5\%$					



MULTI-POINT GAS TEST REPORT

Test Date : June 21, 2022

Equipment : Gas Analyzer (NO₂) Model : 42i
Manufacturer : Thermo Scientific Serial Number : 1182920007

Standard Gas Concentration

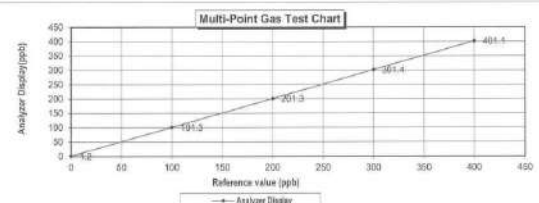
Sulphur Dioxide (SO₂) 44.75 PPM
Nitric Oxide (NO) 45.35 PPM
Methane (CH₄) - PPM
Carbon Monoxide (CO) 1007 PPM
Cylinder No. : CC159599
Expiration Date : Jul 30, 2022

Dilutor Detail

Manufacturer : Thermo Scientific
Model : 146i
Serial Number : 1180540071

Multi-point gas test data

	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	1.20	1.20	1.20
Level 2	20.00%	100.0	101.3	1.30	1.28
Level 3	40.00%	200.0	201.3	1.30	0.65
Level 4	60.00%	300.0	301.4	1.40	0.46
Level 5	80.00%	400.0	401.1	1.10	0.27
Remark : Measuring Range	500.0 ppb		Average Difference (%)	0.77	
:Acceptable Limit $\pm 5\%$					





MULTI-POINT GAS TEST REPORT

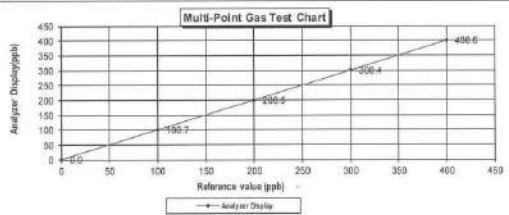
Test Date : May 17, 2022

Equipment : Gas Analyzer (NO₂) Model : 421
Manufacturer : Thermo Scientific Serial Number : 1182920008

Standard Gas Concentration		Diluter Detail	
Sulphur Dioxide (SO ₂)	44.75 PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	45.35 PPM	Model :	146i
Methane (CH ₄)	- PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	1007 PPM		
Cylinder No. :	CC159599		
Expiration Date :	Jul 30, 2022		

Multi-point gas test data

Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	% Error
Level 1 Zero	0.0	0.90	0.90	0.90
Level 2 20.00%	100.0	100.7	0.70	0.70
Level 3 40.00%	200.0	200.5	0.50	0.25
Level 4 60.00%	300.0	300.4	0.40	0.13
Level 5 80.00%	400.0	400.6	0.60	0.15
Remark : Measuring Range 500.0 ppb		Average Difference (%)		
Acceptable Limit $\pm 5\%$		0.43		



CERTIFICATE OF ANALYSIS Grade of Product: EPA Protocol

Part Number: E04N99E15A0 (D3) Reference Number: 122-492135187-1
Cylinder Number: E00143282 Cylinder Volume: 144.4 CF
Laboratory: 124 - Durham (SAP) - NC Cylinder Pressure: 2016 PSIG
PQVP Number: E22021 Valve Config: 650
Gas Code: CO, NO, NO₂, SO₂, BALN Certification Date: Jun 21, 2021
Expiration Date: Jun 21, 2024

Declaration: performed in accordance with EPA Method 319 for the Analyte and Confirmed with Certified Calibration Standards (May 2022) Declaration Date: 05/17/2022, using the daily procedures listed. Analytical Methodology does not require correction for analytical interference. This certificate is a true and accurate statement of the gas purity and composition of the gas as analyzed. There are no significant differences between the gas as analyzed and the gas as certified. The gas is suitable for use in the laboratory.

Do Not Use This Cylinder Below 100 psig, i.e. 6.7 megapascals

Component		ANALYTICAL RESULTS		Total Relative Uncertainty	Assay Date
Reviewed Concentration	Actual Concentration	Protocol	Verified		
NOX	42.00 PPM	45.00 PPM	G1	+/- 1.4% NIST Traceable	06/14/2021, 06/21/2021
NITRIC OXIDE	43.00 PPM	45.00 PPM	G1	+/- 1.4% NIST Traceable	06/14/2021, 06/21/2021
SULFUR DIOXIDE	46.00 PPM	46.00 PPM	G1	+/- 1.0% NIST Traceable	06/14/2021, 06/21/2021
CARBON MONOXIDE	1000 PPM	884.8 PPM	G1	+/- 0.1% NIST Traceable	06/14/2021
NITROGEN	Balance				

Type		Lot ID		Cylinder No		CALIBRATION STANDARDS		Uncertainty	Expiration Date
NITRO	20061120	CC704963	48.50 PPM NITROGEN DIOXIDE/NITROGEN					+/- 1.0%	Feb 02, 2025
PPM	13380	D080205	5.81 PPM NITROGEN DIOXIDE/NITROGEN					+/- 1.0%	Feb 02, 2025
GRAMS	40420558112	CD305541	4.348 PPM NITROGEN DIOXIDE/NITROGEN					+/- 1.1	Feb 18, 2025
NITRO	15011043	CD470277	+0.02 PPM SULFUR DIOXIDE/NITROGEN					+/- 0.8%	Jun 17, 2022
NITRO	14001110	CD424277	590.8 PPM CARBON MONOXIDE/NITROGEN					+/- 0.8%	Nov 16, 2025
The SMALL PPM or GRAM listed above is only for reference to the SAME level in the assay and not for the analysis.									

Instrument/Make/Model		ANALYTICAL EQUIPMENT		Last Multi-Point Calibration
		Analytical Principle		
Nitrogen 6700 AHR0001331 CO		FTIR		Jun 03, 2021
Nitrogen 6700 AHR0001331 NO		FTIR		Jun 03, 2021
Nitrogen 6700 AHR0001331 NO ₂		FTIR		Jun 03, 2021
Nitrogen 6700 AHR0001331 SO ₂		FTIR		Jun 03, 2021

Final Data Available Upon Request

NOTES: PO #8221002607

GROSS WT: 28.40kg

NET WT: 4.72kg



The analysis of the cylinder is related only to the test report.



เอกสารไม่ควบคุม



MULTI-POINT GAS TEST REPORT

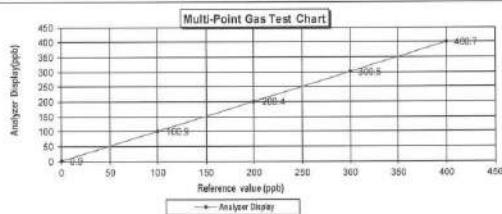
Test Date : May 3, 2022

Equipment : Gas Analyzer (SO₂) Model : 43i
Manufacturer : Thermo SCIENTIFIC Serial Number : 1200906876

Standard Gas Concentration		Diluter Detail	
Sulphur Dioxide (SO ₂)	44.75 PPM	Manufacturer :	Thermo SCIENTIFIC
Nitric Oxide (NO)	45.35 PPM	Model :	146i
Methane (CH ₄)	- PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	1007 PPM		
Cylinder No. :	CC159599		
Expiration Date :	Jul 30, 2022		

Multi-point gas test data

Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	% Error
Level 1 Zero	0.0	0.9	0.90	0.90
Level 2 20.00%	100.0	100.9	0.90	0.89
Level 3 40.00%	200.0	200.4	0.40	0.20
Level 4 60.00%	300.0	300.5	0.50	0.17
Level 5 80.00%	400.0	400.7	0.70	0.17
Remark : Measuring Range 500.0 ppb		Average Difference (%)		
Acceptable Limit $\pm 5\%$		0.47		



MULTI-POINT GAS TEST REPORT

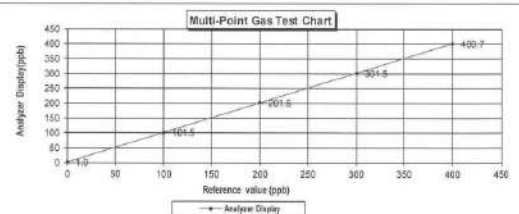
Test Date : May 3, 2022

Equipment : Gas Analyzer (SO₂) Model : 43i
Manufacturer : Thermo SCIENTIFIC Serial Number : 1201778111

Standard Gas Concentration		Diluter Detail	
Sulphur Dioxide (SO ₂)	44.75 PPM	Manufacturer :	Thermo SCIENTIFIC
Nitric Oxide (NO)	45.35 PPM	Model :	146i
Methane (CH ₄)	- PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	1007 PPM		
Cylinder No. :	CC159599		
Expiration Date :	Jul 30, 2022		

Multi-point gas test data

Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	% Error
Level 1 Zero	0.0	1.0	1.00	1.00
Level 2 20.00%	100.0	101.5	1.50	1.48
Level 3 40.00%	200.0	201.6	1.60	0.79
Level 4 60.00%	300.0	301.5	1.50	0.50
Level 5 80.00%	400.0	400.7	0.70	0.17
Remark : Measuring Range 500.0 ppb		Average Difference (%)		
Acceptable Limit $\pm 5\%$		0.79		



MULTI-POINT GAS TEST REPORT

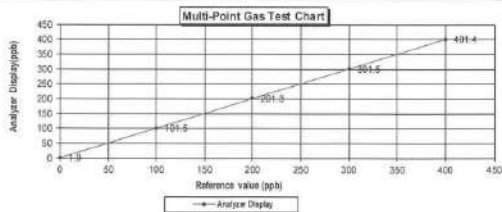
Test Date : May 3, 2022

Equipment : Gas Analyzer (SO₂) Model : 43i
Manufacturer : Thermo SCIENTIFIC Serial Number : 1201778113

Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO ₂)	44.75	PPM	Manufacturer : Thermo SCIENTIFIC
Nitric Oxide (NO)	45.35	PPM	Model : 146i
Methane (CH ₄)	-	PPM	Serial Number : 1180540071
Carbon Monoxide (CO)	1007		
Cylinder No. :	CC159599		
Expiration Date :	Jul 30, 2022		

Multi-point gas test data

Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1 Zero	0.0	1.9	1.90	1.90
Level 2 20.00%	100.0	101.5	1.48	1.48
Level 3 40.00%	200.0	201.3	0.65	0.65
Level 4 60.00%	300.0	301.5	0.50	0.50
Level 5 80.00%	400.0	401.4	0.35	0.35
Remark : Measuring Range 500.0 ppb		Average Difference (%)		
:Acceptable Limit $\pm 5\%$		0.97		



MULTI-POINT GAS TEST REPORT

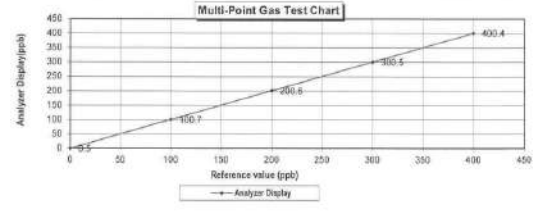
Test Date : Apr 22, 2022

Equipment : Gas Analyzer (SO₂) Model : 43i
Manufacturer : Thermo SCIENTIFIC Serial Number : 1201778116

Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO ₂)	44.75	PPM	Manufacturer : Thermo SCIENTIFIC
Nitric Oxide (NO)	45.35	PPM	Model : 146i
Methane (CH ₄)	-	PPM	Serial Number : 1180540071
Carbon Monoxide (CO)	1007		
Cylinder No. :	CC159599		
Expiration Date :	Jul 30, 2022		

Multi-point gas test data

Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1 Zero	0.0	0.5	0.50	0.50
Level 2 20.00%	100.0	100.7	0.70	0.70
Level 3 40.00%	200.0	200.6	0.30	0.30
Level 4 60.00%	300.0	300.5	0.17	0.17
Level 5 80.00%	400.0	400.4	0.10	0.10
Remark : Measuring Range 500.0 ppb		Average Difference (%)		
:Acceptable Limit $\pm 5\%$		0.35		



MULTI-POINT GAS TEST REPORT

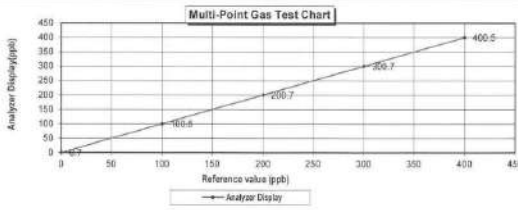
Test Date : Apr 8, 2022

Equipment : Gas Analyzer (SO₂) Model : 43i
Manufacturer : Thermo Scientific Serial Number : 1182920014

Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO ₂)	44.75	PPM	Manufacturer : Thermo SCIENTIFIC
Nitric Oxide (NO)	45.35	PPM	Model : 146i
Methane (CH ₄)	-	PPM	Serial Number : 1180540071
Carbon Monoxide (CO)	1007		
Cylinder No. :	CC159599		
Expiration Date :	Jul 30, 2022		

Multi-point gas test data

Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1 Zero	0.0	0.7	0.70	0.70
Level 2 20.00%	100.0	100.6	0.60	0.60
Level 3 40.00%	200.0	200.7	0.35	0.35
Level 4 60.00%	300.0	300.7	0.23	0.23
Level 5 80.00%	400.0	400.5	0.12	0.12
Remark : Measuring Range 500.0 ppb		Average Difference (%)		
:Acceptable Limit $\pm 5\%$		0.40		



MULTI-POINT GAS TEST REPORT

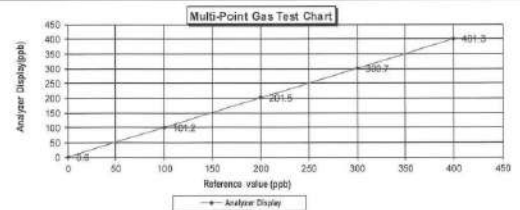
Test Date : May 3, 2022

Equipment : Gas Analyzer (SO₂) Model : 43i
Manufacturer : Thermo SCIENTIFIC Serial Number : 1180540065

Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO ₂)	44.75	PPM	Manufacturer : Thermo SCIENTIFIC
Nitric Oxide (NO)	45.35	PPM	Model : 146i
Methane (CH ₄)	-	PPM	Serial Number : 1180540071
Carbon Monoxide (CO)	1007		
Cylinder No. :	CC159599		
Expiration Date :	Jul 30, 2022		

Multi-point gas test data

Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1 Zero	0.0	0.6	0.60	0.60
Level 2 20.00%	100.0	101.2	1.20	1.19
Level 3 40.00%	200.0	201.5	0.74	0.74
Level 4 60.00%	300.0	300.7	0.23	0.23
Level 5 80.00%	400.0	401.3	0.32	0.32
Remark : Measuring Range 500.0 ppb		Average Difference (%)		
:Acceptable Limit $\pm 5\%$		0.62		





MULTI-POINT GAS TEST REPORT

Test Date : May 3, 2022

Equipment : Gas Analyzer (SO₂) Model : 43i
Manufacturer : Thermo Scientific Serial Number : 1191503040

Standard Gas Concentration

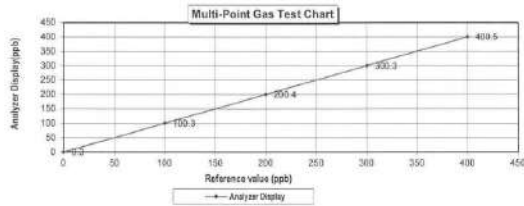
Sulphur Dioxide (SO₂) 44.75 PPM
Nitric Oxide (NO) 45.35 PPM
Methane (CH₄) - PPM
Carbon Monoxide (CO) 1007 PPM
Cylinder No. : CC159599
Expiration Date : Jul 30, 2022

Dilutor Detail

Manufacturer : Thermo SCIENTIFIC
Model : 146i
Serial Number : 1180540071

Multi-point gas test data

	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	% Error
Level 1	Zero	0.0	0.3	0.30	0.30
Level 2	20.00%	100.0	100.3	0.30	0.30
Level 3	40.00%	200.0	200.4	0.20	0.20
Level 4	60.00%	300.0	300.3	0.10	0.10
Level 5	80.00%	400.0	400.5	0.12	0.12
Remark : Measuring Range	500.0 ppb		Average Difference (%)	0.20	
:Acceptable Limit \pm 5%					



MULTI-POINT GAS TEST REPORT

Test Date : Apr 8, 2022

Equipment : Gas Analyzer (SO₂) Model : 43i
Manufacturer : Thermo SCIENTIFIC Serial Number : 1201778112

Standard Gas Concentration

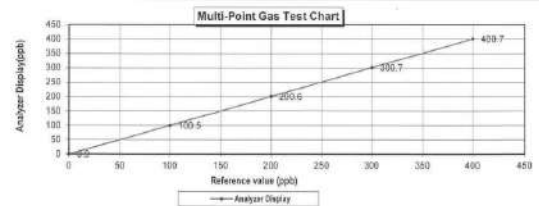
Sulphur Dioxide (SO₂) 44.75 PPM
Nitric Oxide (NO) 45.35 PPM
Methane (CH₄) - PPM
Carbon Monoxide (CO) 1007 PPM
Cylinder No. : CC159599
Expiration Date : Jul 30, 2022

Dilutor Detail

Manufacturer : Thermo SCIENTIFIC
Model : 146i
Serial Number : 1180540071

Multi-point gas test data

	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	% Error
Level 1	Zero	0.0	0.9	0.90	0.90
Level 2	20.00%	100.0	100.5	0.50	0.50
Level 3	40.00%	200.0	200.6	0.30	0.30
Level 4	60.00%	300.0	300.7	0.23	0.23
Level 5	80.00%	400.0	400.7	0.17	0.17
Remark : Measuring Range	500.0 ppb		Average Difference (%)	0.42	
:Acceptable Limit \pm 5%					



MULTI-POINT GAS TEST REPORT

Test Date : Apr 8, 2022

Equipment : Gas Analyzer (SO₂) Model : 43i
Manufacturer : Thermo SCIENTIFIC Serial Number : 1201778115

Standard Gas Concentration

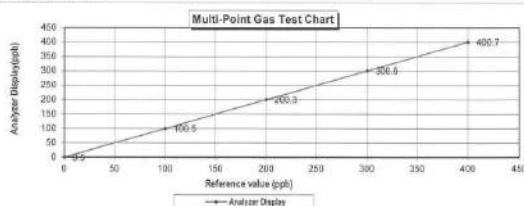
Sulphur Dioxide (SO₂) 44.75 PPM
Nitric Oxide (NO) 45.35 PPM
Methane (CH₄) - PPM
Carbon Monoxide (CO) 1007 PPM
Cylinder No. : CC159599
Expiration Date : Jul 30, 2022

Dilutor Detail

Manufacturer : Thermo SCIENTIFIC
Model : 146i
Serial Number : 1180540071

Multi-point gas test data

	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	% Error
Level 1	Zero	0.0	0.5	0.50	0.50
Level 2	20.00%	100.0	100.5	0.50	0.50
Level 3	40.00%	200.0	200.3	0.15	0.15
Level 4	60.00%	300.0	300.6	0.20	0.20
Level 5	80.00%	400.0	400.7	0.17	0.17
Remark : Measuring Range	500.0 ppb		Average Difference (%)	0.30	
:Acceptable Limit \pm 5%					



Airgas Specialty Gases
Airgas USA, LLC
One United Drive
Durham, NC 27713
airgas.com

CERTIFICATE OF ANALYSIS Grade of Product: EPA Protocol

Part Number: E04N99E15A01D3 Reference Number: 122-492135187-1
Cylinder Number: E00143282 Cylinder Volume: 144.4 CF
Laboratory: 124 - Durham (SAP) - NC Cylinder Pressure: 2016 PSIG
PGVP Number: B22021 Valve Outlet: 650
Gas Code: CO, NO, NO₂, SO₂, H₂, N₂ Certification Date: Jun 21, 2021
Expiration Date: Jun 21, 2024

Declaration: Performance is guaranteed with EPA Protocol for Analytical Grade Calibration Gases (July 2017) document only. Subsequent to this declaration, the user must ensure that the gas is used within the specified shelf life and that the gas is used in accordance with the applicable safety and handling instructions. The user must ensure that the gas is used in accordance with the applicable safety and handling instructions. The user must ensure that the gas is used in accordance with the applicable safety and handling instructions.

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Date
NO	45.00 PPM	45.00 PPM	G1	\pm 1.4% NIST Traceable	06/14/2021, 06/21/2021
NITRIC OXIDE	45.00 PPM	45.00 PPM	G1	\pm 1.4% NIST Traceable	06/14/2021, 06/21/2021
SULFUR DIOXIDE	45.00 PPM	45.00 PPM	G1	\pm 1.4% NIST Traceable	06/14/2021, 06/21/2021
CARBON MONOXIDE	1000 PPM	1000 PPM	G1	\pm 1.4% NIST Traceable	06/14/2021
NITROGEN	Balance	Balance	G1	\pm 1.4% NIST Traceable	06/14/2021

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NITROGEN	2001120	CC700083	48.82 PPM NITROGEN DIOXIDE/NITROGEN	\pm 1.0%	Feb 02, 2025
PM	13300	0680205	5.61 PPM NITROGEN DIOXIDE/NITROGEN	\pm 2.0%	Feb 02, 2025
PM	40042564112	CC305541	4.345 PPM NITROGEN DIOXIDE/NITROGEN	\pm 2.1%	Feb 18, 2025
NITROGEN	15011043	CC432277	48.00 PPM SULFUR DIOXIDE/NITROGEN	\pm 1.0%	Jun 17, 2022
NITROGEN	14001110	CC434277	990.0 PPM CARBON MONOXIDE/NITROGEN	\pm 0.8%	Nov 16, 2025

Instrument/Make/Model	Analytical Principle	Last Multi-Point Calibration
Nitro 6700 AHR001331 CO	FTIR	Jun 03, 2021
Nitro 6700 AHR001331 NO	FTIR	Jun 03, 2021
Nitro 6700 AHR001331 NO ₂	FTIR	Jun 03, 2021
Nitro 6700 AHR001331 SO ₂	FTIR	Jun 03, 2021

Test Data Available Upon Request

NOTES: PGVP #B221002607

GRO-SS WT: 28.40kg

NET WT: 4.72kg



The analytical test results reported on this certificate relate only to the gas analyzed. This concludes the test report.



เอกสารไม่ควบคุม

Mettler-Toledo (Thailand) Ltd.
84/84 - 84/85 Laksale Rd., Bangna Tai Sub-City
Bangna District, Bangkok 10250
+66 2723 0362
MT-TH.ServiceSupport@mt.com



Accuracy Calibration Certificate

Customer

Company: United Analytical and Engineering Consultant Co., Ltd.
Address: 3 Sri Udom Suk 41, Sukhumvit Rd., Bang Cret
City: Phra Khanong Contact: Suttit Chotnong
Zip / Postal: 10250
State / Province: Bangkok
Order Number:

Weighing Device

Manufacturer: Mettler Toledo Instrument Type: Weighing Instrument
Model: AB004-S Asset Number: UAE AIR.010/2550
Serial No.: 1126312528 Terminal Model: N/A
Building: N/A Terminal Serial No.: N/A
Floor: 2 Terminal Asset No.: N/A
Room: Balance Room 2 (2B0)

Range	Max. Capacity	Readability (d)
g	220 g	0.0001 g

Procedure

Calibration Guidelines: EURAMET cg-18 v. 4.0 (11/2015)
Mettler Toledo Work Instruction: CPW002/20
This calibration certificate contains measurements for As Found calibration. No As Left calibration was performed because the device was not modified after As Found calibration. Therefore, results for As Left correspond to As Found.
The sensitivity (span) of the weighing instrument was adjusted before calibration with a built-in weight.
In accordance with EURAMET cg-18 (11/2015), the test loads were selected to reflect the specific use of the weighing device or to accommodate specific calibration conditions.

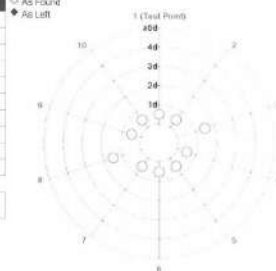
	Temperature	Humidity
As Found	Start: 22.5 °C End: 21.4 °C	Start: 56.1 % End: 63.2 %

As Found Calibration Date: 07-Apr-2022
As Left Calibration Date: N/A
Issue Date: 08-Apr-2022
Calibrator:
Approved Signatory:
☒ Kossaborn Tassanachaisakul
☐ Sami Jitinyom
☐ Sureschek Sukkate

Measurement Results

Repeatability

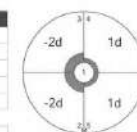
Test Load: 100 g	As Found	As Left
1	99.9989 g	N/A
2	100.0000 g	N/A
3	99.9998 g	N/A
4	100.0000 g	N/A
5	99.9999 g	N/A
6	100.0000 g	N/A
7	99.9999 g	N/A
8	100.0001 g	N/A
9	99.9999 g	N/A
10	100.0000 g	N/A
Standard Deviation	0.00008 g	N/A



The "1d" in the graph represents the readability of the range interval in which the test was performed.
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

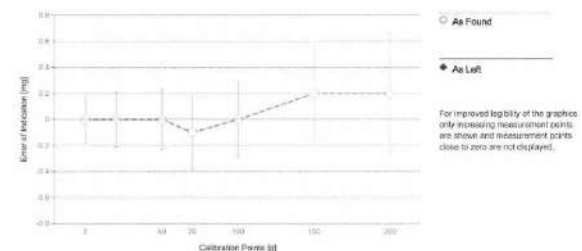
Test Load: 100 g		
Position	As Found	As Left
1	100.0000 g	N/A
2	99.9998 g	N/A
3	99.9998 g	N/A
4	100.0001 g	N/A
5	100.0001 g	N/A
Maximum Deviation	0.0002 g	N/A



The "1d" in the graph represents the readability of the range interval in which the test was performed.

Error of Indication

As Found	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.0000 g	0.0000 g	0.0000 g	6.18 mg	2
2	0.1000 g	0.1000 g	0.0000 g	6.18 mg	2
3	1.0000 g	0.9998 g	-0.0001 g	6.18 mg	2
4	5.0000 g	5.0000 g	0.0000 g	6.18 mg	2
5	10.0000 g	9.9998 g	-0.0001 g	6.20 mg	2
6	20.0000 g	20.0000 g	0.0000 g	6.21 mg	2
7	50.0000 g	50.0000 g	0.0000 g	6.23 mg	2
8	70.0001 g	70.0000 g	-0.0001 g	6.28 mg	2
9	100.0000 g	100.0000 g	0.0000 g	6.29 mg	2
10	150.0000 g	150.0002 g	0.0002 g	6.40 mg	2
11	200.0001 g	200.0003 g	0.0002 g	6.46 mg	2



The uncertainty stated is the expanded uncertainty at calibration obtained by multiplying the standard combined uncertainty by the coverage factor k - which can be larger than 2 according to EURAMET cg-18. The value of the measurand lies within the assigned range of values with a probability of approximately 95%.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated.

Test Equipment

All weights used for metrological testing are traceable to national or international standards. The weights were calibrated and certified by an accredited calibration laboratory.

Weight Set 1: OIML E2

Weight Set No.: W550 Date of Issue: 25-Feb-2022
Certificate Number: C008581631 Calibration Due Date: 14-Aug-2023

Thermo Hygrometer

Equipment No.: IN161 Date of Issue: 14-Jun-2021
Certificate Number: 21H1226 Calibration Due Date: 01-Jun-2022

Remarks

Equipment condition: Good
Next calibration according to customer's procedure
Calibration data not decide by calibration laboratory
Test weight by Filler pan : 1 g = 0.9999 g, 3 g = 3.0000 g, 5 g = 5.0000 g
End of Accredited Section

The information below and any attachments to this calibration certificate are not part of the accredited calibration.

Measurement Uncertainty of the Weighing Instrument in Use

Stated is the expanded uncertainty with $k=2$ in use. The formula shall be used for the estimation of the uncertainty under consideration of the errors of indication. The value R represents the net load indication in the unit of measure of the device.

Temperature coefficient for the evaluation of the measurement uncertainty in use: $3.0 \cdot 10^{-5} / K$

Temperature range on site for the evaluation of the measurement uncertainty in use: $3 K$

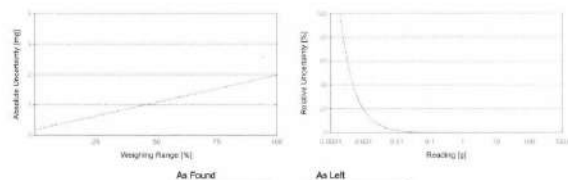
Linearization of Uncertainty Equation

Range			As Found	As Left
	d	Max		
1	0.0001 g	229 g	$U_1 = 0.19 \text{ mg} + 6.00E-17 \text{ mg/g} \cdot R$	N/A

To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

Absolute and Relative Measurement Uncertainty in Use for Various Net Indications (Example)

Net Indication	As Found	As Left
0.0220 g	0.19 mg	0.86%
0.2200 g	0.19 mg	0.087%
2.2000 g	0.21 mg	0.0095%
22.0000 g	0.37 mg	0.0017%
220.0000 g	2.0 mg	0.0009%



Mettler-Toledo (Thailand) Ltd.
848/4 - 848/5 Lassaie Rd., Bangna Tai Sub-District
Bangna District, Bangkok 10260
+66 2723 0362
MT-TH.ServiceSupport@mt.com



Accuracy Calibration Certificate

Customer

Company: United Analyst and Engineering Consultant Co., Ltd.
Address: 3 Sri Uppon Suk 41, Sukhumvit Rd., Bang Chak
City: Phra Khanong Contact: Suvit Chotruk
Zip / Postal: 10260
State / Province: Bangkok
Order Number: 7037427000

Weighing Device

Manufacturer: Mettler Toledo Instrument Type: Weighing Instrument
Model: AB204-SF-FACT Asset Number: LINE.AIR.016/2355
Serial No.: 8108119808 Terminal Model: N/A
Building: N/A Terminal Serial No.: N/A
Floor: 2 Terminal Asset No.: N/A
Room: Balance Room 2 (230)

Range	Max. Capacity	Readability (d)
1	220 g	0.0001 g

Procedure

Calibration Guideline: EURAMET-08-18 v. 4.0 (11/2015)
Mettler TOLEDO Work Instruction: CPW02/2019

This calibration certificate contains measurements for As Found and As Left calibrations.

The sensitivity/span of the weighing instrument was adjusted before As Found and As Left calibrations with a built-in weight. In accordance with EURAMET-08-18 (11/2015), the test loads were selected to reflect the specific use of the weighing device or to accommodate specific calibration conditions.

	Temperature	Humidity
As Found	Start: 22.6 °C End: 22.1 °C	Start: 55.0 % End: 51.9 %
As Left	Start: 22.3 °C End: 22.4 °C	Start: 46.2 % End: 55.8 %

As Found Calibration Date: 07-Apr-2022

As Left Calibration Date: 07-Apr-2022

Issue Date: 08-Apr-2022

Calibrator:

Approved Signatory:

☐ Sand Jirayom
☐ Sureshet Sukkato

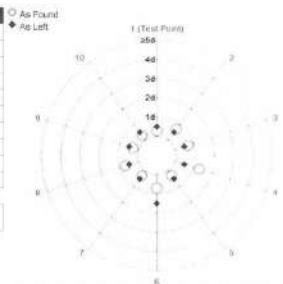
Measurement Results

Repeatability

Test Load: 100 g

	As Found	As Left
1	100.0305 g	99.9900 g
2	100.0304 g	100.0000 g
3	100.0304 g	99.9999 g
4	100.0308 g	100.0000 g
5	100.0305 g	99.9999 g
6	100.0304 g	99.9998 g
7	100.0305 g	100.0000 g
8	100.0304 g	100.0000 g
9	100.0305 g	100.0000 g
10	100.0305 g	100.0000 g

Standard Deviation	0.00007 g	0.00007 g
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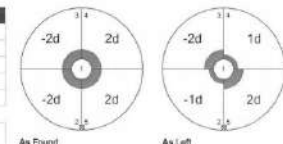
The "r" in the graph represents the repeatability of the range/interval in which the test was performed.
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

Test Load: 100 g

Position	As Found	As Left
1	100.0008 g	100.0000 g
2	100.0003 g	99.9999 g
3	100.0003 g	99.9998 g
4	100.0007 g	100.0001 g
5	100.0007 g	100.0002 g

Maximum Deviation	0.0002 g	0.0002 g
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The "r" in the graph represents the repeatability of the range/interval in which the test was performed.

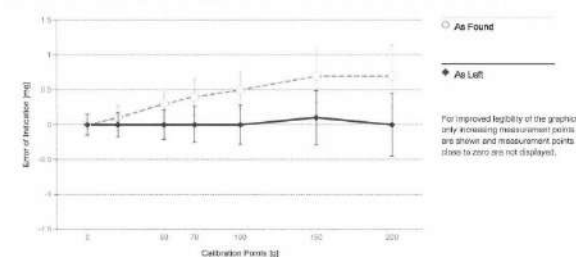
Error of Indication

As Found

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.0000 g	0.0000 g	0.0000 g	6.15 mg	2
2	0.1000 g	0.1001 g	0.0001 g	6.16 mg	2
3	1.0000 g	0.9996 g	-0.0001 g	6.16 mg	2
4	5.0000 g	5.0000 g	0.0000 g	6.16 mg	2
5	10.0000 g	10.0001 g	0.0001 g	6.17 mg	2
6	20.0000 g	20.0001 g	0.0001 g	6.16 mg	2
7	50.0000 g	50.0003 g	0.0003 g	6.20 mg	2
8	70.0001 g	70.0005 g	0.0004 g	6.26 mg	2
9	100.0000 g	100.0005 g	0.0005 g	6.27 mg	2
10	150.0000 g	150.0007 g	0.0007 g	6.38 mg	2
11	200.0001 g	200.0008 g	0.0007 g	6.44 mg	2

As Left

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.0000 g	0.0000 g	0.0000 g	6.15 mg	2
2	0.1000 g	0.1000 g	0.0000 g	6.16 mg	2
3	1.0000 g	0.9999 g	-0.0001 g	6.17 mg	2
4	5.0000 g	5.0000 g	0.0000 g	6.17 mg	2
5	10.0000 g	10.0000 g	0.0000 g	6.17 mg	2
6	20.0000 g	20.0000 g	0.0000 g	6.16 mg	2
7	50.0000 g	50.0000 g	0.0000 g	6.21 mg	2
8	70.0001 g	70.0001 g	0.0000 g	6.26 mg	2
9	100.0000 g	100.0000 g	0.0000 g	6.28 mg	2
10	150.0000 g	150.0001 g	0.0001 g	6.30 mg	2
11	200.0001 g	200.0001 g	0.0000 g	6.43 mg	2



The uncertainty stated is the expanded uncertainty at calibration obtained by multiplying the standard combined uncertainty by the coverage factor $k=2$ which can be larger than 2 according to EURAMET-08-18. The value of the measurand lies within the assigned range of values with a probability of approximately 95%.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated.

Test Equipment

All weights used for metrological testing are traceable to national or international standards. The weights were calibrated and certified by an accredited calibration laboratory.

Weight Set 1: OIML E2

Weight Set No.:	WS80	Date of Issue:	23-Feb-2022
Certificate Number:	C06581831	Calibration Due Date:	14-Aug-2023
Thermo Hygrometer			
Equipment No.:	RN161	Date of Issue:	14-Jun-2021
Certificate Number:	21H1226	Calibration Due Date:	01-Jun-2022

Remarks

FACT adjustment functionality activated
Value of the built-in weight adjusted
Equipment condition: Good
Next calibration according to customer's procedure
Calibration data not decide by calibration laboratory
Test weight by Fiber pen: 1 g = 1.0000 g, 3 g = 3.0000 g, 5 g = 5.0000 g

End of Accredited Section

The information below and any attachments to this calibration certificate are not part of the accredited calibration.

Measurement Uncertainty of the Weighing Instrument in Use

Stated is the expanded uncertainty with $k=2$ in use. The formula shall be used for the estimation of the uncertainty under consideration of the errors of indication. The value K represents the net load indication in the unit of measure of the device.

Temperature coefficient for the evaluation of the measurement uncertainty in use:	$2.5 \cdot 10^{-4} / K$
Temperature range on site for the evaluation of the measurement uncertainty in use:	3 K

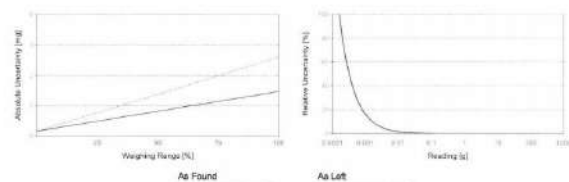
Linearization of Uncertainty Equation

Range	g	Max	As Found	As Left
1	0.0201 g	229 g	$U_1 = 0.16 \text{ mg} + 0.0111 \text{ mg/g} \cdot R$	$U_1 = 0.16 \text{ mg} + 0.00682 \text{ mg/g} \cdot R$

To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

Absolute and Relative Measurement Uncertainty in Use for Various Net Indications (Examples)

Net Indication	As Found	As Left
0.0220 g	0.16 mg	0.16 mg
0.2200 g	0.16 mg	0.16 mg
2.2000 g	0.16 mg	0.17 mg
22.0000 g	0.46 mg	0.29 mg
226.0000 g	2.6 mg	1.5 mg



Mettler-Toledo (Thailand) Ltd.,
840/4 - 840/5 Lasalle Rd., Bangna Tai Sub-District,
Bangna District, Bangkok 10260
+66 2723 6382
MT-TH.ServiceSupport@mt.com



Accuracy Calibration Certificate

Customer

Company:	United Analyst and Engineering Consultant Co., Ltd.
Address:	3 Sar Udon Suk 41, Sukhumvit Rd., Bang Chak
City:	Phra Nangong
Zip / Postal:	10260
State / Province:	Bangkok
Order Number:	



Weighing Device

Manufacturer:	Mettler Toledo	Instrument Type:	Weighing Instrument
Model:	XPE	Asset Number:	UAE-AIR-0100556
Serial No.:	0322273893	Terminal Model:	PAT
Building:	N/A	Terminal Serial No.:	0322273893
Floor:	2	Terminal Asset No.:	N/A
Room:	Balance Room 2 (296)		

Range	Max. Capacity	Readability (g)
1	6.1 g	0.000001 g

Procedure

Calibration Guidelines: EURAMET cg-18 v. 4.0 (11/2015)
METTLER TOLEDO Work Instruction: CPW03029
This calibration certificate contains measurements for As Found and As Left calibrations.
The sensitivity span of the weighing instrument was adjusted before As Found and As Left calibrations with a built-in weight.
In accordance with EURAMET cg-18 (11/2015), the test loads were selected to reflect the specific use of the weighing device or to accommodate specific calibration conditions.

	Temperature	Humidity
As Found	Start: 22.7 °C End: 22.8 °C	Start: 54.2 % End: 53.0 %
As Left	Start: 22.8 °C End: 22.9 °C	Start: 52.0 % End: 50.5 %

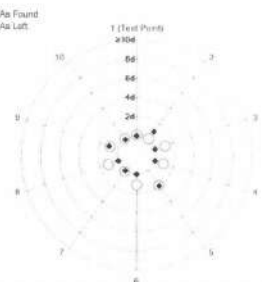
As Found Calibration Date:	07-Apr-2022	Calibrator:	
As Left Calibration Date:	07-Apr-2022		
Issue Date:	08-Apr-2022		

Approved Signature:

Measurement Results

Repeatability

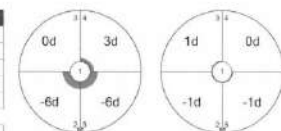
Test Load: 2 g	As Found	As Left
1	2.000007 g	2.000008 g
2	2.000007 g	2.000008 g
3	2.000008 g	2.000008 g
4	2.000008 g	2.000008 g
5	2.000005 g	2.000006 g
6	2.000008 g	2.000008 g
7	2.000007 g	2.000008 g
8	2.000008 g	2.000008 g
9	2.000005 g	2.000006 g
10	2.000007 g	2.000008 g
Standard Deviation	0.0000019 g	0.0000008 g



The "r" in the graph represents the repeatability of the measurement in which the test was performed.
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

Test Load: 2 g	As Found	As Left
Position		
1	2.000008 g	2.000008 g
2	2.000002 g	2.000007 g
3	2.000008 g	2.000009 g
4	2.000011 g	2.000008 g
5	2.000002 g	2.000007 g
Maximum Deviation	0.000006 g	0.000001 g



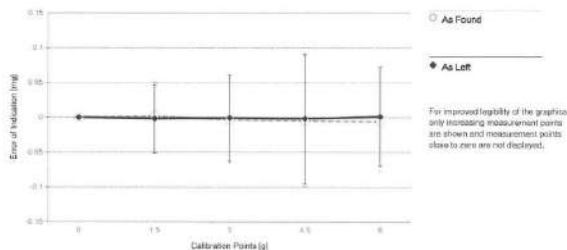
The "e" in the graph represents the repeatability of the measurement in which the test was performed.

Error of Indication

As Found	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.000000 g	0.000000 g	0.000000 g	0.0024 mg	2
2	0.010004 g	0.010005 g	0.000001 g	0.0074 mg	2
3	0.050009 g	0.050003 g	-0.000006 g	0.011 mg	2
4	0.100007 g	0.100007 g	0.000000 g	0.015 mg	2
5	0.150012 g	0.150011 g	-0.000001 g	0.025 mg	2
6	0.170013 g	0.170011 g	-0.000002 g	0.034 mg	2
7	0.200011 g	0.200009 g	-0.000002 g	0.048 mg	2
8	1.500023 g	1.500025 g	0.000002 g	0.049 mg	2
9	3.000021 g	3.000017 g	-0.000004 g	0.062 mg	2
10	4.500031 g	4.500028 g	-0.000003 g	0.084 mg	2
11	6.000026 g	6.000020 g	-0.000006 g	0.072 mg	2

As Left	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.000000 g	0.000000 g	0.000000 g	0.0024 mg	2
2	0.010004 g	0.010005 g	0.000001 g	0.0074 mg	2
3	0.050009 g	0.050005 g	0.000004 g	0.011 mg	2
4	0.100007 g	0.100007 g	0.000000 g	0.015 mg	2
5	0.150012 g	0.150011 g	-0.000001 g	0.025 mg	2
6	0.170013 g	0.170013 g	0.000000 g	0.034 mg	2
7	0.200011 g	0.200010 g	-0.000001 g	0.048 mg	2
8	1.500023 g	1.500021 g	-0.000002 g	0.049 mg	2
9	3.000021 g	3.000020 g	-0.000001 g	0.062 mg	2
10	4.500031 g	4.500029 g	-0.000002 g	0.085 mg	2
11	6.000026 g	6.000027 g	0.000001 g	0.071 mg	2

The calculated uncertainty was replaced by the CMC (Calibration and Measurement Capabilities) value because the calculated uncertainty was smaller than the CMC value.



The uncertainty stated is the expanded uncertainty at calibration obtained by multiplying the standard combined uncertainty by the coverage factor k – which can be larger than 2 according to EURAMET xp-15. The value of the measurand lies within the assigned range of values with a probability of approximately 95%.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated.

Test Equipment

All weights used for metrological testing are traceable to national or international standards. The weights were calibrated and certified by an accredited calibration laboratory.

Weight Set 1: OIML E2

Weight Set No.:	WS80	Date of Issue:	23-Feb-2022
Certificate Number:	C268581831	Calibration Due Date:	14-Aug-2023
Thermo-hygrometer			
Equipment No.:	IK161	Date of Issue:	14-Jun-2021
Certificate Number:	21H1220	Calibration Due Date:	01-Jun-2022

Remarks

FACT adjustment functionality activated

Value of the built-in weight adjusted

Equipment condition: Good

Next calibration according to customer's procedure

Calibration data not decide by calibration laboratory

Test weight by filter : 0.050005 g, 0.050004 g, 0.150012 g, 0.150011 g

End of Accredited Section

The information below and any attachments to this calibration certificate are not part of the accredited calibration.

Measurement Uncertainty of the Weighing Instrument in Use

Stated is the expanded uncertainty with $k=2$ in use. The formula shall be used for the estimation of the uncertainty under consideration of the errors of indication. The value R represents the net load indication in the unit of measure of the device.

Temperature coefficient for the evaluation of the measurement uncertainty in use: $1.6 \cdot 10^{-4} / ^\circ\text{K}$
Temperature range on site for the evaluation of the measurement uncertainty in use: 3 K

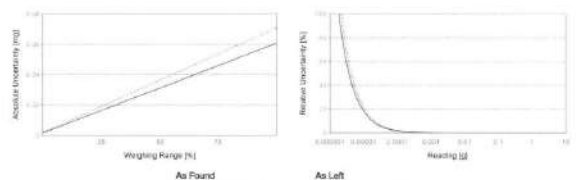
Uncertainty of Uncertainty Equation

Range	g	Max	As Found	As Left
1	0.000001 g	0.1 g	$U_1 = 0.0021 \text{ mg} + 0.0113 \text{ mg/g} \cdot R$	$U_1 = 0.0018 \text{ mg} + 0.0096 \text{ mg/g} \cdot R$

To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

Absolute and Relative Measurement Uncertainty in Use for Various Net Indications (Examples)

Net Indication	As Found	As Left
0.000010 g	0.0021 mg	0.0018 mg
0.000100 g	0.0022 mg	0.0019 mg
0.001000 g	0.0028 mg	0.0024 mg
0.010000 g	0.0066 mg	0.0055 mg
0.100000 g	0.0171 mg	0.0142 mg
1.000000 g	0.0435 mg	0.0355 mg



RECALIBRATION
DUE DATE:
July 5, 2023

Certificate of Calibration

Calibration Certification Information			
Cal. Date:	July 5, 2022	Rootmeter S/N:	438320
Operator:	Jim Tisch	Ta:	297 °K
Calibration Model #:	G25A	Pa:	750.1 mm Hg
		Calibrator S/N:	158M

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.3240	3.2	2.00
2	3	4	1	0.9480	6.4	4.00
3	5	6	1	0.8480	7.9	5.00
4	7	8	1	0.8060	8.7	5.50
5	9	10	1	0.6670	12.7	8.00

Data Tabulation					
Vstd (m3)	Qstd (x-axis)	$\sqrt{\Delta H \left(\frac{Pa}{Pstd} \right) \left(\frac{Vstd}{Ta} \right)}$ (y-axis)	Va (x-axis)	Qa (y-axis)	$\sqrt{\Delta H \left(\frac{Pa}{Pa} \right) \left(\frac{Vstd}{Ta} \right)}$ (y-axis)
0.9860	0.7447	1.4073	0.9957	0.7521	0.8899
0.9818	1.0357	1.9902	0.9915	1.0459	1.2585
0.9798	1.1554	2.2251	0.9895	1.1668	1.4071
0.9788	1.2143	2.3337	0.9884	1.2263	1.4757
0.9735	1.4395	2.8146	0.9831	1.4739	1.7795
	m=	1.96745		m=	1.23199
	b=	-0.05315		b=	-0.03361
	r=	0.99995		r=	0.99995

Calculations	
Vstd=ΔVol((Pa-ΔP)/Pstd)(Tstd/Ta)	Va=ΔVol((Pa-ΔP)/Pa)
Qstd=Vstd/ΔTime	Qa=Va/ΔTime
For subsequent flow rate calculations:	
Qstd= 1/m $\left(\sqrt{\Delta H \left(\frac{Pa}{Pstd} \right) \left(\frac{Vstd}{Ta} \right)} - b \right)$	Qa= 1/m $\left(\sqrt{\Delta H \left(\frac{Pa}{Pa} \right) \left(\frac{Vstd}{Ta} \right)} - b \right)$

Standard Conditions	
Tstd:	298.15 °K
Pstd:	760 mm Hg
Key	
ΔH:	calibrator manometer reading (in H2O)
ΔP:	rootmeter manometer reading (mm Hg)
Ta:	actual absolute temperature (°K)
Pa:	actual barometric pressure (mm Hg)
b:	intercept
m:	slope

RECALIBRATION
US EPA recommends annual recalibration per 1998 40 Code of Federal Regulations Part 50 to 51, Appendix B to Part 50, Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere, 9.2.17, page 30



Certificate of Calibration

Certificate No.: 22P800
Page: 1 of 2

Equipment: U-Tube Manometer

Manufacturer: Dwyer

Model: 1221-36-14/M

Serial No.: -

ID No.: UAE EFM.022/2580

Condition As-Received: Used Item

Received Date: 03 March 2022

Calibration Date: 12 March 2022

Reference: 2203-0131WGC

Ambient Temperature: (23 ± 2) °C

Relative Humidity: (50 ± 10) %

Atmospheric Pressure: 1010 mbar

Submitted by: United Analyst and Engineering Consultant Co., Ltd.

B1 Soi Udomsuk 41, Sukhumvit Road, Bangkok,

Prachinong, Bangkok 10260

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to in-house calibration procedure CP-P04, using "DKD-R 6-1" Calibration of Pressure Gauges, Edition 03/2014 " as a guideline.

Condition of this result of calibration

1. Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Pressure Calibrator	PC106P	1189	MP-0110-21	09 Aug 2022

2. This result of calibration was made on requested at the point specified by customer.

3. Scale and conversion factor is 1 kPa = 4.0146293 inH₂O

4. This instrument was used clean air as pressure media.

5. This instrument was calibrated by applied pressure to high-port (+) side and low-port (-) side open to atmospheric pressure.

6. This instrument was installed in vertical orientation and top of the pressure port was used as the reference level.

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

8. This Certification is traceable to the International System of Unit maintained at:-

-National Institute of Metrology Thailand (NIMT)

Calibrated by: Suwit Aussamee

Issue Date: 14 March 2022

Approved Signatory: *Attapol P.*

[] Phalinee Prabpaipal

[] Sura Suwannasri

[x] Attapol Panurach

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Cert.No.: 22P800
Page: 2 of 2

Result of calibration: Without adjustment

Function: Pressure Measurement

Increasing Pressure

Range: 0 inH₂O to 36 inH₂O

Scale Interval: 0.1 inH₂O (The Fifth Estimate)

UUC Indication				
Applied Pressure (inH ₂ O)	High-port side (inH ₂ O)	Low-port side (inH ₂ O)	AP (inH ₂ O)	Error (inH ₂ O)
0.00	0.00	0.00	0.00	0.00
2.00	1.00	-1.00	2.00	0.00
4.00	2.00	-2.00	4.00	0.00
6.00	3.00	-3.00	6.00	0.00
8.00	4.00	-4.00	8.00	0.00
10.00	5.00	-5.00	10.00	0.02
12.00	6.00	-6.00	12.00	0.02
14.00	7.00	-7.00	14.00	0.04
16.00	8.00	-8.00	16.00	0.04
18.00	9.00	-9.00	18.00	0.04
20.00	10.00	-10.00	20.00	0.04
22.00	11.00	-11.00	22.00	0.02
24.00	12.00	-12.00	24.00	0.02
26.00	13.00	-13.00	26.00	0.02
28.00	14.00	-14.00	28.00	0.04
30.00	15.00	-15.00	30.00	0.04
32.00	16.00	-16.00	32.00	0.04
34.00	16.98	-17.06	34.00	0.04
35.80	17.98	-18.00	35.98	0.18

The uncertainty of measurement was ± 0.11 inH₂O

* UUC = Unit Under Calibration

* AP = High-port side - Low-port side

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

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Page 1/2

Certificate of Calibration

Customer: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Name: -

Address: 81 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Prachinong,
Bangkok 10260

Certificate No: 22-AFM-140

Request No: Req-2022-1407

Unit Under Calibration Details

Measurement Item: Air Flow meter

Space Model: -

Manufacturer: BGI

Sensor Serial Number: -

Model: Delta Cal DCI

Serial Number: 119222

ID: UAE EFM.039/2581

Location of Calibration: LAB 4 AIR VELOCITY METER

Calibration Environment and Details

Temperature: 23 °C ± 1 °C

Humidity: 55 %RH ± 20 %RH

Barometric Pressure: 1013 hPa ± 10 hPa

Received Date: 22 August 2022

Calibration Date: 7 September 2022

Calibration Procedure: In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Air Flow Meter	Gilibrator 3 High Flow	1850101202	Sensidyne	15 June 2023

Traceability:

This certificate provides traceability of measurement to recognized national standard, and to the realization of the International System of Units (SI)

Note:

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor k=2, providing a level of confidence approximately 95 %.

Calibration By:



Signature of calibration technician

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-708-AFM-01 Rev.00 Issue date 01/07/19

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Page 2/2

Certificate No: 22-AFM-140

Request No: Req-2022-1407

Result of Calibration:

Flow Setting	STD Flow Reading	UUC Flow Reading	Correction Flow	Uncertainty
(LPM)	(LPM)	(LPM)	(LPM)	(LPM)
14.3	14.30	14.37	-0.07	0.21
15.6	15.60	15.69	-0.09	0.22
15.8	15.80	15.88	-0.08	0.23
16.6	16.60	16.67	-0.07	0.24
18.3	18.30	18.40	-0.10	0.26

Note:

STD: Standard

UUC: Unit Under Calibration

Calibration media: Air

* Indicates non accredited

End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-708-AFM-01 Rev.00 Issue date 01/07/19

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Certificate of Calibration

Certificate No : 22-TPM-579

Customer : UNITED ANALYST AND ENGINEERING CONSULTANT
Name : CO., LTD.
Request No : Req-2022-1607
Page : 1/2
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Prakanong,
Bangkok 10260

Unit Under Calibration Details

Calibration Parameter : Temperature
Instrument Name : Air Flow meter
Manufacturer : BGI
Model : Delta Cal DC1
Serial Number : 159822
Resolution : 0.1 °C
ID Number : UAE.EFM.039/2561
Range Calibration : 20 °C to 45 °C
Type of Sensor : RTD
Sensor Diameter (mm) : 3
Calibration Position (mm) : 45
Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 15 %RH
Received Date : 22 August 2022
Calibrated Date : 7 September 2022

Calibration Procedure : In-house method CP-TPM-01 by Comparison with Standard Thermometer.

Reference Standard : Digital Thermometer with Sensor, Manufacturer: GINGO/INGO, Model: GT11/RTD100, SN: 08000057, ID: 02-TPM Which was calibrated on 10 March 2022, Calibration Certificate No.: QR22-0578

Traceability : This Certificate is traceable to SI Unit through Quality Reborn Co., Ltd., NSC-ONSC Accreditation No.: Calibration 0282

Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k=2$, providing a level of confidence approximately 95 %.

Approved By :

Issue Date :

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

PM-708-TPM-01 Rev.01 Issue date 13/02/20

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Calibration Note

UUC Adjustment : Not Adjust

Certificate No : 22-TPM-179

Request No : Req-2022-1607

Page : 2/2

Result of Calibration :

UUC Sensor	Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (°C)
Ta	20.004	20.0	0.0	0.14
	25.003	24.9	+0.1	0.14
	30.001	30.0	0.0	0.14
	35.002	34.9	+0.1	0.14
	40.002	39.8	+0.2	0.14
Tf	45.005	45.0	0.0	0.14
	20.004	20.1	+0.1	0.14
	25.003	24.9	+0.1	0.14
	30.001	29.9	+0.1	0.14
	35.002	34.9	+0.1	0.14
	40.002	39.9	+0.1	0.14
	45.005	45.2	+0.2	0.14

End of Certificate

Calibrated By :

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

PM-708-TPM-01 Rev.01 Issue date 13/02/20

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 TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLIANG, SUANLIANG, BANGKOK 10250
TEL: 0-2715-3000-24 FAX: 0-2719-9444

 INNOVATIVE
under International Metrological style
 NIST-708-TPM-01
CALIBRATION 02/28

Certificate of Calibration

Certificate No. : 22P2728
Page : 1 of 2

Equipment : Aneroid Barometer
Manufacturer : Barigo
Model : -
Serial No. : -
ID No. : UAE-ANV.182/2550
Condition As-Received : Used item
Received Date : 20 July 2022
Calibration Date : 22 July 2022
Reference : 2297-0584WSC
Submitted by : United Analyst and Engineering Consultant Co., Ltd.
Ambient Temperature : (23 ± 2) °C
Relative Humidity : (50 ± 15) %
Atmospheric Pressure : 1010 mbar
Procedure used : The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to in-house calibration procedure CP-AP10, using " DKD-R 6-1 ; Calibration of Pressure Gauges, Edition 03/2014 " as a guidelines.


Condition of this result of calibration



1. Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard Barometer	DPI142	1422509046	MP-0076-22	02 May 2023
2. This instrument was installed in vertical orientation and center of the dial was used as the reference level.
3. This result of calibration was made on requested at the point specified by customer.
4. This result of calibration instrument was in absolute pressure.
5. This instrument was used clean air as pressure media.
6. The certificate is valid only to the item calibrated on date and place of calibration.
7. This Certification is traceable to the International System of Unit maintained at:-
National Institute of Metrology Thailand (NIMT)

Calibrated by : Suwit Aussanee
Issue Date : 25 July 2022
Approved Signatory : 

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 TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLIANG, SUANLIANG, BANGKOK 10250
TEL: 0-2715-3000-24 FAX: 0-2719-9444

 INNOVATIVE
under International Metrological style
 NIST-708-TPM-01
CALIBRATION 02/28

Certificate of Calibration

Cert.No.: 22P2728
Page: 2 of 2

Result of calibration:- Without adjustment
Function:- Absolute Pressure Measurement
Range: 960 hPa to 1030 hPa
Scale Interval: 1 hPa (The Fifth Estimate)

Increasing Pressure

Applied Pressure (hPa)	969.27	967.46	978.89	989.96	999.86	1009.89	1020.96	1031.06
UUC* Indication (hPa)	960.0	970.0	980.0	990.0	1000.0	1010.0	1020.0	1030.0
Error (hPa)	3.73	2.54	1.11	0.44	0.15	0.11	-0.59	-1.06

Decreasing Pressure

Applied Pressure (hPa)	1031.19	1020.73	1009.91	999.92	989.72	979.13	967.71	956.64
UUC* Indication (hPa) <th>1030.0</th> <th>1020.0</th> <th>1010.0</th> <th>1000.0</th> <th>990.0</th> <th>980.0</th> <th>970.0</th> <th>960.0</th>	1030.0	1020.0	1010.0	1000.0	990.0	980.0	970.0	960.0
Error (hPa) <td>-1.19</td> <td>-0.73</td> <td>0.56</td> <td>0.08</td> <td>0.28</td> <td>0.87</td> <td>2.29</td> <td>3.36</td>	-1.19	-0.73	0.56	0.08	0.28	0.87	2.29	3.36

The uncertainty of measurement was ± 0.30 hPa
* UUC = Unit Under Calibration
The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95 %.

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1110529



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
334/4 PITTANAKARN ROAD SOI 16, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL. 0-2713-3000-31 FAX: 0-2719-9484



Certificate of Calibration

Certificate No.: 22H1588
Page: 1 of 2

Equipment: Dial Thermo-Hygrometer
Manufacturer: Barigo
Model: -
Serial No.: -
ID No.: UAE.ANV.0042548

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

Condition As-Received: Used Item

Received Date: 20 July 2022

Calibration Date: 22 July 2022

to 27 July 2022

Reference: 2207-0506WSG

Ambient Temperature: (25 ± 3) °C

Relative Humidity: (50 ± 29) %

Submitted by: United Analyst and Engineering Consultant Co., Ltd.

81 Soi Udomsak 41, Sukhumvit Road, Bangkok,
Phraekhong, Bangkok 10260

Procedure used: Calibration were conducted using in-house calibration procedure CP-H02 according to comparison
with standard chilled mirror sensor for humidity measurement function and comparison with standard
temperature probe for temperature measurement function into humidity / temperature chamber.

Condition of this result of calibration

1. Reference standards Instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard Chilled Mirror Hygrometer Sensor	Dew Prime II	31853	18714	17 Sep 2022
2) Standard Humidity/Temperature Meter	400	10240757	TH-0125-21	13 Dec 2022

2. The 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 maintained at:-

-National Institute of Standards and Technology (NIST), The United States of America

-National Institute of Metrology Thailand (NIMT)

Calibrated by: Sonchai Dumwong
Issue Date: 03 August 2022

Approved Signatory:

(✓) Chakrit

() Pongthorn Tantiyawuti

() Viporn Tantiyawuti

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B 0293722



Cert. No.: 22H1588
Page: 2 of 2

Result of Calibration:

Function:

Before Adjustment

Humidity measurement

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Error (%R.H.)	Uncertainty of Measurement (±%R.H.)
25.0	40.1	38	-2.1	1.6
25.0	60.0	57	-3.0	1.8
25.0	80.0	74	-6.0	2.0

Result of Calibration:

Function:

After Adjustment

Humidity measurement

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Error (%R.H.)	Uncertainty of Measurement (±%R.H.)
25.0	40.1	40	-0.1	1.6
25.0	60.0	60	0.0	1.8
25.0	80.0	77	-3.0	2.0

Result of Calibration:

Function:

Without Adjustment

Temperature measurement

Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (±°C)
20.00	20.5	0.50	0.72
25.04	25.0	-0.04	0.72
30.01	30.0	-0.01	0.72
35.04	34.5	-0.54	0.72
39.98	39.0	-0.98	0.72

UUC* : Unit Under Calibration

The reported uncertainty of measurement was based on standard uncertainty multiplied
by coverage factor k = 2.00, providing confidence level approximately 95%.

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right solutions.
right partner.

รายงานเครื่องมือใช้ในการวิเคราะห์ / ผลสอบ

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal.	Pres. Calibrate (Months)
Ambient	Cadmium	High Volume	BKC, F50371	-	-	On site Calibration
Ambient	Cadmium	High Volume	BKC, F50363	-	-	On site Calibration
Ambient	Cadmium	High Volume	BKC, F50364	-	-	On site Calibration
Ambient	Cadmium	High Volume	BKC, F51257	-	-	On site Calibration
Ambient	Cadmium	High Volume	BKC, F50358	-	-	On site Calibration
Ambient	Cadmium	High Volume	BKC, F50366	-	-	On site Calibration
Ambient	Cadmium	High Volume	BKC, F50369	-	-	On site Calibration
Ambient	Cadmium	High Volume	BKC, F50372	-	-	On site Calibration
Ambient	Cadmium	High Volume	BKC, F50368	-	-	On site Calibration
Ambient	Cadmium	High Volume	BKC, F50372	-	-	On site Calibration
Ambient	Cadmium	High Volume	BKC, F50372	-	-	On site Calibration
Ambient	Cadmium	High Volume	BKC, F50363	-	-	On site Calibration
Ambient	Cadmium	High Volume	BKC, F50369	-	-	On site Calibration
Ambient	Cadmium	CP-DSS	BKC, 613037	18-Sep-21	12-Mar-23	18
Ambient	Lead	High Volume	BKC, F50373	-	-	On site Calibration
Ambient	Lead	High Volume	BKC, F50363	-	-	On site Calibration
Ambient	Lead	High Volume	BKC, F50364	-	-	On site Calibration
Ambient	Lead	High Volume	BKC, F51257	-	-	On site Calibration
Ambient	Lead	High Volume	BKC, F50368	-	-	On site Calibration
Ambient	Lead	High Volume	BKC, F50369	-	-	On site Calibration
Ambient	Lead	High Volume	BKC, F50372	-	-	On site Calibration
Ambient	Lead	CP-DSS	BKC, 613037	18-Sep-21	12-Mar-23	18
Ambient	Mercury	High Volume	BKC, F50373	-	-	On site Calibration
Ambient	Mercury	High Volume	BKC, F50363	-	-	On site Calibration
Ambient	Mercury	High Volume	BKC, F50364	-	-	On site Calibration
Ambient	Mercury	High Volume	BKC, F51257	-	-	On site Calibration
Ambient	Mercury	High Volume	BKC, F50368	-	-	On site Calibration
Ambient	Mercury	High Volume	BKC, F50369	-	-	On site Calibration
Ambient	Mercury	High Volume	BKC, F50372	-	-	On site Calibration
Ambient	Mercury	CUPPS	BKC, 613011	7-Jan-22	6-Jun-23	12
Ambient	Hydrogen Chloride	Field Rotameter	BKC, F51227	1-Jul-22	1-Oct-22	3
Ambient	Hydrogen Chloride	Ion Chromatography	BKC, F50374	12-Jan-22	12-Jan-23	12
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	BKC, F50374	26-Jan-22	27-Jul-23	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	PMG, F50420	26-Jan-22	27-Jul-23	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	BKC, F50375	4-Mar-22	2-Sep-23	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	BKC, F50375	26-Jan-22	27-Jul-23	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	PMG, F50424	6-Jan-22	7-Jul-23	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	BKC, F50378	30-Aug-21	28-Feb-23	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	BKC, F50348	8-Jan-22	9-Oct-23	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	BKC, F50320	8-Oct-21	8-Apr-23	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	PMG, F50426	6-Jan-22	7-Jul-23	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	BKC, F50374	26-Jan-22	27-Jul-23	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	BKC, F50320	8-Oct-21	8-Apr-23	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	PMG, F50425	26-Jan-22	27-Jul-23	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	BKC, F50373	26-Jan-22	27-Jul-23	18

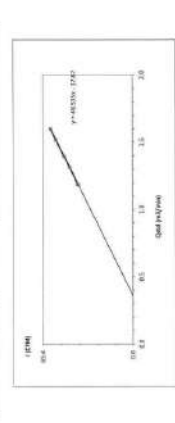
1

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High Volume Air Sampler Calibration Worksheet



Project Site:	701 Jomtien Beach Public Co., Ltd.	Remanute Pressure (mm Hg):	750
Calibrate Location:	Na Thale (Jomtien Beach) LL	Temperature (°C):	30
Calibrate Date:	15-Sep-22	High Volume ID:	BKC, F50373
Calibration No.:	C-150922-BKC-F50373	High Volume Model:	751-50000
Calibration ID:	BKC, F50373	High Volume SN:	751-50000
Calibration Model:	751-50000	Calibration Steps:	3, 10, 30, 60
Calibration SN:	2214	Calibration Interval:	12/2022
Type No.	1	Flow (m³/min)	1.000
2	1.0	1.000	40.000
3	1.0	1.000	40.000
4	1.0	1.000	40.000
5	1.0	1.000	40.000
6	1.0	1.000	40.000

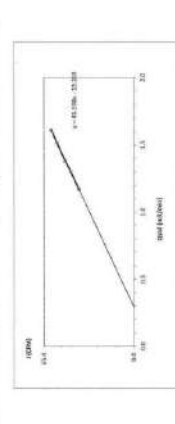


701 Jomtien Beach Public Co., Ltd. - Jomtien Beach - Pattaya - Chonburi - Thailand

High Volume Air Sampler Calibration Worksheet



Project Site:	701 Jomtien Beach Public Co., Ltd.	Remanute Pressure (mm Hg):	750
Calibrate Location:	Na Thale (Jomtien Beach) LL	Temperature (°C):	30
Calibrate Date:	15-Sep-22	High Volume ID:	BKC, F50373
Calibration No.:	C-150922-BKC-F50373	High Volume Model:	751-50000
Calibration ID:	BKC, F50373	High Volume SN:	751-50000
Calibration Model:	751-50000	Calibration Steps:	3, 10, 30, 60
Calibration SN:	2214	Calibration Interval:	12/2022
Type No.	1	Flow (m³/min)	1.000
2	1.0	1.000	40.000
3	1.0	1.000	40.000
4	1.0	1.000	40.000
5	1.0	1.000	40.000
6	1.0	1.000	40.000

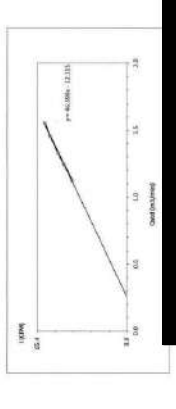


701 Jomtien Beach Public Co., Ltd. - Jomtien Beach - Pattaya - Chonburi - Thailand

High Volume Air Sampler Calibration Worksheet



Project Site:	701 Jomtien Beach Public Co., Ltd.	Remanute Pressure (mm Hg):	750
Calibrate Location:	Na Thale (Jomtien Beach) LL	Temperature (°C):	30
Calibrate Date:	15-Sep-22	High Volume ID:	BKC, F50373
Calibration No.:	C-150922-BKC-F50373	High Volume Model:	751-50000
Calibration ID:	BKC, F50373	High Volume SN:	751-50000
Calibration Model:	751-50000	Calibration Steps:	3, 10, 30, 60
Calibration SN:	2214	Calibration Interval:	12/2022
Type No.	1	Flow (m³/min)	1.000
2	1.0	1.000	40.000
3	1.0	1.000	40.000
4	1.0	1.000	40.000
5	1.0	1.000	40.000
6	1.0	1.000	40.000

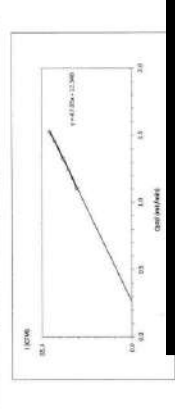


701 Jomtien Beach Public Co., Ltd. - Jomtien Beach - Pattaya - Chonburi - Thailand

High Volume Air Sampler Calibration Worksheet



Project Site:	701 Jomtien Beach Public Co., Ltd.	Remanute Pressure (mm Hg):	750
Calibrate Location:	Na Thale (Jomtien Beach) LL	Temperature (°C):	30
Calibrate Date:	15-Sep-22	High Volume ID:	BKC, F50373
Calibration No.:	C-150922-BKC-F50373	High Volume Model:	751-50000
Calibration ID:	BKC, F50373	High Volume SN:	751-50000
Calibration Model:	751-50000	Calibration Steps:	3, 10, 30, 60
Calibration SN:	2214	Calibration Interval:	12/2022
Type No.	1	Flow (m³/min)	1.000
2	1.0	1.000	40.000
3	1.0	1.000	40.000
4	1.0	1.000	40.000
5	1.0	1.000	40.000
6	1.0	1.000	40.000

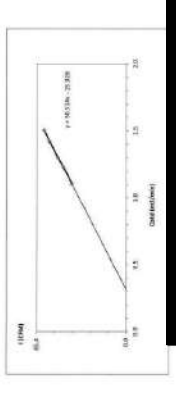


701 Jomtien Beach Public Co., Ltd. - Jomtien Beach - Pattaya - Chonburi - Thailand

High Volume Air Sampler Calibration Worksheet



Project Site:	701 Jomtien Beach Public Co., Ltd.	Remanute Pressure (mm Hg):	750
Calibrate Location:	Na Thale (Jomtien Beach) LL	Temperature (°C):	30
Calibrate Date:	15-Sep-22	High Volume ID:	BKC, F50373
Calibration No.:	C-150922-BKC-F50373	High Volume Model:	751-50000
Calibration ID:	BKC, F50373	High Volume SN:	751-50000
Calibration Model:	751-50000	Calibration Steps:	3, 10, 30, 60
Calibration SN:	2214	Calibration Interval:	12/2022
Type No.	1	Flow (m³/min)	1.000
2	1.0	1.000	40.000
3	1.0	1.000	40.000
4	1.0	1.000	40.000
5	1.0	1.000	40.000
6	1.0	1.000	40.000

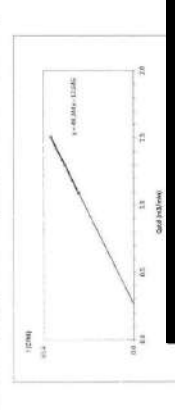


701 Jomtien Beach Public Co., Ltd. - Jomtien Beach - Pattaya - Chonburi - Thailand

High Volume Air Sampler Calibration Worksheet



Project Site:	701 Jomtien Beach Public Co., Ltd.	Remanute Pressure (mm Hg):	750
Calibrate Location:	Na Thale (Jomtien Beach) LL	Temperature (°C):	30
Calibrate Date:	15-Sep-22	High Volume ID:	BKC, F50373
Calibration No.:	C-150922-BKC-F50373	High Volume Model:	751-50000
Calibration ID:	BKC, F50373	High Volume SN:	751-50000
Calibration Model:	751-50000	Calibration Steps:	3, 10, 30, 60
Calibration SN:	2214	Calibration Interval:	12/2022
Type No.	1	Flow (m³/min)	1.000
2	1.0	1.000	40.000
3	1.0	1.000	40.000
4	1.0	1.000	40.000
5	1.0	1.000	40.000
6	1.0	1.000	40.000



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Autosampler Operation

Purpose:
This test verifies that the autosampler operation is performed and completed successfully.

Test Details:
This test involves the following steps:
1. Verify the autosampler is properly calibrated and ready for use.
2. Perform a series of injections using the autosampler.
3. Verify the results of the injections are accurate and consistent.

Configuration Details:
Method Name: **Method:** **Expected Result:** **Status:**

Results:
Injection 1: Injection 2: Injection 3: Injection 4: Injection 5:

Overall Test Status:

Date: September 13, 2021 10:00 AM
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Instrument Tests

Purpose:
This test verifies that the instrument tests are performed and completed successfully.

Test Details:
This test involves the following steps:
1. Verify the instrument is properly calibrated and ready for use.
2. Perform a series of tests using the instrument.
3. Verify the results of the tests are accurate and consistent.

Configuration Details:
Method Name: **Method:** **Expected Result:** **Status:**

Results:
Injection 1: Injection 2: Injection 3: Injection 4: Injection 5:

Overall Test Status:

Date: September 13, 2021 10:00 AM
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Protocol Details

Purpose:
This section describes the protocol used for the test.

Test Details:
This test involves the following steps:
1. Verify the instrument is properly calibrated and ready for use.
2. Perform a series of tests using the instrument.
3. Verify the results of the tests are accurate and consistent.

Configuration Details:
Method Name: **Method:** **Expected Result:** **Status:**

Results:
Injection 1: Injection 2: Injection 3: Injection 4: Injection 5:

Overall Test Status:

Date: September 13, 2021 10:00 AM
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Instrument Details

Purpose:
This section describes the instrument used for the test.

Test Details:
This test involves the following steps:
1. Verify the instrument is properly calibrated and ready for use.
2. Perform a series of tests using the instrument.
3. Verify the results of the tests are accurate and consistent.

Configuration Details:
Method Name: **Method:** **Expected Result:** **Status:**

Results:
Injection 1: Injection 2: Injection 3: Injection 4: Injection 5:

Overall Test Status:

Date: September 13, 2021 10:00 AM
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Autosampler Operation

Purpose:
This test verifies that the autosampler operation is performed and completed successfully.

Test Details:
This test involves the following steps:
1. Verify the autosampler is properly calibrated and ready for use.
2. Perform a series of injections using the autosampler.
3. Verify the results of the injections are accurate and consistent.

Configuration Details:
Method Name: **Method:** **Expected Result:** **Status:**

Results:
Injection 1: Injection 2: Injection 3: Injection 4: Injection 5:

Overall Test Status:

Date: September 13, 2021 10:00 AM
Page 11/14

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Declaration of Change Control

Purpose:
This test verifies that the change control process is performed and completed successfully.

Test Details:
This test involves the following steps:
1. Verify the change control process is properly documented and ready for use.
2. Perform a series of tests using the change control process.
3. Verify the results of the tests are accurate and consistent.

Configuration Details:
Method Name: **Method:** **Expected Result:** **Status:**

Results:
Injection 1: Injection 2: Injection 3: Injection 4: Injection 5:

Overall Test Status:

Date: September 13, 2021 10:00 AM
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Autosampler Operation

Purpose:
This test verifies that the autosampler operation is performed and completed successfully.

Test Details:
This test involves the following steps:
1. Verify the autosampler is properly calibrated and ready for use.
2. Perform a series of injections using the autosampler.
3. Verify the results of the injections are accurate and consistent.

Configuration Details:
Method Name: **Method:** **Expected Result:** **Status:**

Results:
Injection 1: Injection 2: Injection 3: Injection 4: Injection 5:

Overall Test Status:

Date: September 13, 2021 10:00 AM
Page 13/14

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Agilent Chemical Engineering Business

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Attachments

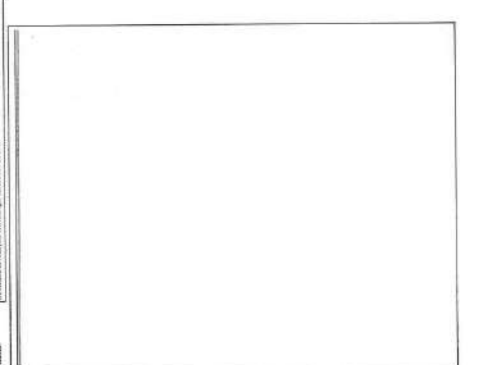
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0003	General	Certificate of Qualification for AOC	1
0004	General	Certificate of Qualification for AOC	1
0005	Method	Certificate of Qualification for AOC	1
0006	Comments	Certificate of Qualification for AOC	1
0007	General	Certificate of Qualification for AOC	1
0008	General	Certificate of Qualification for AOC	1
0009	General	Certificate of Qualification for AOC	1
0010	General	Certificate of Qualification for AOC	1

Item:
 System ID:

Revision: 12.001 (05/07 PM)
 Attachment:

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© 2010 by Agilent Technologies Document Number:	Agilent Thermal Conductivity Detectors TCD Elements of Analytical Measurement: Calibration Solutions	
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Date:	Document No.: 11-0011-0001-0100
Revision ID:	01-000001

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JNAC GROUP
Approved calibration laboratory
PAC 1502-0227
PAC 1502-0227
CALIBRATION

63/14-16/735-35, Sub Postbox 27/1, Pathumwan Rd,
Wellness, Bangkok, Thailand 10500 Thailand.
Tel: (66) 02-66881813 Fax: (66) 02-66881814 www.jnac.com

CERTIFICATE OF CALIBRATION


Customer No. 1502-0227
Page 1 of 2 pages

Need of calibration: ☐ Initial calibration ☐ Recalibration ☐ Recalibration after repair

The results of calibration and calibration certificate are valid for the next date:

Item	Calibration	Due Date	Remarks
1. 1000g	1000g	2023-12-31	
2. 500g	500g	2023-12-31	
3. 100g	100g	2023-12-31	
4. 50g	50g	2023-12-31	
5. 10g	10g	2023-12-31	
6. 5g	5g	2023-12-31	
7. 1g	1g	2023-12-31	
8. 0.5g	0.5g	2023-12-31	
9. 0.1g	0.1g	2023-12-31	
10. 0.05g	0.05g	2023-12-31	
11. 0.01g	0.01g	2023-12-31	
12. 0.005g	0.005g	2023-12-31	
13. 0.001g	0.001g	2023-12-31	
14. 0.0005g	0.0005g	2023-12-31	
15. 0.0001g	0.0001g	2023-12-31	
16. 0.00005g	0.00005g	2023-12-31	
17. 0.00001g	0.00001g	2023-12-31	
18. 0.000005g	0.000005g	2023-12-31	
19. 0.000001g	0.000001g	2023-12-31	
20. 0.0000005g	0.0000005g	2023-12-31	
21. 0.0000001g	0.0000001g	2023-12-31	
22. 0.00000005g	0.00000005g	2023-12-31	
23. 0.00000001g	0.00000001g	2023-12-31	
24. 0.000000005g	0.000000005g	2023-12-31	
25. 0.000000001g	0.000000001g	2023-12-31	
26. 0.0000000005g	0.0000000005g	2023-12-31	
27. 0.0000000001g	0.0000000001g	2023-12-31	
28. 0.00000000005g	0.00000000005g	2023-12-31	
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49. 0.000000000000000000001g	0.000000000000000000001g	2023-12-31	
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51. 0.0000000000000000000001g	0.0000000000000000000001g	2023-12-31	
52. 0.00000000000000000000005g	0.00000000000000000000005g	2023-12-31	
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54. 0.000000000000000000000005g	0.000000000000000000000005g	2023-12-31	
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56. 0.0000000000000000000000005g	0.0000000000000000000000005g	2023-12-31	
57. 0.0000000000000000000000001g	0.0000000000000000000000001g	2023-12-31	
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65. 0.00000000000000000000000000001g	0.00000000000000000000000000001g	2023-12-31	
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76. 0.00000000000000000000000000000000005g	0.00000000000000000000000000000000005g	2023-12-31	
77. 0.00000000000000000000000000000000001g	0.00000000000000000000000000000000001g	2023-12-31	
78. 0.000000000000000000000000000000000005g	0.000000000000000000000000000000000005g	2023-12-31	
79. 0.000000000000000000000000000000000001g	0.000000000000000000000000000000000001g	2023-12-31	
80. 0.0000000000000000000000000000000000005g	0.0000000000000000000000000000000000005g	2023-12-31	
81. 0.0000000000000000000000000000000000001g	0.0000000000000000000000000000000000001g	2023-12-31	
82. 0.00000000000000000000000000000000000005g	0.00000000000000000000000000000000000005g	2023-12-31	
83. 0.00000000000000000000000000000000000001g	0.00000000000000000000000000000000000001g	2023-12-31	
84. 0.000000000000000000000000000000000000005g	0.000000000000000000000000000000000000005g	2023-12-31	
85. 0.000000000000000000000000000000000000001g	0.000000000000000000000000000000000000001g	2023-12-31	
86. 0.0000000000000000000000000000000000000005g	0.0000000000000000000000000000000000000005g	2023-12-31	
87. 0.0000000000000000000000000000000000000001g	0.0000000000000000000000000000000000000001g	2023-12-31	
88. 0.005g	0.005g	2023-12-31	
89. 0.001g	0.001g	2023-12-31	
90. 0.0005g	0.0005g	2023-12-31	
91. 0.0001g	0.0001g	2023-12-31	
92. 0.005g	0.005g	2023-12-31	
93. 0.001g	0.001g	2023-12-31	
94. 0.0005g	0.0005g	2023-12-31	
95. 0.0001g	0.0001g	2023-12-31	
96. 0.005g	0.005g	2023-12-31	
97. 0.001g	0.001g	2023-12-31	
98. 0.0005g	0.0005g	2023-12-31	
99. 0.0001g	0.0001g	2023-12-31	
100. 0.005g	0.005g	2023-12-31	

Signature of the customer: _____
Signature of the laboratory: _____
Date: _____



JNAC GROUP
Approved calibration laboratory
PAC 1502-0227
PAC 1502-0227
CALIBRATION

63/14-16/735-35, Sub Postbox 27/1, Pathumwan Rd,
Wellness, Bangkok, Thailand 10500 Thailand.
Tel: (66) 02-66881813 Fax: (66) 02-66881814 www.jnac.com

CERTIFICATE OF CALIBRATION

Customer No. 1502-0227
Page 1 of 2 pages

Need of calibration: ☐ Initial calibration ☐ Recalibration ☐ Recalibration after repair

The results of calibration and calibration certificate are valid for the next date:

Item	Calibration	Due Date	Remarks
1. 1000g	1000g	2023-12-31	
2. 500g	500g	2023-12-31	
3. 100g	100g	2023-12-31	
4. 50g	50g	2023-12-31	
5. 10g	10g	2023-12-31	
6. 5g	5g	2023-12-31	
7. 1g	1g	2023-12-31	
8. 0.5g	0.5g	2023-12-31	
9. 0.1g	0.1g	2023-12-31	
10. 0.05g	0.05g	2023-12-31	
11. 0.01g	0.01g	2023-12-31	
12. 0.005g	0.005g	2023-12-31	
13. 0.001g	0.001g	2023-12-31	
14. 0.0005g	0.0005g	2023-12-31	
15. 0.0001g	0.0001g	2023-12-31	
16. 0.00005g	0.00005g	2023-12-31	
17. 0.00001g	0.00001g	2023-12-31	
18. 0.000005g	0.000005g	2023-12-31	
19. 0.000001g	0.000001g	2023-12-31	
20. 0.0000005g	0.0000005g	2023-12-31	
21. 0.0000001g	0.0000001g	2023-12-31	
22. 0.00000005g	0.00000005g	2023-12-31	
23. 0.00000001g	0.00000001g	2023-12-31	
24. 0.000000005g	0.000000005g	2023-12-31	
25. 0.000000001g	0.000000001g	2023-12-31	
26. 0.0000000005g	0.0000000005g	2023-12-31	
27. 0.0000000001g	0.0000000001g	2023-12-31	
28. 0.00000000005g	0.00000000005g	2023-12-31	
29. 0.00000000001g	0.00000000001g	2023-12-31	
30. 0.000000000005g	0.000000000005g	2023-12-31	
31. 0.000000000001g	0.000000000001g	2023-12-31	
32. 0.0000000000005g	0.0000000000005g	2023-12-31	
33. 0.0000000000001g	0.0000000000001g	2023-12-31	
34. 0.00000000000005g	0.00000000000005g	2023-12-31	
35. 0.00000000000001g	0.00000000000001g	2023-12-31	

[illegible]

**J
NAC**
NATIONAL ASSOCIATION
OF CHARTERED ACCOUNTANTS

03/14/13-03/16/13, 601 Piedmont Ave., Peachtree City, Georgia 30069, 404/460-0400, 1-800-762-4600, www.jnac.org
Tel. 404/460-0400, 1-800-762-4600 Fax: 404/460-0850 www.jnac.org

CERTIFICATE OF CALCULATION

Chartered Accountant
 10/1/13 to 10/1/14

Chartered Accountant
 10/1/13 to 10/1/14

Member's Name

Member's Name

Member's Name

Member's Name

Member's Name

Member's Name

Member's Name

Member's Name

Member's Name

Member's Name

Member's Name

Member's Name

Member's Name

Member's Name

Member's Name

Member's Name

Member's Name

Member's Name

Member's Name

Member's Name

Member's Name

10/1/13 to 10/1/14
 APPROVED BY: [Signature]
 NOTARY DATE: 10/1/14

Chartered Accountant
 10/1/13 to 10/1/14

Chartered Accountant
 10/1/13 to 10/1/14

Chartered Accountant
 10/1/13 to 10/1/14

Chartered Accountant
 10/1/13 to 10/1/14

Chartered Accountant
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Chartered Accountant
 10/1/13 to 10/1/14


Chartered Accountant
 10/1/13 to 10/1/14

Chartered Accountant
 10/1/13 to 10/1/14

Chartered Accountant
 10/1/13 to 10/1/14

**J
NAC**
 National Association
 of Chartered Accountants

THIS CERTIFICATE WAS ISSUED BY THE NATIONAL ASSOCIATION OF CHARTERED ACCOUNTANTS (NAC) ON 10/1/14. IT IS VALID FOR 10/1/13 TO 10/1/14.

	63714-1667055-86, 601 Indusiarako 271, Puzoskanoa, 481 Nafarroa, Nafarroa Garaia, 48100, Nafarroa Garaia, Spain Tel: 948 504808 1211730, 500 02 6656500 email:nac@nac.es																									
	Customer Number: 0001000002 Page: 1 of 1 Page																									
Declaration of completion of Customer Review																										
Period of Collection: <input checked="" type="checkbox"/> Annual Declaration: <input type="checkbox"/> Semi-Annual																										
The prices of our paper are payable in Euro Euros.																										
<table border="1"> <thead> <tr> <th>Quantity or M2</th> <th>Converted Tonnage</th> <th>Typical cost</th> <th>Exceptional Tonnage cost</th> </tr> </thead> <tbody> <tr> <td>5000</td> <td>17</td> <td>10</td> <td>10 - 20</td> </tr> <tr> <td>10000</td> <td>34</td> <td>10</td> <td>10 - 20</td> </tr> <tr> <td>15000</td> <td>51</td> <td>10</td> <td>10 - 20</td> </tr> <tr> <td>20000</td> <td>68</td> <td>10</td> <td>10 - 20</td> </tr> <tr> <td>25000</td> <td>85</td> <td>10</td> <td>10 - 20</td> </tr> </tbody> </table>	Quantity or M2	Converted Tonnage	Typical cost	Exceptional Tonnage cost	5000	17	10	10 - 20	10000	34	10	10 - 20	15000	51	10	10 - 20	20000	68	10	10 - 20	25000	85	10	10 - 20	Remarks: The quantities in units to apply the current pricing of the Unit value Declaration are greater than a partial value of the quantity in units. The quantities in units are not rounded up, but are rounded down. The quantities in units are not rounded up, but are rounded down. The quantities in units are not rounded up, but are rounded down.	
Quantity or M2	Converted Tonnage	Typical cost	Exceptional Tonnage cost																							
5000	17	10	10 - 20																							
10000	34	10	10 - 20																							
15000	51	10	10 - 20																							
20000	68	10	10 - 20																							
25000	85	10	10 - 20																							

[illegible]

651/4 15/6746-516, Soc. Petică-Rușești 2771, Pitești-județul Ialomi
 Municipiul, Municipiul-Rușești 100052, Tulcea
 Tel: (098 07) 6050319-15 Fax: (098 02) 6038080 www.federatia.ro

Declarația de Conformare la Solicitația de


Declarația de Conformare la Solicitația de

Prin declarația de conformare, eu, subsemnatul,

declarați în numele grupului de lucru, în calitate de reprezentant al acestuia,

că toate informațiile și documentele furnizate sunt corecte și veritabile.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	
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Meter Console Verification

Dry Gas Meter ID. : ENSS 046 Date of Calibration : 18/10/2022
Instrument Brand : Apex / Model 572 Calibrated By : MW

Wet gas meter Information

Wet gas Brand : Shinagawa Wet gas S/N : 544122
Wet gas Model : W-NK-2.5A Expire Date : July 28, 2023

Orifice Setting ΔH ₀ (mm H ₂ O)	Wet gas		Metering System		Time (min)	YI	ΔH ₀
	V _w (L)	T _w (°C)	V _g (L)	T _g (°C)			
13	134.89	22.6	140.0	23.0	12:21	0.9638	51.152
13	135.94	22.5	140.0	23.0	12:18	0.9714	49.948
26	134.55	22.4	140.0	23.5	8:51	0.9622	52.725
26	134.09	22.2	140.0	24.0	8:51	0.9614	52.908
40	266.95	21.9	280.0	24.5	13:09	0.9561	45.255
40	265.75	21.7	280.0	25.5	13:08	0.9576	45.320
50	264.05	21.3	280.0	26.0	12:23	0.9535	50.951
50	263.46	20.9	280.0	26.0	12:23	0.9526	50.945
70	262.58	20.6	280.0	27.0	10:08	0.9518	47.915
70	262.92	20.4	280.0	27.0	10:07	0.9536	47.569
90	262.76	20.2	280.0	27.0	8:55	0.9519	47.596
90	262.40	20.1	280.0	27.0	8:54	0.9509	47.516
Average						0.9574	49.142

Remark : YI ± 0.02 from average
YI = 1.00 ± 0.05
ΔH₀ ± 5.08 mm H₂O from average
ΔH₀ = 46.7 ± 6.4 mm H₂O

Checked By :
Position :
Date :



VERIFIED
BY: *M. Saeed* DATE: Oct 19, 2022

SGS (Thailand) Limited | 100 Nongtinkee Road, Chongnonsiri, Nonthaburi 11070 | +66 (0)2 678 15 13 | +66 (0)2 678 15 41 | www.sgs.com
Member of the SGS Group



Temperature Display Verification

Dry Gas Meter ID. : ENSS 046 Date of Calibration : 18/10/2022
Instrument Brand : Apex / Model 672 Calibrated By : MW

Temperature Simulator Information

Simulator Brand : Altex Industries, Inc. Simulator S/N : T4L1015
Simulator Model : Altex Model 22 TC source Expire Date : 06/07/2023

Standard Value	Instrument Display				
	Stack	Probe	Filter	Aux	Exit
300	300	300	301	300	-
200	201	200	200	201	-
150	151	151	150	150	-
100	100	100	100	100	101
50	50	50	50	50	50
0	0	0	0	0	0
Difference	0.2%	1.0	1.0	1.0	1.0

Remark : Stack ≤ ± 1.5 % Absolute Aux ≤ ± 3.0 °C
Probe ≤ ± 3.0 °C Exit ≤ ± 3.0 °C
Filter ≤ ± 3.0 °C

Checked By :
Position :
Date :



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Manometer Verification

Dry Gas Meter ID. : ENSS 046 Date of Calibration : 18/10/2022
Instrument Brand : Apex / Model 572 Calibrated By : MW

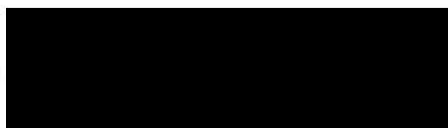
Magnehelic gauge Information

Magnehelic Brand : Dwyer Industries, Inc. Magnehelic S/N : R060822A1109
Magnehelic Model : 2000-25 MMC Expire Date : 23/09/2023

Manometer data				
Test No.	Manometer Reference ΔP (mm.H ₂ O):A	Manometer monitoring ΔP (mm.H ₂ O):B	Difference	Reference/Monitoring A/B
1	2.0	2.0	0.00	1.00
2	6.0	6.2	0.20	0.97
3	10.0	10.2	0.20	0.98
4	16.0	16.2	0.20	0.99
5	20.0	20.4	0.40	0.98
Average			0.20	0.98

Remark : [Reference (Avg) / Monitoring (Avg)] must be = 0.95 to 1.05

Checked By :
Position :
Date :



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Prob Nozzle Diameter Calibration Data Sheet

Date : 14/11/2022 Personal : MW
Vernier (Digital) : Dial Caliper Reference : GS 584507
Nozzle ID : ENSS 008 Nozzle Set (Borosilicate Glass)

Nozzle No.	Nozzle Diameter (mm)			Hi-Lo	D _{avg}
	D1	D2	D3	ΔD	
1	3.30	3.30	3.28	0.02	3.29
2	3.78	3.80	3.78	0.02	3.79
3	4.60	4.64	4.68	0.08	4.64
4	5.78	5.76	5.74	0.04	5.76
5	7.10	7.14	7.18	0.08	7.14
6	8.88	8.92	8.88	0.04	8.89
7	11.14	11.10	11.14	0.04	11.13
Max:					0.08 Pass

Remark : ΔD = Maximum difference between any two diameters, must be ≤ 0.100 mm
D_{avg} = (D1+D2+D3)/3

Checked By :
Position :
Date :

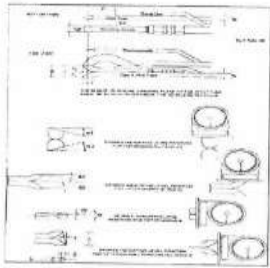


VERIFIED
BY: *M. Saeed* DATE: Nov 30, 2022

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Certificate of Calibration
S-Type Geometric Pitot Tube Calibration
See the Code of Federal Regulations, Title 42, Part 66, Appendix A,
Method 2, Item 4



Pitot tube/Probe No.		No.8	
Parameter	Value	Allowable Range	Check
Assembly Level?	Y	Yes or Y	PASS
Ports Damaged?	N	No or N	PASS
$\alpha 1$	3	$-10^{\circ} < \alpha 1 < +10^{\circ}$	PASS
$\alpha 2$	-1.3	$-10^{\circ} < \alpha 2 < +10^{\circ}$	PASS
$\beta 1$	1.7	$-5^{\circ} < \beta 1 < +5^{\circ}$	PASS
$\beta 2$	-0.4	$-5^{\circ} < \beta 2 < +5^{\circ}$	PASS
γ	2.2	N/A	-
θ	1	N/A	-
D_1	0.375	0.168" to 0.375"	PASS
A	0.949	2.10, $\leq A \leq 3.00$,	PASS
A/ D_1	1.265	1.05, $\leq A/D_1 \leq 1.5$	PASS
$Z = A \tan \gamma$	0.036	$Z \leq 0.125"$	PASS
$W = A \tan \theta$	0.017	$W \leq 0.031"$	PASS

I certify that pitot tube/probe No. 8 meets or exceeds all specifications, criteria and/or applicable design features and is hereby assigned a pitot tube certification factor of 0.04. See 43 CFR Pt. 63, App. A, EPA Method 2

Standard Device

Device Name: Digital inclinometer

Manufacturer: BASLINE

Model: 11-1005

Expiration date: 07-Dec-21

ENHS No.: ENHS 22158

Certified by:

Date:

SGS (Thailand) Limited

100 Nangreem Road, Chongnonsi

Yamwua Bangkok 10120

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Nakhorn Ratchasima Office:

154390 Suraseni Road

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F : + 66 (0)44 922 920



WHEN YOU NEED TO BE SURE

ภาคผนวก จ
หนังสืออนุญาตขึ้นทะเบียน
ห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท ทีพีไอ โพลีน จำกัด (มหาชน)



กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ เขตราชเทวี

อากาศเสีย จำนวน ๘ รายการ ตรวจพบค่าเกินมาตรฐานตามเกณฑ์ จำนวน ๓๔ รายการ รวมทั้งสิ้นจำนวน ๔๑ รายการ ตามสิ่งที่ส่งมาด้วย

หนังสือฉบับนี้...

- 12 -

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

ปฏิบัติการการแพทย์ฉุกเฉินในโรงพยาบาลชุมชน

โทรสาร ๐ ๒๓๕๔ ๓๒๐๘ ๐ ๒๓๕๔ ๓๔๑๕

ลำดับที่	สารพิษ	วิธีวิเคราะห์
1	Antimony	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[3]
2	Arsenic	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[3]
3	Carbon Monoxide	Instrumental Analyzer Method ^[2]
4	Copper	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[3]
5	Lead	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[3]

6 Oxides...

ผู้เข้าร่วมประชุมและผู้สังเกตการณ์
การประชุมมีมติเห็นชอบให้ดำเนินการ

-16-

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
6	Oxides of Nitrogen	Instrumental Analyzer Method ^[3]
7	Sulfur Dioxide	Instrumental Analyzer Method ^[3]
8	Total Suspended Particulate	Isokinetic Sampling, Gravimetric Method ^[3]

สิ่งปลูกสร้างหรือวัสดุที่ไม่ใช้แล้ว จำนวน 14 รายการ

ลำดับที่	สารมลพิษ	วิธีการตรวจ
1	Antimony	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,4,6)
2	Arsenic	2) Digestion, Inductively Coupled Plasma Method ^(5,6) 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,4,6)
3	Barium	2) Digestion, Inductively Coupled Plasma Method ^(5,6) 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,4,6)
4	Cadmium	2) Digestion, Inductively Coupled Plasma Method ^(5,6) 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,4,6)
5	Chromium	2) Digestion, Inductively Coupled Plasma Method ^(5,6) 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,4,6)
6	Copper	2) Digestion, Inductively Coupled Plasma Method ^(5,6) 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,4,6)
7	Lead	2) Digestion, Inductively Coupled Plasma Method ^(5,6) 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,4,6)
8	Mercury	2) Digestion, Inductively Coupled Plasma Method ^(5,6) 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,4,6)
9	Nickel	2) Digestion, Inductively Coupled Plasma Method ^(5,6) 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,4,6)

(นาง)
ผู้ชำนาญการ

สมทบทุนมูลนิธิเพื่อเด็กพิการ

10 Selenium...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
10	Selenium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,4,6) 2) Digestion, Inductively Coupled Plasma Method ^(5,6)
11	Silver	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,4,6) 2) Digestion, Inductively Coupled Plasma Method ^(5,6)
12	Thallium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,4,6) 2) Digestion, Inductively Coupled Plasma Method ^(5,6)
13	Vanadium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,4,6) 2) Digestion, Inductively Coupled Plasma Method ^(5,6)
14	Zinc	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,4,6) 2) Digestion, Inductively Coupled Plasma Method ^(5,6)

เอกสารอ้างอิง

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3. United States Environmental Protection Agency. Standards of Performance for New Stationary Sources. 40 CFR 60. Appendix A, 2017.
4. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. SW-846, 1997.
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(ใน
ผู้แทนกรม

บริษัท ยูไนเต็ด แอนนาลิสต์
แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด

ที่ อก ๐๓๑๐(๑)/ ๑๘๗ ๕



กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐
๑๙ กุมภาพันธ์ ๒๕๖๕

เรื่อง คัดสรรหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
เรียน กรรมการผู้จัดการ บริษัท ยูโนเด็ค แอนนาลิสต์ แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด
อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารเคมีของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๒๗ ธันวาคม ๒๕๖๔

สิ่งที่ส่งมาด้วย ๑. รายชื่อผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๔๐ ราย
๒. รายชื่อเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๐๖ ราย
๓. ขอบข่ายสารเคมีที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม
ตามหนังสือที่อ้างถึง บริษัท ยูโนเด็ค แอนนาลิสต์ แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด
ขอต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ๖-๑๔๕๕-๕๑๖๒-๕
ขออายุเลข ๕๑ ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร ต่อกรมโรงงานอุตสาหกรรม นั้น
กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท ยูโนเด็ค แอนนาลิสต์ แอนด์ เอ็นจิเนียริง
คอนซัลแตนท์ จำกัด คัดสรรหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน โดยมีองค์ประกอบดังนี้
ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๔๐ ราย ตามสิ่งที่ส่งมาด้วย ๑
ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๐๖ ราย ตามสิ่งที่ส่งมาด้วย ๒
ค. ขอบข่ายสารเคมีที่ได้รับขึ้นทะเบียนไม่วิเคราะห์ในน้ำเสีย น้ำใต้ดิน อากาศเสีย สิ่งปฏิกูล
หรือวัสดุที่ไม่ใช่แล้ว และดิน ตามสิ่งที่ส่งมาด้วย ๓

หนังสือฉบับนี้จะหมดอายุในวันที่ ๒ กุมภาพันธ์ ๒๕๖๘ หากประสงค์จะต่ออายุหนังสือ
รับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอต่อ
กรมโรงงานอุตสาหกรรมภายใน ๓๐ วัน ก่อนวันสิ้นสุดของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
ทั้งนี้ สามารถยื่นคำขอผ่านระบบอิเล็กทรอนิกส์ได้ที่หน้าเว็บไซต์กรมโรงงานอุตสาหกรรม ตาม QR Code ที่
หนังสือฉบับนี้

จึงเรียนมาเพื่อทราบ



กองวิจัยและเคมียามผลิตโรงงาน
กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบและทะเบียนห้องปฏิบัติการ
โทร ๐ ๒๕๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕
โทรสาร ๐ ๒๕๓๐ ๖๓๑๒ ต่อ ๒๑๓๔
ไปรษณีย์อิเล็กทรอนิกส์ saraban@dlw.gmai.go.th

-๒-

๓๖) นายศุภณัฐ คุมธนาคุณ
๓๗) นางสาวศิริภาพร เหมอินทร์
๓๘) นางสาวนิต ชำนิ
๓๙) นางสาวพรนภา วีระจินดา
๔๐) นายนาเคนทร์ พันธุวิชาติกุล

ทะเบียนเลขที่ ๖-๑๔๕๕-๕๑๖๒-๕
ทะเบียนเลขที่ ๖-๑๔๕๕-๕๑๖๒-๕
ทะเบียนเลขที่ ๖-๑๔๕๕-๕๑๖๒-๕
ทะเบียนเลขที่ ๖-๑๔๕๕-๕๑๖๒-๕
ทะเบียนเลขที่ ๖-๑๔๕๕-๕๑๖๒-๕



เอกสารแนบท้ายหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท ยูโนเด็ค แอนนาลิสต์ แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด เลขทะเบียน ๖-๑๔๕๕
ที่ อก ๐๓๑๐(๑)/ ๑๘๗ ๕ ลงวันที่ ๑๙ กุมภาพันธ์ ๒๕๖๕

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์		รายชื่อ
๑		ทะเบียนเลข
๒		ทะเบียนเลข
๓		ทะเบียนเลข
๔		ทะเบียนเลข
๕		ทะเบียนเลข
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๓๗		ทะเบียนเลข
๓๘		ทะเบียนเลข
๓๙		ทะเบียนเลข
๔๐		ทะเบียนเลข

เอกสารแนบท้ายหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท ยูโนเด็ค แอนนาลิสต์ แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด เลขทะเบียน ๖-๑๔๕๕
ที่ อก ๐๓๑๐(๑)/ ๑๘๗ ๕ ลงวันที่ ๑๙ กุมภาพันธ์ ๒๕๖๕

ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์		รายชื่อ
๑		ทะเบียนเลข
๒		ทะเบียนเลข
๓		ทะเบียนเลข
๔		ทะเบียนเลข
๕		ทะเบียนเลข
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๓๖) นายณกสิน...

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ปฏิกิริยาของระบบนิเวศต่อการเปลี่ยนแปลงสภาพภูมิอากาศ

สิ่งที่ส่งมาด้วย ๓

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ลำดับ	สารเคมี	วิธีวิเคราะห์
1	Aldrin	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
2	Arsenic	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
3	Barium	Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
4	α -BHC	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
5	β -BHC	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
6	δ -BHC	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
7	γ -BHC	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
8	Biochemical Oxygen Demand	1) 5-Day BOD Test, Azide Modification Method ⁽⁴⁾ 2) 5-Day BOD Test, Membrane Electrode Method ⁽⁴⁾
9	Cadmium	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾ 3) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
10	Chemical Oxygen Demand	1) Closed Reflux, Titrimetric Method ⁽⁴⁾ 2) Closed Reflux, Colorimetric Method ⁽⁴⁾ 3) Open Reflux, Titrimetric Method ⁽⁴⁾
11	Chlordane	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
12	Chromium	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾ 3) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
13	Color	ADM1 Weighted-Ordinate Spectrophotometric Method ⁽⁴⁾
14	Copper	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾ 3) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
15	Cyanide	1) Distillation, Colorimetric Method ⁽⁴⁾ 2) Flow Injection Analysis Method ⁽⁴⁾

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
16	o,p'-DDT	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
17	4,4'-DDD	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
18	4,4'-DDE	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
19	4,4'-DDT	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
20	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
21	Endosulfan I	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
22	Endosulfan II	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
23	Endosulfan sulfate	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
24	Endrin	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
25	Endrin aldehyde	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
26	Formaldehyde	Distillation, Colorimetric Method ⁽¹⁾
27	Free Chlorine	1) Iodometric Method ⁽²⁾ 2) DPD Ferrous Titrimetric Method ⁽⁴⁾
28	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
29	Heptachlor Epoxide	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
30	Hexavalent Chromium	1) Colorimetric Method ⁽⁴⁾ 2) Extraction, Direct Air-Acetylene Flame Method ⁽⁴⁾
31	Lead	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾ 3) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
32	Manganese	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾ 3) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
33	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽⁴⁾
34	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
35	Nickel	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾ 3) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
36	Oil & Grease	1) Liquid-Liquid, Partition-Gravimetric Method ⁽⁴⁾ 2) Soxhlet Extraction Method ⁽⁴⁾
37	pH	Electrometric Method ⁽⁴⁾
38	Phenols	1) Distillation, Chloroform Extraction Method ⁽⁴⁾ 2) Distillation, Direct Photometric Method ⁽⁴⁾
39	Selenium	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
40	Sulfide	1) Iodometric Method ⁽⁴⁾ 2) Methylene Blue Method ⁽⁴⁾
41	Temperature	Laboratory and Field Methods ⁽⁴⁾
42	Total Dissolved Solids	Dried at 180 °C ⁽⁴⁾
43	Total Kjeldahl Nitrogen	Semi-Micro-Kjeldahl Method ⁽⁴⁾
44	Total Suspended Solids	Dried at 103-105 °C ⁽⁴⁾
45	Trivalent Chromium	1) Digestion, Direct Air-Acetylene Flame Method; Colorimetric Method; Calculation ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation ⁽⁴⁾
46	Zinc	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾ 3) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾

น้ำใต้ดิน จำนวน 126 รายการ

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

4 Anthracene...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
4	Anthracene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
5	Antimony	Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
6	Arsenic	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
7	Atrazine	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
8	Barium	1) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
9	Benz(a)anthracene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
10	Benzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
11	Benzo(b)fluoranthene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
12	Benzo(k)fluoranthene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) 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	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾

15 Benzo(g,h,i)perylene...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
15	Benzo(g,h,i)perylene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
16	Beryllium	Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
17	Bis(2-chloroethyl)ether	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
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, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾ 3) Digestion, Inductively Coupled Plasma 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	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) 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...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
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, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾ 3) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
34	Chromium (II)	1) Digestion, Direct Air-Acetylene Flame Method; Colorimetric Method; Calculation ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation ⁽⁴⁾
35	Chromium (VI)	1) Colorimetric Method ⁽⁴⁾ 2) Extraction, Air-Acetylene Flame Method ⁽⁴⁾
36	Chrysene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
37	Cyanide	Distillation, Colorimetric Method ⁽⁴⁾
38	2,4-D	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
39	DDD	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
40	DDE	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
41	DDT	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾

42 Dibenzo(a,h)anthracene...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
42	Dibenz[a,h]anthracene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) 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⁾
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-Dichloropopane	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	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾

58 Diethyl phthalate...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
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	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
65	Endrin	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
66	Ethylbenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
67	Fluoranthene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
68	Fluorene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
69	Heptachlor	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾

70 Heptachlor epoxide...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
70	Heptachlor epoxide	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) 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	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
75	β-HCH	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
76	γ-HCH	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) 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, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾ 3) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾

82 Manganese...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
82	Manganese	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾ 3) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
83	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽⁴⁾
84	Methanol	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
85	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic 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	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) 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	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
92	Nickel	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾ 3) Digestion, Inductively Coupled Plasma 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...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
96	Polychlorinated Biphenyls - PCB 1016 - PCB 1221 - PCB 1232 - PCB-1242 - PCB-1248 - PCB-1254 - PCB-1260	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
97	Pentachlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
98	pH	Electrometric Method ⁽⁴⁾
99	Phenanthrene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
100	Phenol	1) Distillation, Chloroform Extraction Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
101	Pyrene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
102	Selenium	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
103	Silver	Digestion, Inductively Coupled Plasma 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...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
108	Toxaphene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
109	TPH (C ₈ - C ₉)	1) Purge and Trap, Gas Chromatographic Method ^{(1),(2)} 2) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^{(1),(2)}
110	TPH (C ₈ - C ₁₆)	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^{(2),(1)}
111	TPH (C ₁₆ - C ₃₀)	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^{(2),(1)}
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	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	Digestion, Inductively Coupled Plasma 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...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
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, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾ 3) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾

ตารางรายชื่อ (ต่อเนื่อง) จำนวน 25 รายการ

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
1	Antimony	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾
2	Arsenic	1) Isokinetic Sampling, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ⁽⁵⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾
3	Cadmium	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ⁽⁵⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾
4	Carbon Monoxide	Instrumental Analyzer Method ⁽⁵⁾
5	Chlorine	Isokinetic Sampling, Ion Chromatographic Method ⁽⁵⁾
6	Chromium	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ⁽⁵⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾
7	Cobalt	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾
8	Copper	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ⁽⁵⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾
9	Cresol	Absorption Sampling, Gas Chromatographic Method ⁽⁵⁾

10 Dioxins/Furans...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
10	Dioxins/Furans	Isokinetic Sampling ⁽⁵⁾
11	Hydrogen Chloride	Isokinetic Sampling, Ion Chromatographic Method ⁽⁵⁾
12	Hydrogen Fluoride	Isokinetic Sampling, Ion Chromatographic Method ⁽⁵⁾
13	Hydrogen Sulfide	Absorption Sampling, Iodometric Method ⁽⁵⁾
14	Lead	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ⁽⁵⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾
15	Manganese	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ⁽⁵⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾
16	Mercury	Isokinetic Sampling, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽⁵⁾
17	Nickel	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ⁽⁵⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾
18	Opacity	Ringelmann's Method ⁽¹⁾
19	Oxides of Nitrogen	1) Absorption Sampling, Phenoldisulfonic acid Method ⁽⁵⁾ 2) Instrumental Analyzer Method ⁽⁵⁾
20	Selenium	1) Isokinetic Sampling, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ⁽⁵⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾
21	Sulfur Dioxide	1) Absorption Sampling, Barium-Thorin Titrimetric Method ⁽⁵⁾ 2) Instrumental Analyzer Method ⁽⁵⁾
22	Sulfuric Acid	Isokinetic Sampling, Barium-Thorin Titrimetric Method ⁽⁵⁾
23	Total Suspended Particulate	Isokinetic Sampling, Gravimetric Method ⁽⁵⁾
24	Vanadium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾
25	Xylene	1) Bag Sampling, Gas Chromatographic Method ⁽⁵⁾ 2) Adsorption Sampling, Gas Chromatographic Method ⁽⁵⁾

สิ่งบ่งชี้...

สิ่งปลูกสร้างหรือวัสดุที่ไม่ใช้แล้ว จำนวน 35 รายการ

ลำดับ	สารเคมี	วิธีวิเคราะห์
1	Aldrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,9,22) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)
2	Antimony	Digestion, Inductively Coupled Plasma Method ^(7,13)
3	Arsenic	1) Waste Extraction, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(2,6,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,15) 3) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(7,15) 4) Digestion, Inductively Coupled Plasma Method ^(7,15)
4	Barium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,15) 2) Digestion, Inductively Coupled Plasma Method ^(7,15)
5	Beryllium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,15) 2) Digestion, Inductively Coupled Plasma Method ^(7,15)
6	Cadmium	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(2,6,14) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,15) 3) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,15) 4) Digestion, Inductively Coupled Plasma Method ^(7,15)
7	Chlordane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,9,22) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)
8	Chromium	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(2,6,14) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,15)

3) Digestion,...

ลำดับ	สารเคมี	วิธีวิเคราะห์
9	Chromium (III)	3) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 4) Digestion, Inductively Coupled Plasma Method ^(7,15) 1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method; Waste Extraction, Colorimetric Method; Calculation ^(2,6,14,16) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method; Waste Extraction, Colorimetric Method; Calculation ^(2,6,13,16) 3) Digestion, Flame Atomic Absorption Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation ^(7,8,14,16) 4) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation ^(7,8,13,16)
10	Chromium (VI)	1) Waste Extraction, Colorimetric Method ^(2,16) 2) Alkaline Digestion, Colorimetric Method ^(8,16)
11	Cobalt	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,13) 2) Digestion, Inductively Coupled Plasma Method ^(7,13)
12	Copper	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(2,6,14) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,15) 3) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 4) Digestion, Inductively Coupled Plasma Method ^(7,15)
13	2,4-D	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,9,22) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)
14	DDD	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,9,22) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)

15 DDE,...

ลำดับ	สารเคมี	วิธีวิเคราะห์
15	DDE	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,9,22) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)
16	DDT	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,9,22) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)
17	Dieldrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,9,22) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)
18	Endrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,9,22) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)
19	Heptachlor	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,9,22) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)
20	Lead	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(2,6,14) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,15) 3) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 4) Digestion, Inductively Coupled Plasma Method ^(7,15)
21	Lindane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,9,22) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)
22	Mercury	1) Waste Extraction, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^(2,17) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,15)

3) Digestion,...

ลำดับ	สารเคมี	วิธีวิเคราะห์
23	Methoxychlor	3) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽¹⁸⁾ 4) Digestion, Inductively Coupled Plasma Method ^(7,15) 5) Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method ⁽¹⁹⁾
24	Molybdenum	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,9,22) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)
25	Nickel	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,15) 2) Digestion, Inductively Coupled Plasma Method ^(7,13) 1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(2,6,14) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,15) 3) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 4) Digestion, Inductively Coupled Plasma Method ^(7,15)
26	Polychlorinated Biphenyls - 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	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,9,22) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)

- 2,2',4,5,5'-

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
27	- 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 Pentachlorophenol	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(2,6,28) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) Electrometric Method ^(31,32)
28	pH	
29	Selenium	1) Waste Extraction, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(2,6,20) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,13) 3) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(7,20) 4) Digestion, Inductively Coupled Plasma Method ^(7,13)

30 Silver...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
30	Silver	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,13)
31	Thallium	2) Digestion, Inductively Coupled Plasma Method ^(7,13) 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,13)
32	Toxaphene	2) Digestion, Inductively Coupled Plasma Method ^(7,13) 1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,9,22) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)
33	Trichloroethylene	1) Waste Extraction, Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(2,12,23) 2) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
34	Vanadium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,13)
35	Zinc	2) Digestion, Inductively Coupled Plasma Method ^(7,13) 1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(2,6,14) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,13) 3) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 4) Digestion, Inductively Coupled Plasma Method ^(7,13)

สิบ จำนวน 125 รายการ

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,24) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
2	Acetone	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)

3 Aldrin...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
3	Aldrin	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
4	Anthracene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,26) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
5	Antimony	Digestion, Inductively Coupled Plasma Method ^(7,13)
6	Arsenic	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(7,15) 2) Digestion, Inductively Coupled Plasma Method ^(7,13)
7	Atrazine	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
8	Barium	Digestion, Inductively Coupled Plasma Method ^(7,13)
9	Benzo(a)anthracene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,24) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
10	Benzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
11	Benzo(b)fluoranthene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,24) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
12	Benzo(k)fluoranthene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,24) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
13	Benzoic acid	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
14	Benzo(a)pyrene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,24) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)

15 Benzo(g,h,i)perylene...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
15	Benzo(g,h,i)perylene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
16	Beryllium	Digestion, Inductively Coupled Plasma Method ^(7,13)
17	Bis(2-chloroethyl)ether	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
18	Bis(2-ethylhexyl)phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
19	Bromodichloromethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
20	Bromoform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
21	Butanol	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
22	Butyl benzyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
23	Cadmium	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 2) Digestion, Inductively Coupled Plasma Method ^(7,13)
24	Carbazole	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
25	Carbon disulfide	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
26	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
27	Chlordane	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
28	p-Chloroaniline	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
29	Chlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
30	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)

31 Chloroform...

ลำดับ	สารเคมี	วิธีวิเคราะห์
31	Chloroform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
32	2-Chlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
33	Chromium	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 2) Digestion, Inductively Coupled Plasma Method ^(7,13)
34	Chromium (III)	1) Digestion, Flame Atomic Absorption Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation ^(7,13,14) 2) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation ^(7,13,14)
35	Chromium (VI)	Alkaline Digestion, Colorimetric Method ^(8,14)
36	Chrysene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,24) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)
37	Cyanide	Extraction, Distillation, Colorimetric Method ^(28,29,30)
38	2,4-D	Ultrasonic Extraction, Gas Chromatographic Method ⁽²⁷⁾
39	DDD	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)
40	DDE	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)
41	DDT	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)
42	Dibenz(a,h)anthracene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,24) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)

43 Di-n-butyl phthalate...

ลำดับ	สารเคมี	วิธีวิเคราะห์
43	Di-n-butyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
44	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
45	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
46	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
47	3,3'-Dichlorobenzidine	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
48	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
49	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
50	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
51	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
52	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
53	2,4-Dichlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)
54	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
55	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
56	1,3-Dichloropropene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
57	Dieldrin	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)
58	Diethyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
59	2,4-Dimethylphenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)

60 2,4-Dinitrophenol...

ลำดับ	สารเคมี	วิธีวิเคราะห์
60	2,4-Dinitrophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)
61	2,4-Dinitrotoluene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)
62	2,6-Dinitrotoluene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)
63	Di-n-Octyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
64	Endosulfan	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)
65	Endrin	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)
66	Ethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
67	Fluoranthene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,24) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)
68	Fluorene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,24) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)
69	Heptachlor	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)
70	Heptachlor epoxide	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)

71 Hexachlorobenzene...

ลำดับ	สารเคมี	วิธีวิเคราะห์
71	Hexachlorobenzene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)
72	Hexachloro-1,3-butadiene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
73	n-Hexane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
74	α-HCH	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)
75	β-HCH	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)
76	γ-HCH	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)
77	Hexachlorocyclopentadiene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
78	Hexachloroethane	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
79	Indeno(1,2,3-cd)pyrene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,24) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,24)
80	Isophorone	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
81	Lead	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 2) Digestion, Inductively Coupled Plasma Method ^(7,13)
82	Manganese	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 2) Digestion, Inductively Coupled Plasma Method ^(7,13)

83 Mercury...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
83	Mercury	1) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽¹⁸⁾ 2) Digestion, Inductively Coupled Plasma Method ^(7,13) 3) Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method ⁽¹⁹⁾
84	Methanol	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
85	Methoxychlor	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
86	Methyl bromide	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,23)
87	Methylene chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,23)
88	2-Methylphenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
89	2-Methylnaphthalene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
90	Methyl tert-butyl ether	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,23)
91	Naphthalene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,24) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
92	Nickel	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 2) Digestion, Inductively Coupled Plasma Method ^(7,13)
93	Nitrobenzene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
94	N-Nitrosodiphenylamine	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
95	N-Nitrosodi-n-propylamine	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)

96 Polychlorinated Biphenyls...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
96	Polychlorinated Biphenyls - Aroclor 1016 - Aroclor 1221 - Aroclor 1232 - Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1260 Polychlorinated Biphenyls - 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	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,28) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)

- 2,2',3,4',5,5',6...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
97	- 2,2',3,4',5,5',6-Heptachlorobiphenyl - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl Pentachlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
98	Phenanthrene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,26) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
99	Phenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
100	Pyrene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,26) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
101	Selenium	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(7,22) 2) Digestion, Inductively Coupled Plasma Method ^(7,13)
102	Silver	Digestion, Inductively Coupled Plasma Method ^(7,13)
103	Styrene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,23)
104	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,23)
105	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,23)
106	Toluene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,23)
107	Toxaphene	Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)
108	TPH (C ₉ -C ₁₀)	1) Purge and Trap, Gas Chromatographic Method ^(12,21) 2) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,23)
109	TPH (C ₉ -C ₁₀)	Ultrasonic Extraction, Gas Chromatographic Method ^(10,21)
110	TPH (C ₁₀ -C ₁₃)	Ultrasonic Extraction, Gas Chromatographic Method ^(10,21)
111	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,23)

112 1,1,1-Trichloroethane...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
112	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,23)
113	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,23)
114	Trichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,23)
115	2,4,5-Trichlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
116	2,4,6-Trichlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
117	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,23)
118	Vanadium	Digestion, Inductively Coupled Plasma Method ^(7,13)
119	Vinyl acetate	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,23)
120	Vinyl chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,23)
121	m-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,23)
122	o-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,23)
123	p-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,23)
124	Xylene (Total)	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,23)
125	Zinc	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 2) Digestion, Inductively Coupled Plasma Method ^(7,13)

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บริษัท เอแอลเอส แล็บอราทอรี กรุ๊ป (ประเทศไทย) จำกัด



ที่ อก ๐๓๑๐(๑) ๑๐๖๕

กรมโรงงานอุตสาหกรรม
ถนนพรหมรามที่ ๒ เขตราชเทวี
กรุงเทพมหานคร ๑๐๕๐๐

๒๘ มกราคม ๒๕๖๕

เรื่อง ค่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
เรียน กรรมการผู้จัดการ บริษัท เอแอนด์เอส แลบริทอรี่ กรุ๊ป (ประเทศไทย) จำกัด
อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และขอใบสารเคมีของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๒๐ กรกฎาคม ๒๕๖๓

สิ่งที่ส่งมาด้วย ๑. รายชื่อผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๑ แผ่น
๒. รายชื่อเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๕ แผ่น
๓. ขอบข่ายสารเคมีที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๓๑ แผ่น
ตามที่แจ้งถึงอ้างถึง บริษัท เอแอนด์เอส แลบริทอรี่ กรุ๊ป (ประเทศไทย) จำกัด ขอต่ออายุ
หนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ๖-๒๐๕-๕๐๙-๕๐๙-๕๐๙
ขอขยายผลการ ๕๐ ถนนพัฒนาการ แขวงพัฒนาการ เขตสวนหลวง กรุงเทพมหานคร
ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท เอแอนด์เอส แลบริทอรี่ กรุ๊ป (ประเทศไทย)
จำกัด ค่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน โดยมีองค์ประกอบดังนี้
ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๖ ราย ตามสิ่งที่ส่งมาด้วย ๑
ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๖๒ ราย ตามสิ่งที่ส่งมาด้วย ๒
ค. ขอบข่ายสารเคมีที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย จำนวน ๕๙ รายการ นำได้เป็น
จำนวน ๑๒๖ รายการ ยากาเคมี ๑๖ รายการ สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน ๑๕ รายการ และอื่น
จำนวน ๑๒๕ รายการ รวมทั้งสิ้นจำนวน ๑๖๒ รายการ ตามสิ่งที่ส่งมาด้วย ๓

หนังสือฉบับนี้จะมีผลตั้งแต่วันที่ ๒ กันยายน ๒๕๖๖ หากประสงค์จะต่ออายุหนังสือ
รับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุหรือขอเอกสารประกอบคำขอ
ต่อกรมโรงงานอุตสาหกรรม ภายใน ๓๐ วัน ก่อนวันสิ้นสุดของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์
เอกชน ซึ่งคำขอต่ออายุดังกล่าวจะรับได้ที่กรมโรงงานอุตสาหกรรม

จึงเรียนมาเพื่อทราบ



อธิบดีกรมโรงงานอุตสาหกรรม
ผู้ชำนาญการอาวุโสและโฆษกสำนักงาน
ปฏิบัติการทางเคมีและสิ่งแวดล้อม

กองวิจัยและเตือนภัยพิษโรงงาน
กลุ่มมาตรฐานวิชาการวิเคราะห์ทดสอบและทะเบียนห้องปฏิบัติการ
โทร. ๐ ๒๒๐๒ ๕๔๕๖ ๐ ๒๒๐๒ ๕๐๐๒
โทรสาร ๐ ๒๒๕๕ ๓๒๐๘ ๐ ๒๒๕๕ ๓๔๕๕

เอกสารแนบท้ายหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท เอแอนด์เอส แลบริทอรี่ กรุ๊ป (ประเทศไทย) จำกัด
ที่ อก ๐๓๑๐(๑) ๑๐๖๕ ลงวันที่ ๒๘ มกราคม ๒๕๖๕

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๖ ราย

- ๑) นางสาวสุภาพร จันทะรัง
- ๒) นางสาวชัชชัย โกมารกุล ณ นคร
- ๓) นายศราวุธ จิตวานนท์
- ๔) นางสาวกนกกร เอนก
- ๕) นายสุริยา สอนแก้ว
- ๖) นายวิฑูรย์ ชุมพรวิทย์

ทะเบียนเลขที่ ๖-๒๐๕-๕๐๙-๕๐๙-๕๐๙
ทะเบียนเลขที่ ๖-๒๐๕-๕๐๙-๕๐๙-๕๐๙
ทะเบียนเลขที่ ๖-๒๐๕-๕๐๙-๕๐๙-๕๐๙
ทะเบียนเลขที่ ๖-๒๐๕-๕๐๙-๕๐๙-๕๐๙
ทะเบียนเลขที่ ๖-๒๐๕-๕๐๙-๕๐๙-๕๐๙



ผู้ชำนาญการอาวุโสและโฆษกสำนักงาน
ปฏิบัติการทางเคมีและสิ่งแวดล้อม

เอกสารแนบท้ายหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท เอแอนด์เอส แลบริทอรี่ กรุ๊ป (ประเทศไทย) จำกัด เลขทะเบียน ๖-๒๐๕
ที่ อก ๐๓๑๐(๑) ๑๐๖๕ ลงวันที่ ๒๘ มกราคม ๒๕๖๕

๑)	ทะเบียนเลขที่
๒)	ทะเบียนเลขที่
๓)	ทะเบียนเลขที่
๔)	ทะเบียนเลขที่
๕)	ทะเบียนเลขที่
๖)	ทะเบียนเลขที่
๗)	ทะเบียนเลขที่
๘)	ทะเบียนเลขที่
๙)	ทะเบียนเลขที่
๑๐)	ทะเบียนเลขที่
๑๑)	ทะเบียนเลขที่
๑๒)	ทะเบียนเลขที่
๑๓)	ทะเบียนเลขที่
๑๔)	ทะเบียนเลขที่
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๒๙)	ทะเบียนเลขที่
๓๐)	ทะเบียนเลขที่
๓๑)	ทะเบียนเลขที่
๓๒)	ทะเบียนเลขที่
๓๓)	ทะเบียนเลขที่
๓๔)	ทะเบียนเลขที่

อธิบดีกรมโรงงานอุตสาหกรรม
ผู้ชำนาญการอาวุโสและโฆษกสำนักงาน
ปฏิบัติการทางเคมีและสิ่งแวดล้อม

๓๕) นางสาวปราณีทิพย์...

ผู้ชำนาญการอาวุโสและโฆษกสำนักงาน
ปฏิบัติการทางเคมีและสิ่งแวดล้อม

๓๖) นายสมบูรณ์...

๑๖๖)	ทะเลเบียมเลา
๑๖๗)	ทะเลเบียมเลา
๑๖๘)	ทะเลเบียมเลา
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๑๙๙)	ทะเลเบียมเลา
๒๐๐)	ทะเลเบียมเลา

๑๖๖) นายมนตรี...

๑๖๖)	ทะเลเบียมเลา
๑๖๗)	ทะเลเบียมเลา
๑๖๘)	ทะเลเบียมเลา
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๒๐๐)	ทะเลเบียมเลา

๑๖๖) นางสาวสุภากร...

๑๖๖)	ทะเลเบียมเลา
๑๖๗)	ทะเลเบียมเลา
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๑๙๙)	ทะเลเบียมเลา
๒๐๐)	ทะเลเบียมเลา

(นายศิริ จันทวิมล)
 ๑๖๖) นายมนตรี...

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกสาร
 บริษัท เอนเอเอส แล็บราทอรี กรุ๊ป (ประเทศไทย) จำกัด เลขทะเบียน ๖-๒๐๐๔
 ที่ ๒๐๑๐(๑) ๑๐๖๕ ลงวันที่ ๒๘ มกราคม ๒๕๖๕

ขอขยายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๑๖๑ รายการ

แนบท้าย 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, Titrmetric Method ⁽⁴⁾
16	Chlordane	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
17	Chromium	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ⁽⁴⁾
18	Color	ADMI Weighted-Ordinate Spectrophotometric Method

(นายศิริ จันทวิมล)
 ๑๖๖) นายมนตรี...

19 Copper...

ลำดับที่	สารเคมี	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) DPD Ferrous Titrimetric Method ⁽⁴⁾ 2) Iodometric Method ⁽⁴⁾
35	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
36	Heptachlor epoxide	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
37	Hexavalent Chromium	Filtration, Colorimetric Method ⁽⁴⁾
38	3-Hydroxycarbofuran	High-Performance Liquid Chromatographic Method ⁽⁴⁾
39	Lead	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
40	Manganese	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
41	Mercury	1) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/Mass spectrometric Method ⁽⁴⁾
42	Methiocarb	High-Performance Liquid Chromatographic Method ⁽⁴⁾
43	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾

44 Methomyl...

(นาง) [redacted] [redacted]
ผู้อำนวยการศูนย์มาตรฐานวิธีวิเคราะห์และทดสอบ
กรมส่งเสริมการค้าระหว่างประเทศ

ลำดับที่	สารเคมี	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⁾

นับได้ต้น จำนวน 126 รายการ

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

3 Aldrin...

(นาง) [redacted] [redacted]
ผู้อำนวยการศูนย์มาตรฐานวิธีวิเคราะห์และทดสอบ
กรมส่งเสริมการค้าระหว่างประเทศ

ลำดับที่	สารเคมี	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⁾

Bis(2-ethylhexyl)phthalate...

(นาง) [redacted] [redacted]
ผู้อำนวยการศูนย์มาตรฐานวิธีวิเคราะห์และทดสอบ
กรมส่งเสริมการค้าระหว่างประเทศ

ลำดับที่	สารเคมี	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⁾

34 Chromium (III)...

(นาง) [redacted] [redacted]
ผู้อำนวยการศูนย์มาตรฐานวิธีวิเคราะห์และทดสอบ
กรมส่งเสริมการค้าระหว่างประเทศ

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⁾

cis-1,2-Dichloroethylene...

ผู้ดำเนินการตรวจวัด/วิเคราะห์ข้อมูล
.....เป็นต้นฉบับที่.....

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⁾

Fluorene...

ผู้ดำเนินการตรวจวัด/วิเคราะห์ข้อมูล
.....เป็นต้นฉบับที่.....

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⁾

84 Methanol...

ผู้ดำเนินการตรวจวัด/วิเคราะห์ข้อมูล
.....เป็นต้นฉบับที่.....

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⁾

7 Pentachloropheno...

ผู้ดำเนินการตรวจวัด/วิเคราะห์ข้อมูล
.....เป็นต้นฉบับที่.....

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
97	Pentachlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
98	pH	Electrometric Method ⁽⁴⁾
99	Phenanthrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
100	Phenol	1) Distillation, Direct Photometric Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
101	Pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
102	Selenium	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
103	Silver	1) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ⁽⁴⁾
104	Styrene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
105	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
106	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
107	Toluene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
108	Toxaphene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ⁽⁴⁾
109	TPH (C ₅ -C ₉)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(13,24)
110	TPH (C ₁₀ -C ₁₆)	Solvent Extraction, Gas Chromatographic Method ^(9,21)
111	TPH (C ₁₀ -C ₁₆)	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⁾

1,1,2-Trichloroethane...

ผู้ดำเนินการควบคุมการตรวจวัด:
นายชัชวาลย์ วัฒนศิริ

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⁾

ตรวจวิเคราะห์ (ปัจจัยระหว่าง) จำนวน 16 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Antimony	Isokinetic, Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
2	Arsenic	Isokinetic, Digestion, Inductively Coupled Plasma Method ⁽⁴⁾

Carbon Monoxide...

ผู้ดำเนินการควบคุมการตรวจวัด:
นายชัชวาลย์ วัฒนศิริ

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

สิ่งปลูก...

ผู้ดำเนินการ...

สิ่งปลูกหรือวัสดุที่ไม่ใช่ตัว จำนวน 35 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Aldrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,4,25) 2) Soxhlet Extraction, Gas Chromatographic Method ^(1,4,25) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(22,31)
2	Antimony	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,4,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,4,16) 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 ^(1,4,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,4,16) 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 ^(1,4,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,4,16) 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 ^(1,4,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,4,16) 3) Digestion, Inductively Coupled Plasma Method ^(7,15) 4) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method ^(7,16)

6 Cadmium...

ผู้ดำเนินการควบคุมการตรวจวัด:
นายชัชวาลย์ วัฒนศิริ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
6	Cadmium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1.6.18) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1.6.18) 3) Digestion, Inductively Coupled Plasma Method ^(7.1.18) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7.1.18)
7	Chlordane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.25) 2) Soxhlet Extraction, Gas Chromatographic Method ^(1.9.25) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(1.9.25)
8	Chromium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1.6.18) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1.6.18) 3) Digestion, Inductively Coupled Plasma Method ^(7.1.18) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7.1.18)
9	Chromium (III)	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method; Waste Extraction, Colorimetric Method; Calculation Method ^(1.6.18, 1.7) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method; Waste Extraction, Colorimetric Method; Calculation Method ^(1.6.18, 1.7) 3) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^(7.1.18, 1.7) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^(7.1.18, 1.7)
10	Chromium (VI)	1) Waste Extraction, Colorimetric Method ^(1.6.17) 2) Alkaline Digestion, Colorimetric Method ^(1.6.17)

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ผู้ชำนาญการด้าน...

11 Cobalt...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
11	Cobalt	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1.6.18) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1.6.18) 3) Digestion, Inductively Coupled Plasma Method ^(7.1.18) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7.1.18)
12	Copper	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1.6.18) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1.6.18) 3) Digestion, Inductively Coupled Plasma Method ^(7.1.18) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7.1.18)
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 ^(1.9.25) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(1.9.25)
14	DDD	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.25) 2) Soxhlet Extraction, Gas Chromatographic Method ^(1.9.25) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(1.9.25)
15	DOE	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.25) 2) Soxhlet Extraction, Gas Chromatographic Method ^(1.9.25) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(1.9.25)
16	DDT	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.25)

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2) Soxhlet...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
17	Dieldrin	2) Soxhlet Extraction, Gas Chromatographic Method ^(1.9.25) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(1.9.25)
18	Endrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.25) 2) Soxhlet Extraction, Gas Chromatographic Method ^(1.9.25) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(1.9.25)
19	Heptachlor	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.25) 2) Soxhlet Extraction, Gas Chromatographic Method ^(1.9.25) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(1.9.25)
20	Lead	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1.6.18) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1.6.18) 3) Digestion, Inductively Coupled Plasma Method ^(7.1.18) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7.1.18)
21	Lindane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.25) 2) Soxhlet Extraction, Gas Chromatographic Method ^(1.9.25) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(1.9.25)
22	Mercury	1) Waste Extraction, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^(1.6.18)

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ผู้ชำนาญการด้าน...

2) Waste Extraction...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
23	Methoxychlor	2) Waste Extraction, Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method ^(1.6.18) 3) Waste Extraction, Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method ^(1.6.20) 4) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^(1.6) 5) Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method ^(1.6) 6) Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method ^(1.6)
24	Mirex	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1.9.25) 2) Soxhlet Extraction, Gas Chromatographic Method ^(1.9.25) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(1.9.25)
25	Molybdenum	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1.6.18) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1.6.18) 3) Digestion, Inductively Coupled Plasma Method ^(7.1.18) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7.1.18)
26	Nickel	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1.6.18) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1.6.18) 3) Digestion, Inductively Coupled Plasma Method ^(7.1.18) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7.1.18)

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ผู้ชำนาญการด้าน...

27 Polychlorinated...

ลำดับที่	สารเคมี	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 - 2,3',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',4,6-Pentachlorobiphenyl - 2,2',3,4,5'-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',5,6-Nonachlorobiphenyl	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(1,9,23) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10,23) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(23,31)

chlorophenol...

ผู้แทน

ลำดับที่	สารเคมี	วิธีวิเคราะห์
28	Pentachlorophenol	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,25) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10,23) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(23,31)
29	pH	Electrometric Method ^(26,30)
30	Selenium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,4,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,4,16) 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 ^(1,4,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,4,16)
32	Thallium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,4,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,4,16) 3) Digestion, Inductively Coupled Plasma Method ^(7,15) 4) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,16)
33	Toxaphene	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,25) 2) Soxhlet Extraction, Gas Chromatographic Method ^(10,23) 3) Automated Soxhlet Extraction, Gas Chromatographic Method ^(23,31)
34	Vanadium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,4,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(1,4,16) 3) Digestion, Inductively Coupled Plasma Method ^(7,15)

4) Digestion...

ผู้แทน

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

ดิน จำนวน 125 รายการ

ลำดับที่	สารเคมี	วิธีวิเคราะห์
1	Acenaphthene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(23,31)
2	Acetone	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,24)
3	Aldrin	1) Soxhlet Extraction, Gas Chromatographic Method ^(10,23) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(23,31)
4	Anthracene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(23,31)
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 ^(10,23) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(23,31)
8	Barium	1) Digestion, Inductively Coupled Plasma Method ^(7,15) 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,16)

(a)anthracene...

ผู้แทน

ลำดับที่	สารเคมี	วิธีวิเคราะห์
9	Benzo(a)anthracene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(23,31)
10	Benzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,24)
11	Benzo(b)fluoranthene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(23,31)
12	Benzo(k)fluoranthene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(23,31)
13	Benzoic acid	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(23,31)
14	Benzo(a)pyrene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(23,31)
15	Benzog(h)perylene	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(23,31)
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 ^(23,31)
18	Bis(2-ethylhexyl)phthalate	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(23,31)
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 ^(23,31)
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 ^(23,31)
25	Carbon Disulfide	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,24)

26 Carbon tetrachloride...

ผู้แทน

ลำดับที่	สารเคมี	วิธีวิเคราะห์
26	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(14,24)
27	Chlordane	1) Soxhlet Extraction, Gas Chromatographic Method ^(14,22) 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 ^(7,14,17) 2) Digestion, Inductively Coupled Plasma/ Mass Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^(7,14,17)
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 ^(25,27,28)
38	2,4-D	1) Soxhlet Extraction, Gas Chromatographic Method ^(10,25) 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)

40 DDE...

(ใน [redacted])
 ๖๖๖สารพิษตกค้างในอาหารและสิ่งแวดล้อม

ลำดับที่	สารเคมี	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)

57 Dieldrin...

(ใน [redacted])
 ๖๖๖สารพิษตกค้างในอาหารและสิ่งแวดล้อม

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

71 Hexachlorobenzene...

(ใน [redacted])
 ๖๖๖สารพิษตกค้างในอาหารและสิ่งแวดล้อม

ลำดับที่	สารเคมี	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 Method ^(7,18)

2) Thermal...

(ใน [redacted])
 ๖๖๖สารพิษตกค้างในอาหารและสิ่งแวดล้อม

ลำดับที่	สารเคมี	วิธีวิเคราะห์
84	Methanol	2) Thermal Decomposition, Amalgamation, and Atomic Absorption Spectrophotometry ^(7,11) 3) Digestion, Cold-Vapor Atomic Fluorescence Spectrometric Method ⁽²³⁾
85	Methoxychlor	Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(14,24)
86	Methyl Bromide	1) Soxhlet Extraction, Gas Chromatographic Method ^(10,25) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(25,31)
87	Methylene Chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,24)
88	2-methylphenol	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,24)
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 ^(7,13) 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 ^(10,28) 2) Automated Soxhlet Extraction, Gas Chromatographic Method ^(25,31)

- Aroclor 1242...

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

101 Selenium...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
101	Selenium	1) Digestion, Inductively Coupled Plasma Method ^(7,13) 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,14)
102	Silver	1) Digestion, Inductively Coupled Plasma Method ^(7,13) 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 ^(10,22) 2) Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(25,31)
108	TPH (C ₅ -C ₉)	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,24)
109	TPH (C ₁₀ -C ₁₄)	1) Solvent Extraction, Gas Chromatographic Method ^(11,21) 2) Automated Soxhlet Extraction, Gas Chromatographic Method ^(21,31)
110	TPH (C ₁₅ -C ₃₅)	1) Solvent Extraction, Gas Chromatographic Method ^(11,21) 2) Automated Soxhlet Extraction, Gas Chromatographic Method ^(21,31)
111	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,24)
112	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,24)
113	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,24)
114	Trichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,24)
115	2,4,5-Trichlorophenol	Automated Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(25,31)

116 2,4,6-Trichlorophenol...

ลำดับที่	สารเคมี	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 ^(7,13) 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 ^(7,13) 2) Digestion, Inductively Coupled Plasma/Mass Spectrometric Method ^(7,14)

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นางสาวกัญญาพร นิลศิริ

กลุ่มงานวิชาการบริหารงานพิเศษและงานอื่นที่เกี่ยวข้องกับการ ก่อตั้งและดำเนินงานของหน่วยงาน การร่วมทุนสหสาขาวิชา โทร. ๐ ๒๖๒๑ ๕๐๐๕, ๕๐๑๖

บริษัท เอสจีเอส (ประเทศไทย) จำกัด

ลำดับที่	สารเคมี	วิธีการตรวจ
1	Acenaphthene	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
2	Acetone	Purge and Trap Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
3	Aldrin	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
4	Anthracene	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
5	Antimony	Digestion, Inductively Coupled Plasma Method ⁽¹⁾
6	Arsenic	Digestion, Inductively Coupled Plasma Method ⁽¹⁾
7	Atrazine	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
8	Barium	Digestion, Inductively Coupled Plasma Method ⁽¹⁾
9	Benzene	Purge and Trap Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
10	Benzo(a)anthracene	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
11	Benzo(b)fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
12	Benzo(k)fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
13	Benzoic acid	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
14	Benzo(a)pyrene	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
15	Benzo(g,h,i)perylene	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
16	Beryllium	Digestion, Inductively Coupled Plasma Method ⁽¹⁾
17	Bis(2-chloroethyl)ether	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
18	Bis(2-Ethylhexyl)phthalate	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
19	Bromodichloromethane	Purge and Trap Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
20	Bromoform	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾

21 Butyl...

ลำดับที่	สารเคมี	วิธีการตรวจ
21	Butyl benzyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
22	Cadmium	Digestion, Inductively Coupled Plasma Method ⁽¹⁾
23	Carbazole	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
24	Carbon disulfide	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
25	Carbon tetrachloride	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
26	Chlordane	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
27	p-Chloroaniline	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
28	Chlorobenzene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
29	Chlorodibromomethane	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
30	Chloroform	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
31	2-Chlorophenol	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
32	Chromium	Digestion, Inductively Coupled Plasma Method ⁽¹⁾
33	Chromium Hexavalent	Filtration, Colorimetric Method ⁽¹⁾
34	Chromium Trivalent	Digestion, Inductively Coupled Plasma Method ; Filtration, Colorimetric Method; Calculation ⁽¹⁾
35	Chrysene	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
36	Cyanide	Distillation, Colorimetric Method
37	2,4-D	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
38	DDD	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
39	DDE	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
40	DDT	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾

41 Dibenz...

ลำดับที่	สารเคมี	วิธีการตรวจ
41	Dibenz(a,h)anthracene	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
42	Di-n-Butyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
43	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
44	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
45	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
46	3,3-Dichlorobenzidine	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
47	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
48	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
49	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
50	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
51	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
52	2,4-Dichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
53	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
54	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
55	1,3-Dichloropropene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
56	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
57	Diethyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
58	2,4-Dimethylphenol	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾

59 Dinitrophenol...

ลำดับที่	สารเคมี	วิธีการตรวจ
59	2,4-Dinitrophenol	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
60	2,4-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
61	2,6-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
62	Di-n-octyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
63	Endosulfan	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
64	Endrin	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
65	Ethylbenzene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
66	Fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
67	Fluorene	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
68	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
69	Heptachlor epoxide	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
70	Hexachlorobenzene	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
71	Hexachloro-1,3-butadiene	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
72	α-HCH	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
73	β-HCH	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
74	γ-HCH	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
75	Hexachlorocyclopentadiene	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
76	Hexachloroethane	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾

77 n-Hexane...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
77	n-Hexane	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method
78	Indeno(1,2,3-cd)pyrene	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
79	Isophorone	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽²⁾
80	Lead	Digestion, Inductively Coupled Plasma Method ⁽¹⁾
81	Manganese	Digestion, Inductively Coupled Plasma Method ⁽¹⁾
82	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽¹⁾
83	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
84	Methyl Bromide	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
85	Methylene Chloride	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
86	2-Methylnaphthalene	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
87	2-Methylphenol	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
88	Methyl tert-butyl ether	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
89	Naphthalene	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
90	Nickel	Digestion, Inductively Coupled Plasma Method ⁽¹⁾
91	Nitrobenzene	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
92	N-Nitrosodiphenylamine	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
93	N-Nitrosodi-n-propylamine	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
94	Pentachlorophenol	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
95	pH	Electrometric Method ⁽¹⁾
96	Phenanthrene	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾

ลำดับที่	สารเคมี	วิธีวิเคราะห์
97	Phenol	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
98	Pyrene	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
99	Selenium	Digestion, Inductively Coupled Plasma Method ⁽¹⁾
100	Silver	Digestion, Inductively Coupled Plasma Method ⁽¹⁾
101	Styrene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
102	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
103	Tetrachloroethylene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
104	Toluene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
105	Toxaphene	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
106	TPH (C ₇ -C ₉)	Purge and Trap, Gas Chromatographic Mass Spectrometric Method
107	TPH (C ₁₀ -C ₁₄)	Purge and Trap, Gas Chromatographic Mass Spectrometric Method
108	TPH (C ₁₅ -C ₂₅)	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
109	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
110	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
111	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
112	Trichloroethylene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
113	2,4,5-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
114	2,4,6-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
115	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
116	Vanadium	Digestion, Inductively Coupled Plasma Method ⁽¹⁾

117 Vinyl...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
117	Vinyl acetate	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
118	Vinyl chloride	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
119	m-Xylene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
120	o-Xylene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
121	p-Xylene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
122	Xylene (Total)	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
123	Zinc	Digestion, Inductively Coupled Plasma Method ⁽¹⁾

จากคณะ (ปล่องระบาย) จำนวน 28 รายการ

ลำดับที่	สารเคมี	วิธีวิเคราะห์
1	Antimony	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽¹⁾
2	Arsenic	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽¹⁾
3	Beryllium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽¹⁾
4	Cadmium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽¹⁾
5	Carbon Monoxide	Instrumental Analyzer Method ⁽¹⁾
6	Chlorine	Isokinetic Sampling, Ion Chromatographic Method ⁽¹⁾
7	Chromium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽¹⁾
8	Cobalt	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽¹⁾
9	Copper	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽¹⁾
10	Cresol	Absorption Sampling, Gas Chromatographic Method ⁽¹⁾
11	Dioxin/Furan	Isokinetic Sampling, Analysis by ISO/IEC 17025 Accredited Laboratory

ลำดับที่	สารเคมี	วิธีวิเคราะห์
12	Hydrogen Chloride	Isokinetic Sampling, Ion Chromatographic Method ⁽¹⁾
13	Hydrogen Fluoride	Isokinetic Sampling, Ion Chromatographic Method ⁽¹⁾
14	Hydrogen Sulfide	Absorption Sampling, Iodometric Method ⁽¹⁾
15	Lead	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽¹⁾
16	Manganese	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽¹⁾
17	Mercury	Isokinetic Sampling, Digestion, Cold Vapour Atomic Absorption Spectrometric Method ⁽¹⁾
18	Nickel	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽¹⁾
19	Opacity	Ringelmann's Method ⁽¹⁾
20	Oxides of Nitrogen	1) Absorption Sampling, Colorimetric Method ⁽¹⁾ 2) Instrumental Analyzer Method ⁽¹⁾
21	Tellurium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽¹⁾
22	Tin	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽¹⁾
23	Total Suspended Particulate	Isokinetic Sampling, Gravimetric Method ⁽¹⁾
24	Selenium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽¹⁾
25	Sulfur Dioxide	1) Absorption Sampling, Barium-Thioin Titrimetric Method ⁽¹⁾ 2) Instrumental Analyzer Method ⁽¹⁾
26	Sulfuric Acid	Isokinetic Sampling, Barium-Thioin Titrimetric Method ⁽¹⁾
27	Vanadium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽¹⁾
28	Xylene	Absorption Sampling, Gas Chromatographic Method ⁽¹⁾

สิ่งปฏิกูลหรือวัสดุ...

สิ่งปฏิกูลหรือวัสดุไม่ใช้แล้ว จำนวน 37 รายการ

ลำดับที่	สารเคมี	วิธีวิเคราะห์
1	Aldrin	Ultrasonic Extraction, Gas Chromatographic Method ⁽²⁾⁽²⁾⁽¹⁾
2	Antimony	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ⁽⁸⁾⁽¹²⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁸⁾⁽¹⁵⁾
3	Arsenic	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ⁽²⁾⁽¹⁵⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁸⁾⁽¹⁵⁾
4	Barium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ⁽²⁾⁽¹⁵⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁸⁾⁽¹⁵⁾
5	Beryllium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ⁽²⁾⁽¹⁵⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁸⁾⁽¹⁵⁾
6	Cadmium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ⁽²⁾⁽¹⁵⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁸⁾⁽¹⁵⁾
7	Chlordane	Ultrasonic Extraction, Gas Chromatographic Method ⁽¹²⁾⁽²⁾⁽¹⁾
8	Chromium (III)	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method; Waste Extraction Colorimetric Method; Calculation ⁽³⁾⁽¹⁷⁾ 2) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation Method ⁽²⁾⁽¹⁷⁾
9	Chromium (VI)	1) Waste Extraction, Digestion, Colorimetric Method ⁽³⁾⁽¹⁷⁾ 2) Alkaline Digestion, Colorimetric Method ⁽¹⁶⁾⁽¹⁷⁾
10	Cobalt	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ⁽²⁾⁽¹⁵⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁸⁾⁽¹⁵⁾
11	Copper	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ⁽²⁾⁽¹⁵⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁸⁾⁽¹⁵⁾

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Dieldrin...

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ลำดับที่	สารเคมี	วิธีวิเคราะห์
12	Dieldrin	Ultrasonic Extraction, Gas Chromatographic Method ⁽¹²⁾⁽²⁾⁽¹⁾
13	DDD	Ultrasonic Extraction, Gas Chromatographic Method ⁽¹²⁾⁽²⁾⁽¹⁾
14	DDE	Ultrasonic Extraction, Gas Chromatographic Method ⁽¹²⁾⁽²⁾⁽¹⁾
15	DDT	Ultrasonic Extraction, Gas Chromatographic Method ⁽¹²⁾⁽²⁾⁽¹⁾
16	2,4-D (2,4-Dichlorophenoxyacetic acid)	Ultrasonic Extraction, Gas Chromatographic Method ⁽¹²⁾⁽²⁾⁽¹⁾
17	Endrin	Ultrasonic Extraction, Gas Chromatographic Method ⁽¹²⁾⁽²⁾⁽¹⁾
18	Heptachlor	Ultrasonic Extraction, Gas Chromatographic Method ⁽¹²⁾⁽²⁾⁽¹⁾
19	Kepon	Ultrasonic Extraction, Gas Chromatographic Method ⁽¹²⁾⁽²⁾⁽¹⁾
20	Lead	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ⁽²⁾⁽¹⁵⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁸⁾⁽¹⁵⁾
21	Lindane	Ultrasonic Extraction, Gas Chromatographic Method ⁽¹²⁾⁽²⁾⁽¹⁾
22	Mercury	1) Waste Extraction, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽¹⁴⁾⁽¹⁶⁾ 2) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽¹⁴⁾
23	Methoxychlor	Ultrasonic Extraction, Gas Chromatographic Method ⁽¹²⁾⁽²⁾⁽¹⁾
24	Mirex	Ultrasonic Extraction, Gas Chromatographic Method ⁽¹²⁾⁽²⁾⁽¹⁾
25	Molybdenum	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ⁽²⁾⁽¹⁵⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁸⁾⁽¹⁵⁾
26	Polychlorinated Biphenyls (PCBs)	Ultrasonic Extraction, Gas Chromatographic Method ⁽¹²⁾⁽²⁾⁽¹⁾
27	Pentachlorophenol	Ultrasonic Extraction, Gas Chromatographic Method ⁽¹²⁾⁽²⁾⁽¹⁾
28	Nickel	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ⁽²⁾⁽¹⁵⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁸⁾⁽¹⁵⁾
29	Selenium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ⁽²⁾⁽¹⁵⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁸⁾⁽¹⁵⁾

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26 Chlordane...

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ลำดับที่	สารเคมี	วิธีวิเคราะห์
30	Silver	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ⁽³⁾⁽¹⁵⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁸⁾⁽¹⁵⁾
31	Silvex; 2,4,5-Trichlorophenoxyisopropyl acid	Ultrasonic Extraction, Gas Chromatographic Method ⁽¹²⁾⁽²⁾⁽¹⁾
32	Thallium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ⁽²⁾⁽¹⁵⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁸⁾⁽¹⁵⁾
33	Total Chromium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method; Waste Extraction Colorimetric Method; Calculation ⁽⁸⁾⁽¹⁷⁾ 2) Digestion, Inductively Coupled Plasma - Atomic Emission Spectrometry Method ⁽⁸⁾⁽¹⁷⁾
34	Toxaphene	Ultrasonic Extraction, Gas Chromatographic Method ⁽¹²⁾⁽²⁾⁽¹⁾
35	Trichloroethylene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁴⁾⁽²¹⁾
36	Vanadium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ⁽²⁾⁽¹⁵⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁸⁾⁽¹⁵⁾
37	Zinc	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ⁽²⁾⁽¹⁵⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁸⁾⁽¹⁵⁾

สิ่ง จำนวน 123 รายการ

ลำดับที่	สารเคมี	วิธีวิเคราะห์
1	Acenaphthene	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁴⁾⁽²¹⁾
2	Acetone	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁴⁾⁽²¹⁾
3	Aldrin	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁴⁾⁽²¹⁾
4	Anthracene	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁴⁾⁽²¹⁾
5	Antimony	Digestion, Inductively Coupled Plasma Method ⁽⁸⁾⁽¹⁵⁾

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26 Chlordane...

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ลำดับที่	สารเคมี	วิธีวิเคราะห์
6	Arsenic	Digestion, Inductively Coupled Plasma Method ⁽⁸⁾⁽¹⁵⁾
7	Atrazine	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁴⁾⁽²¹⁾
8	Barium	Digestion, Inductively Coupled Plasma Method ⁽⁸⁾⁽¹⁵⁾
9	Benzolanthracene	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁴⁾⁽²¹⁾
10	Benzene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁴⁾⁽²¹⁾
11	Benz(b)fluoranthene	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁴⁾⁽²¹⁾
12	Benz(k)fluoranthene	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁴⁾⁽²¹⁾
13	Benzoic acid	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁴⁾⁽²¹⁾
14	Benzo(a)pyrene	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁴⁾⁽²¹⁾
15	Benzo(g,h,i)perylene	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁴⁾⁽²¹⁾
16	Beryllium	Digestion, Inductively Coupled Plasma Method ⁽⁸⁾⁽¹⁵⁾
17	Bis(2-Chloroethyl)ether	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁴⁾⁽²¹⁾
18	Bis(2-Ethylhexyl)phthalate	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁴⁾⁽²¹⁾
19	Bromodichloromethane	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁴⁾⁽²¹⁾
20	Bromoform	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁴⁾⁽²¹⁾
21	Butyl benzyl phthalate	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁴⁾⁽²¹⁾
22	Cadmium	Digestion, Inductively Coupled Plasma Method ⁽⁸⁾⁽¹⁵⁾
23	Carbazole	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁴⁾⁽²¹⁾
24	Carbon disulfide	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁴⁾⁽²¹⁾
25	Carbon tetrachloride	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁴⁾⁽²¹⁾

26 Chlordane...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
26	Chlordane	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,26)
27	p-Chloroaniline	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,26)
28	Chlorobenzene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ^(21,27)
29	Chlorodibromomethane	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ^(21,28)
30	Chloroform	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ^(21,27)
31	2-Chlorophenol	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,29)
32	Chromium	Digestion, Inductively Coupled Plasma Method ^(9,13)
33	Chromium (III)	Digestion, Inductively Coupled Plasma Method ; Titration, Colorimetric Method; Calculation ^(9,10,14)
34	Chromium (IV)	Alkaline Digestion, Colorimetric Method ⁽¹⁰⁾
35	Chrysene	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,30)
36	Cyanide	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,31)
37	2,4-D	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,32)
38	DDD	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,33)
39	DDE	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,33)
40	DDT	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,34)
41	Dibenz(a,h)anthracene	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,35)
42	Di-n-butyl phthalate	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,36)
43	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ^(21,37)

44 1,3-Dichlorobenzene...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
44	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ^(21,38)
45	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ^(21,39)
46	3,3-Dichlorobenzidine	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,40)
47	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ^(21,41)
48	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ^(21,42)
49	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ^(21,43)
50	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ^(21,44)
51	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ^(21,45)
52	2,4-Dichlorophenol	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,46)
53	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ^(21,47)
54	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ^(21,48)
55	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ^(21,49)
56	Dieldrin	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,50)
57	Diethyl phthalate	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,51)
58	2,4-Dimethylphenol	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,52)
59	2,4-Dinitrophenol	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,53)
60	2,4-Dinitrotoluene	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,54)
61	2,6-Dinitrotoluene	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,55)

ลำดับที่	สารเคมี	วิธีวิเคราะห์
62	Di-n-octyl phthalate	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,56)
63	Endosulfan	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,57)
64	Endrin	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,58)
65	Ethylbenzene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ^(21,59)
66	Fluoranthene	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,60)
67	Fluorene	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,61)
68	Heptachlor	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,62)
69	Heptachlor epoxide	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,63)
70	Hexachlorobenzene	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,64)
71	Hexachloro-1,3-butadiene	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,65)
72	α-HCH	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,66)
73	β-HCH	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,67)
74	γ-HCH	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,68)
75	Hexachlorocyclopentadiene	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,69)
76	Hexachloroethane	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,70)
77	n-Hexane	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ^(21,71)
78	Indeno(1,2,3-cd)pyrene	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,72)
79	Isophorone	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,73)
80	Lead	Digestion, Inductively Coupled Plasma Method ^(9,15)

ลำดับที่	สารเคมี	วิธีวิเคราะห์
81	Manganese	Digestion, Inductively Coupled Plasma Method ^(9,15)
82	Mercury	Digestion, Cold vapor Atomic Absorption Spectrometric Method
83	Methoxychlor	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,74)
84	Methyl Bromide	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ^(21,75)
85	Methylene Chloride	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ^(21,76)
86	2-Methylnaphthalene	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,77)
87	2-Methylphenol	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,78)
88	Methyl tert-butyl ether	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ^(21,79)
89	Naphthalene	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,80)
90	Nickel	Digestion, Inductively Coupled Plasma Method ^(9,15)
91	Nitrobenzene	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,81)
92	N-Nitrosodiphenylamine	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,82)
93	N-Nitrosodi-n-propylamine	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,83)
94	Pentachlorophenol	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,84)
95	Phenanthrene	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,85)
96	Phenol	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,86)
97	Polychlorinated Biphenyls (PCBs)	Ultrasonic Extraction, Gas Chromatographic Method ^(9,16)
98	Pyrene	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(21,87)
99	Selenium	Digestion, Inductively Coupled Plasma Method ^(9,15)
100	Silver	Digestion, Inductively Coupled Plasma Method ^(9,18)

101 Styrene...

ลำดับที่	สารเคมี	วิธีการตรวจ
101	Styrene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ^(1,2)
102	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ^(1,2)
103	Tetrachloroethylene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ^(1,2)
104	Toluene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ^(1,2)
105	Toxaphene	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(1,2)
106	TPH (C ₇ -C ₉)	Purge and Trap, Gas Chromatographic Mass Spectrometric Method ^(1,2)
107	TPH (C ₁₀ -C ₁₄)	Ultrasonic Extraction, Gas Chromatographic Mass Spectrometric Method ^(1,2)
108	TPH (C ₁₅ -C ₁₉)	Ultrasonic Extraction, Gas Chromatographic Mass Spectrometric Method ^(1,2)
109	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ^(1,2)
110	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ^(1,2)
111	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ^(1,2)
112	Trichloroethylene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ^(1,2)
113	2,4,5-Trichlorophenol	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(1,2)
114	2,4,6-Trichlorophenol	Microwave Extraction, Gas Chromatographic / Mass Spectrometric Method ^(1,2)
115	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ^(1,2)
116	Vanadium	Digestion, Inductively Coupled Plasma Method ^(1,2)
117	Vinyl Acetate	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ^(1,2)
118	Vinyl Chloride	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ^(1,2)

ลำดับที่	สารเคมี	วิธีการตรวจ
119	m-Xylene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ^(1,2)
120	o-Xylene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ^(1,2)
121	p-Xylene	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ^(1,2)
122	Xylene (Total)	Purge and Trap, Gas Chromatographic / Mass Spectrometric Method ^(1,2)
123	Zinc	Digestion, Inductively Coupled Plasma Method ^(1,2)

เอกสารอ้างอิง

1. กระทรวงสาธารณสุข. ประกาศกระทรวงสาธารณสุข พ.ศ.2549 เรื่อง กำหนดค่าปริมาณสารพิษที่เจือปนในอากาศที่รับมาชดเชยจากปัจจัยของมลพิษในสิ่งแวดล้อม.ราชกิจจานุเบกษา, 4 ธันวาคม 2549, เล่มที่ 123 ตอนพิเศษ 125 1.
2. กระทรวงสาธารณสุข. ประกาศกระทรวงสาธารณสุข พ.ศ.2548 เรื่อง การกำหนดค่าปริมาณสารพิษที่เจือปนในอากาศ.ราชกิจจานุเบกษา, 25 มกราคม 2549, เล่มที่ 123 ตอนพิเศษ 114.
3. แผนกวิศวกรรมสิ่งแวดล้อมแห่งประเทศไทย. คู่มือวิเคราะห์น้ำเสีย. พิมพ์ครั้งที่ 4. กรุงเทพฯ: เอ็นแม็กมาคัลเลอร์, 2547.
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Ref No.: 0303/6168

CERTIFICATE OF TESTING LABORATORY ACCREDITATION

This is to certify that

SGS (Thailand) Limited, Laboratory Services
41/23 Soi Rama III (59), Rama III Road,
Chongnonsee, Yannawa, Bangkok 10120

has successfully undergone assessment according to ISO/IEC 17025:2017
and under the Bureau of Laboratory Accreditation, Department of Science Service
for the requirements, regulations and criteria for the competence of testing laboratories

LABORATORY ACCREDITATION
Accreditation Number TESTING - 0017
BLA-DSS

The scope of accreditation is as annexed hereto

Issue date : 21st April 2020Expired date : 20th April 2023

Signature :

Director of

Bureau of Laboratory Accreditation, Department of Science Service,
Ministry of Higher Education, Science, Research and Innovation

Scope of Laboratory Accreditation

Laboratory Name : SGS (Thailand) Limited, Laboratory Services

Address : 41/23 Soi Rama III (59), Rama III Road,
Chongnonsee, Yannawa, Bangkok 10120

Accreditation Number : TESTING - 0017

Laboratory Status : ☒ Permanent ☐ Site ☐ Temporary ☐ Mobile

Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
1	Water	- Cadmium 0.002 mg/L to 0.1 mg/L - Copper 0.01 mg/L to 1.0 mg/L - Lead 0.01 mg/L to 1.0 mg/L - Manganese 0.1 mg/L to 4.0 mg/L - Nickel 0.01 mg/L to 1.0 mg/L - Zinc 0.01 mg/L to 1.0 mg/L - Arsenic 0.002 mg/L to 0.036 mg/L	In - house method : LBEN-05119 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 3120 B In - house method : LBEN-05119 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 3114 C

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Laboratory Status : ☒ Permanent ☐ Site ☐ Temporary ☐ Mobile

Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
1	Water	- Antimony 0.63 µg/L to 6.25 µg/L - Arsenic 0.63 µg/L to 6.25 µg/L - Cadmium 0.63 µg/L to 6.25 µg/L - Chromium 0.63 µg/L to 12.5 µg/L - Cobalt 1.25 µg/L to 62.50 µg/L - Copper 0.63 µg/L to 6.25 µg/L - Lead 0.63 µg/L to 6.25 µg/L - Manganese 0.63 µg/L to 6.25 µg/L	In - house method : LBEN-14004 based on United States Environmental Protection Agency, 2014, EPA Method 6020B, Revision 2

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Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
1 (cont.)	Water	- Nickel 0.63 µg/L to 6.25 µg/L - Silver 2.5 µg/L to 62.5 µg/L - Zinc 2.5 µg/L to 62.5 µg/L - Mercury 0.5 mg/L to 8.0 mg/L - Hexavalent chromium 1.0 µg/L to 6.25 µg/L	In - house method : LBEN-14004 based on United States Environmental Protection Agency, 2014, EPA Method 6020B, Revision 2 In - house method : LBEN-08145 based on United States Environmental Protection Agency, 1994, EPA Method 245.1, Revision 3.0 ISO 18412 : 2005

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Item Number	Test Material / Product	Test item / Range of Testing	Test Method / Technique Used
1 (cont.)	Water	- pH 6.0 to 10.0 - Ammonia - Nitrogen 0.10 mg/L to 10.0 mg/L - Total phosphorus 0.10 mg/L to 10.0 mg/L	In - house method : LBEN-09152 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 - H ⁺ B In-house method : LBEN-19003 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 NH ₃ -F In - house method : LBEN-19002 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500-P J

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Item Number	Test Material / Product	Test item / Range of Testing	Test Method / Technique Used
1 (cont.)	Water	- Oil and Grease 0.50 mg/L to 100.0 mg/L - Color 5 M ⁻¹ to 30 M ⁻¹ - Phenol 0.001 mg/L to 0.10 mg/L - Cyanide 0.01 mg/L to 0.50 mg/L	In - house method : LBEN-18005 based on United States Environmental Protection Agency, 2010, EPA, Method 1664, Revision 8 ISO 7887 : 2011, method B In - house method : LBEN-15007 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 5550 B, C In - house method : LBEN-97018 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500-CN C, E

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Item Number	Test Material / Product	Test item / Range of Testing	Test Method / Technique Used
1 (cont.)	Water	- Navy Blue 1.0 mg/L to 7.5 mg/L Azo colorants - Aniline - m-Methylaniline - p-Toluidine - o-Toluidine - m-Toluidine - n-ethylamine - 2-chloroaniline - 2,4-Xylydine - 2,5-Xylydine 0.10 µg/L to 3.00 µg/L	In - house method : LBLC-19004 based on United States Environmental Protection Agency, 2007, EPA, Method 8321 B In - house method : SOP LBGC-18004 based on ISO 14362-1 : 2017

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Item Number	Test Material / Product	Test item / Range of Testing	Test Method / Technique Used
1 (cont.)	Water	Azo colorants - o-Anisidine - 4-Chloroaniline - n-n-diethylaniline - p-Cresidine - 2,4,5 - Trimethylaniline - 4-Chloro-o-toluidine - 2,4-Toluenediamine - 2,4 - Diaminoanisole - 2-Naphthylamine - 5-Nitro-o-toluidine - 5-Nitro-o-anilidine - 4-Aminobiphenyl - 4-Aminoazobenzene - 4,4'-Oxydianiline 0.10 µg/L to 3.00 µg/L	In - house method : SOP LBGC-18004 based on ISO 14362-1 : 2017

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Laboratory Status : ☒ Permanent ☐ Site ☐ Temporary ☐ Mobile

Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
1 (cont.)	Water	Azo colorants - Benzidine - 4,4'-Thiodianiline - o-Aminoozotoluene - 3,3'-Dimethyl-4,4'-diaminodiphenylmethane - 3,3'-Dimethylbenzidine - 4,4'-Thiodianiline - 3,3'-Dichlorobenzidine - 4,4'-Methylene-bis-(2-chloro aniline) - 3,3'-Dimethoxybenzidine 0.10 µg/L to 3.00 µg/L	In - house method : SOP LBGC-18004 based on ISO 14362-1 : 2017

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Accreditation Number : Testing - 0017

Laboratory Status : ☒ Permanent ☐ Site ☐ Temporary ☐ Mobile

Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
1 (cont.)	Water	Organotin Compounds - Trimethyltin(TMT) - Dimethyltin(DMT) - Dipropyltin-dichloride(DPrT) - Monobutyltin(MBT) - Tripropyltin(TPrT) - Dibutyltin(DBT) - Tributyltin(TBT) - Monocetyl tin(MOT) - Tetraethyltin(TeBT) - Diphenyltin(DPhT) - Dioctyltin(DOT) - Triphenyltin(TPhT) - Tri-cyclohexyltin(TCyT) - Tri-n-octyltin(TOT) 0.05 µg/L to 2.0 µg/L	In - house method : SOP LBGC-18006 based on ISO 17353 : 2004

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Address : 41/23 Soi Rama III (59), Rama III Road,
Chongnonsee, Yannawa, Bangkok 10120

Accreditation Number : Testing - 0017

Laboratory Status : ☒ Permanent ☐ Site ☐ Temporary ☐ Mobile

Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
1 (cont.)	Water	Polycyclic Aromatic Hydrocarbons (PAHs) - Naphthalene - 2-Methylphthalene - 1-Methylphthalene - Acenaphthylene - Acenaphthene - Fluorene - Phenanthrene - Anthracene - Fluoranthene - Pyrene - Cyclopenta [c,d] pyrene - Benz[a] Anthracene - Chrysene 0.01 µg/L to 2.0 µg/L	In - house method : SOP LBGC-18008 based on DIN 38407-39 : 2011

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Address : 41/23 Soi Rama III (59), Rama III Road,
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Accreditation Number : Testing - 0017

Laboratory Status : ☒ Permanent ☐ Site ☐ Temporary ☐ Mobile

Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
1 (cont.)	Water	Polycyclic Aromatic Hydrocarbons (PAHs) - Benzo (b) Fluoranthene - Benzo (j) Fluoranthene - Benzo (k) Fluoranthene - Benzo (e) pyrene - Benzo (a) pyrene - Indeno (1,2,3-cd) pyrene - Dibenzo (ah) anthracene - Benzo (ghi) perylene 0.01 µg/L to 2.0 µg/L	In - house method : SOP LBGC-18008 based on DIN 38407-39 : 2011

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Address : 41/23 Soi Rama III (59), Rama III Road,
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Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
1 (cont.)	Water	Chlorophenol - 4-Chloro-3-methylphenol - 2-Chlorophenol - 3-Chlorophenol - 4-Chlorophenol - 2,4-Dichlorophenol - 2,5-Dichlorophenol - 2,6-Dichlorophenol - 3,5-Dichlorophenol - 2,3-Dichlorophenol - 3,4-Dichlorophenol - Pentachlorophenol - 2,3,4,6-Tetrachlorophenol 0.5 µg/L to 20.0 µg/L	In - house method : SOP LBGC-18003 based on ISO 17070 : 2015

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Laboratory Status : ☒ Permanent ☐ Site ☐ Temporary ☐ Mobile

Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
1 (cont.)	Water	Chlorophenol - 2,4,5-Trichlorophenol - 2,4,6-Trichlorophenol - 2,3,4-Trichlorophenol - 2,3,5-Trichlorophenol - 3,4,5-Trichlorophenol - 2,3,4,5-Tetrachlorophenol - 2,3,5,6-Tetrachlorophenol - 2,3,6-trichlorophenol 0.5 µg/L to 20.0 µg/L Phthalates - Dimethyl phthalate - Diethyl phthalate - Di-iso-butyl phthalate - Benzyl buthyl phthalate 5 µg/L to 30 µg/L	In - house method : SOP LBGC-18003 based on ISO 17070 : 2015 In - house method : SOP LBGC-18007 based on ISO 18856 : 2004

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Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
1 (cont.)	Water	Phthalates - Di-butyl phthalate - Di-2-ethyl hexyl phthalate - Di-isononyl phthalate - Bis-methylglycol ester phthalate - Di-isoheptyl phthalate - Bis cyclohexyl phthalate - Di-n-octyl phthalate - Bis(2-propylheptyl) phthalate - Bis-nonyl phthalate - Bis-propyl phthalate - Bis-iso-pentyl phthalate - n-pentyl-iso-pentyl phthalate - Bis-n-pentyl phthalate - Di-n-hexyl phthalate - Bis-iso-octyl phthalate - Di-isodecyl phthalate 5 µg/L to 30 µg/L	In - house method : SOP LBGC-18007 based on ISO 18856 : 2004

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Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
1 (cont.)	Water	Volatile Organic Compound - Methylene Chloride - Benzene - 1,2-Dichloroethane - Trichloroethylene - Tetrachloroethylene - Total Xylene 5 µg/L to 20 µg/L - p-Cresol - o-Cresol - m-Cresol 5 µg/L to 25 µg/L	In - house method : SOP LBGC-18009 based on United States Environmental Protection Agency, 1996, EPA, Method 8260B, Revision 2.0 In - house method : SOP LBGC-18010 based on United States Environmental Protection Agency, 1996, EPA, Method 8250 B, Revision 2.0

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Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
1 (cont.)	Water	Perfluorocarbons (PFCs) : - 6:2 PFOH - 8:2 PFOH - 10:2 PFOH - 6:2 FTA - 8:2 FTA - 10:2 FTA 5 µg/L to 25 µg/L Flame retardants - 2,2-bis(bromomethyl)-1,3-propane-diol - Tris (2-chloroethyl) phosphate - Tris (1,3-dichloro-isopropyl) phosphate - Hexabromocyclododecane 5.0 µg/L to 25.0 µg/L	In - house method : LBEGC-18011 based on GB/T 29493.2 : 2013 In - house method : LBGC-18005 based on United States Environmental Protection Agency, 2005, EPA, Method 527, Revision 1.0

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Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
1 (cont.)	Water	Flame retardants - Polybrominated biphenyls ethers - Polybrominated diphenyl ethers 0.25 µg/L to 1.5 µg/L Disperse dyes - Basic violet 1 - Basic violet 3 - Disperse Blue 1 - Disperse Blue 7 - Disperse Brown 1 - Disperse Orange 1 - Disperse Orange 3 - Disperse Orange 11 - Disperse Orange 37/76 - Disperse Red 1 10.0 µg/L to 50.0 µg/L	In - house method : LBGC-18005 based on United States Environmental Protection Agency, 2005, EPA, Method 527, Revision 1.0 In - house method : LBLC-18002 based on Journal of Chromatographic Science 2015, 53 : page 1257-1264

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Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
1 (cont.)	Water	Disperse dyes - Disperse Violet 1 - Disperse Yellow 1 - Disperse Yellow 9 - Disperse Yellow 39 - Disperse Yellow 54 - Solvent Yellow 1 - Solvent Yellow 2 - Solvent Yellow 3 - Solvent Yellow 14 10.0 µg/L to 50.0 µg/L	In - house method : LBLC-18002 based on Journal of Chromatographic Science 2015, 53 : page 1257-1264

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Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
1 (cont.)	Water	Flame retardant - Tris (2,3-dibromopropyl) phosphate - Bis (2,3-dibromopropyl) phosphate 1.00 µg/L to 4.00 µg/L - Glycol 20 µg/L to 100 µg/L	In - house method : LBLC-18001 based on ISO 18857-2 : 2009 In - house method : LBGC-18012 based on United States Environmental Protection Agency, 2014, EPA, Method 600/16-14/008

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Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
1 (cont.)	Water	- Conductivity 145 $\mu\text{S}/\text{cm}$ to 12 880 $\mu\text{S}/\text{cm}$ - Total Solids at 103 °C to 105 °C 50 mg/L to 20 000 mg/L - Total Suspended Solids at 103 °C to 105 °C 5 mg/L to 10 000 mg/L	In - house method : LBEN-02110 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 2510 B In - house method : LBEN-05150 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 2540 B In - house method : LBEN-97042 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 2540 D

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Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
1 (cont.)	Water	- Total Dissolved Solids at 180 °C 50 mg/L to 20 000 mg/L - Total hardness (calculates as CaCO_3) 1 mg/L to 300 mg/L - BOD 2 mg/L to 2 100 mg/L	In - house method : LBEN-00106 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 2540 C In - house method : LBEN-00998 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 2540 C In - house method : LBEN-97006 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 5210 B

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 Address : 41/23 Soi Rama III (59), Rama III Road,
 Chongnonsee, Yannawa, Bangkok 10120
 Accreditation Number : Testing - 0017
 Laboratory Status : ☒ Permanent ☐ Site ☐ Temporary ☐ Mobile

Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
1 (cont.)	Water	- COD 10 mg/L to 300 mg/L - COD 10 mg/L to 400 mg/L - Nitrate 0.02 mg/L to 6.0 mg/L	In - house method : LBEN-97010 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 5220 C In - house method : LBEN-12161 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 5220 D In - house method : LBEN-97029 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 - NO_3^- E

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 Address : 41/23 Soi Rama III (59), Rama III Road,
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 Accreditation Number : Testing - 0017
 Laboratory Status : ☒ Permanent ☐ Site ☐ Temporary ☐ Mobile

Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
1 (cont.)	Water	- Nitrite 0.02 mg/L to 1.0 mg/L - Sulfate 2.0 mg/L to 100.0 mg/L - Total organic carbon 0.5 mg/L to 10.0 mg/L	In - house method : LBEN-97049 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 - NO_2^- B In - house method : LBEN-14003 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 - SO_4^{2-} E In - house method : LBEN-09149 based on United States Environmental Protection Agency, 2004, EPA Method 5060 A, Revision 1.0

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Address : 41/23 Soi Rama III (59), Rama III Road,
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Accreditation Number : Testing - 0017

Laboratory Status : ☒ Permanent ☐ Site ☐ Temporary ☐ Mobile

Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
1 (cont.)	Water	Perfluorocarbons (PFCs) : - PFPeA - PFBS - PFHxS - PFHpS - PF-3,7-DMOA - PFDA - PFOS - PFUnA - PFDoA - PFS - PFTnA - PFTeA - PFOSA 0.05 µg/L to 0.3 µg/L	In - house method : LBLC-17014 based on DIN 38407-42 : 2011 03 and analysis with HPLC-MS

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Address : 41/23 Soi Rama III (59), Rama III Road,
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Accreditation Number : Testing - 0017

Laboratory Status : ☒ Permanent ☐ Site ☐ Temporary ☐ Mobile

Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
1 (cont.)	Water	Allyl phenol ethoxylate : - OPEO - NPEO 1 µg/L to 10 µg/L	In - house method : LBLC-17013 based on ISO 18857-2 : 2009 and analysis with HPLC-MS

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Address : 41/23 Soi Rama III (59), Rama III Road,
Chongnonsee, Yannawa, Bangkok 10120

Accreditation Number : Testing - 0017

Laboratory Status : ☒ Permanent ☐ Site ☐ Temporary ☐ Mobile

Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
2	Wastewater	- Mercury 0.5 µg/L to 8.0 µg/L - pH 4.0 to 10.0 - Total Solids at 103 °C to 105 °C 50 mg/L to 20 000 mg/L	In - house method : LBEN-08145 based on United States Environmental Protection Agency, 1994, EPA Method 245.1, Revision 3.0 In - house method : LBEN-09152 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 - H ⁺ B In - house method : LBEN-09150 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 2540 B

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Laboratory Status : ☒ Permanent ☐ Site ☐ Temporary ☐ Mobile

Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
2 (cont.)	Wastewater	- Total Suspended Solids at 105 °C to 105 °C 5 mg/L to 10 000 mg/L - Total Dissolved Solids at 180 °C 50 mg/L to 20 000 mg/L - Conductivity 145 µS/cm to 12 680 µS/cm	In - house method : LBEN-07002 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 2540 D In - house method : LBEN-00106 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 2540 C In - house method : LBEN-02110 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 2510 B

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 Laboratory Status : ☒ Permanent ☐ Site ☐ Temporary ☐ Mobile

Item Number	Test Material / Product	Test item / Range of Testing	Test Method / Technique Used
2 (cont.)	Wastewater	- Total hardness (calculates as CaCO ₃) 2 mg/L to 500 mg/L - BOD 2 mg/L to 2 100 mg/L - COD 10 mg/L to 3 000 mg/L	In - house method : LBEN-00098 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 2340 C In - house method : LBEN-97006 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 5210 B In - house method : LBEN-97010 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 5220 C

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Item Number	Test Material / Product	Test item / Range of Testing	Test Method / Technique Used
2 (cont.)	Wastewater	- COD 10 mg/L to 500 mg/L - Nitrate 0.02 mg/L to 15.0 mg/L - Nitrite 0.02 mg/L to 1.0 mg/L	In - house method : LBEN-12161 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 5220 D In - house method : LBEN-97029 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 - NO ₃ -E In - house method : LBEN-97049 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 - NO ₂ -B

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Item Number	Test Material / Product	Test item / Range of Testing	Test Method / Technique Used
2 (cont.)	Wastewater	- Sulfate 2.0 mg/L to 100.0 mg/L - Total organic carbon 0.5 mg/L to 10.0 mg/L - Ammonia-Nitrogen 0.02 mg/L to 20 mg/L	In - house method : LBEN-14003 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 - SO ₄ ²⁻ -E In - house method : LBEN-09149 based on United States Environmental Protection Agency, 2004, EPA Method 9060 A, Revision 1.0 In - house method : LBEN-11158 based on ASTM D1426-08

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Item Number	Test Material / Product	Test item / Range of Testing	Test Method / Technique Used
2 (cont.)	Wastewater	- Total phosphorus 0.01 mg/L to 40 mg/L - Dissolved phosphorus 0.005 mg/L to 20 mg/L - Glycol 20 µg/L to 200 µg/L	In - house method : LBEN-97037 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 - P B4, E In - house method : LBEN-97037 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 - P B1, E In - house method : LBGC-18012 based on United States Environmental Protection Agency, 2014, EPA, Method 600/P-14/008

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Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
2 (cont.)	Wastewater	- Ammonia-Nitrogen 0.10 mg/L to 10.0 mg/L - Total phosphorus 0.10 mg/L to 10.0 mg/L - Chloride 1 mg/L to 20 000 mg/L	In - house method : LBEN-19003 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 NH ₃ -F In - house method : LBEN-19002 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500-PJ In - house method : LBEN-11157 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500-CLD

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Laboratory Status : ☒ Permanent ☐ Site ☐ Temporary ☐ Mobile

Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
2 (cont.)	Wastewater	- Navy Blue 1.0 mg/L to 7.5 mg/L Perfluorocarbons (PFCs) : - PFPeA - PFBS - PFTxS - PFT-pS - PF-3,7-DMCA - PFDA - PFOS - PFOuA - PFDoA 0.05 µg/L to 0.3 µg/L	In - house method : LBLC-19004 based on United States Environmental Protection Agency, 2007, EPA, Method 8321B In - house method : LBLC-17014 based on DIN 38407-42 : 2011-03 and analysis with HPLC-MS

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Address : 41/23 Soi Rama III (59), Rama III Road,
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Accreditation Number : Testing - 0017

Laboratory Status : ☒ Permanent ☐ Site ☐ Temporary ☐ Mobile

Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
2 (cont.)	Wastewater	Perfluorocarbons (PFCs) : - PFDS - PFTuA - PFTeA - PFOSA 0.05 µg/L to 0.3 µg/L Alkyl phenol ethoxylate : - OPEO - NPEO 1 µg/L to 10 µg/L - Phenol 0.001 mg/L to 0.1 mg/L	In - house method : LBLC-17014 based on DIN 38407-42 : 2011-03 and analysis with HPLC-MS In - house method : LBLC-17013 based on ISO 18857-2 : 2009 and analysis with HPLC-MS In - house method : LBEN-15007 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 5530 B-C

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Accreditation Number : Testing - 0017

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Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
2 (cont.)	Wastewater	- Cyanide 0.05 mg/L to 0.2 mg/L - Oil and Grease 1 mg/L to 100 mg/L - Oil and Grease 0.5 mg/L to 100 mg/L	In - house method : LBEN-97018 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 CN ⁻ C, E In - house method : LBEN-97031 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 5520 B In - house method : LBEN-16005 based on United States Environmental Protection Agency, 2010, EPA, Method 1664, Revision B

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Item Number	Test Material / Product	Test item / Range of Testing	Test Method / Technique Used
2 (cont.)	Wastewater	- Sulfide 0.01 mg/L to 1.0 mg/L - Sulfite 0.75 mg/L to 3.0 mg/L - Total nitrogen 2 mg/L to 200 mg/L - True color 5 M ⁻¹ to 30 M ⁻¹	In - house method : LBEN-97045 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 S ²⁻ -D In - house method : LBEN-18006 based on United States Environmental Protection Agency, 1978, EPA, Method 377.1 In - house method : LBAG-18002 based on ISO 5663 : 1984 ISO 7887 : 2011, Method B

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Item Number	Test Material / Product	Test item / Range of Testing	Test Method / Technique Used
2 (cont.)	Wastewater	- Arsenic 0.63 µg/L to 6.25 µg/L - Lead 0.63 µg/L to 6.25 µg/L - Cadmium 0.63 µg/L to 6.25 µg/L - Copper 0.63 µg/L to 6.25 µg/L - Manganese 0.63 µg/L to 6.25 µg/L - Nickel 0.63 µg/L to 6.25 µg/L - Zinc 2.5 µg/L to 62.5 µg/L - Silver 2.5 µg/L to 62.5 µg/L	In - house method : LBEN-14004 based on United States Environmental Protection Agency, 2014, EPA, Method 6020B, Revision 2

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Item Number	Test Material / Product	Test item / Range of Testing	Test Method / Technique Used
2 (cont.)	Wastewater	- Chromium 0.63 µg/L to 12.5 µg/L - Antimony 0.63 µg/L to 12.5 µg/L - Cobalt 1.25 µg/L to 62.5 µg/L - Hexavalent chromium 1.0 µg/L to 5.0 µg/L Flame retardant: - Tri (2,3-dibromopropyl) phosphate - Bis (2,3-dibromopropyl) phosphate 1.00 µg/L to 4.00 µg/L	In - house method : LBEN-14004 based on United States Environmental Protection Agency, 2014, EPA, Method 6020B, Revision 2 ISO 18412 : 2005 In - house method : LBLC-18001 based on ISO 18857-2 : 2009

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Item Number	Test Material / Product	Test item / Range of Testing	Test Method / Technique Used
2 (cont.)	Wastewater	Disperse dyes - Disperse Blue 1 - Disperse Blue 7 - Disperse Brown 1 - Disperse Orange 1 - Disperse Orange 3 - Disperse Orange 11 - Disperse Orange 37/76 - Disperse Red 1 - Disperse Yellow 1 - Disperse Yellow 9 - Disperse Yellow 39 - Basic violet 3 - Solvent Yellow 1 - Solvent Yellow 2 - Solvent Yellow 3 10.0 µg/L to 50.0 µg/L	In - house method : LBLC-18002 based on Journal of Chromatographic Science 2015, 53 : page 1257-1264

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Item Number	Test Material / Product	Test item / Range of Testing	Test Method / Technique Used
2 (cont.)	Wastewater	Disperse dyes - Basic violet 1 - Solvent Yellow 14 - Disperse Yellow 54 - Disperse Violet 1 10.0 µg/L to 50.0 µg/L Azo colorants - Aniline - m-Methylaniline - p-Toluidine - o-Toluidine - m-Toluidine - n-ethylamine - 2-chloroaniline - 2,4-Xylicine - 2,5-Xylicine 0.5 µg/L to 3.0 µg/L	In - house method : LBLC-18002 based on Journal of Chromatographic Science 2015,35 : page 1257-1264 In - house method : SOP LBGC-18004 based on ISO 14362-1 : 2017

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Item Number	Test Material / Product	Test item / Range of Testing	Test Method / Technique Used
2 (cont.)	Wastewater	Azo colorants - o-Anisidine - 4-Chloroaniline - n,n-diethylaniline - p-Cresidine - 2,4,5 - Trimethylaniline - 4-Chloro-o-toluidine - 2,4-Toluenediamine - 2,4 - Diaminoaniline - 2-Naphthylamine - 5-Nitro-o-toluidine - 5-Nitro-o-anisidine - 4-Aminobiphenyl - 4-Aminoazobenzene - 4,4'-Oxydianiline - Benzidine 0.5 µg/L to 3.0 µg/L	In - house method : SCP LBGC-18004 based on ISO 14362-1 : 2017

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Item Number	Test Material / Product	Test item / Range of Testing	Test Method / Technique Used
2 (cont.)	Wastewater	Azo colorants - 4,4'-Thiodianiline - o-Aminoazotoluene - 3,3'-Dimethyl-4,4'- diaminodiphenylmethane - 3,3'-Dimethylbenzidine - 4,4'-Thiodianiline - 3,3'-Dichlorobenzidine - 4,4'-Methylenebis (2-chloroaniline) - 3,3'-Dimethoxybenzidine 0.5 µg/L to 3.0 µg/L	In - house method : SOP LBGC-18004 based on ISO 14362-1 : 2017

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Item Number	Test Material / Product	Test item / Range of Testing	Test Method / Technique Used
2 (cont.)	Wastewater	Flame retardants - 2,2-bis(bromomethyl)-1,3-propane-diol - Tris (2-chloroethyl) phosphate - Tris (1,3-dichloroisopropyl) phosphate - Hexabromocyclododecane 5 µg/L to 25 µg/L - Polybrominated biphenyls ether - polybrominated diphenyl ethers 0.25 µg/L to 1.5 µg/L	In - house method : LBGC-18005 based on United States Environmental Protection Agency, 2005, EPA, Method 527, Revision 1.0

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Item Number	Test Material / Product	Test item / Range of Testing	Test Method / Technique Used
2 (cont.)	Wastewater	Organotin compounds - Trimethyltin (TMT) - Dimethyltin (DMT) - Dipropyltin-dichloride (DPrOT) - Monobutyltin (MBT) - Tripropyltin (TPPT) - Dibutyltin (DBT) - Tributyltin (TBT) - Monoethyltin (MET) - Tetraethyltin (TeET) - Diphenyltin (DPHT) - Dioctyltin (DOT) - Triphenyltin (TPHT) - Tri-cyclohexyltin (TCyT) - Tri-n-octyltin (TOT) 0.05 µg/L to 2.0 µg/L	In - house method : SOP LBGC-18006 based on ISO 17353 : 2004

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 Laboratory Status : ☒ Permanent ☐ Site ☐ Temporary ☐ Mobile

Item Number	Test Material / Product	Test item / Range of Testing	Test Method / Technique Used
2 (cont.)	Wastewater	Polycyclic Aromatic Hydrocarbons (PAH) - Naphthalene - 2-Methylphthalene - 1-Methylphthalene - Acenaphthylene - Acenaphthene - Fluorene - Phenanthrene - Anthracene - Fluoranthene - Pyrene - Cyclopenta (c,d) pyrene - Benzo(a) Anthracene - Chrysene 1.0 µg/L to 20.0 µg/L	In - house method : LBGC-18008 based on DIN 38407-39 : 2011

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 Laboratory Status : ☒ Permanent ☐ Site ☐ Temporary ☐ Mobile

Item Number	Test Material / Product	Test item / Range of Testing	Test Method / Technique Used
2 (cont.)	Wastewater	Polycyclic Aromatic Hydrocarbons (PAH) - Benzo(b) Fluoranthene - Benzo(j) Fluoranthene - Benzo(k) Fluoranthene - Benzo(e) Pyrene - Benzo(a) Pyrene - Indeno(1,2,3-cd) Pyrene - Dibenzo (ah) Anthracene - Benzo (ghi) perylene 1.0 µg/L to 20.0 µg/L	In - house method : LBGC-18008 based on DIN 38407-39 : 2011

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Item Number	Test Material / Product	Test item / Range of Testing	Test Method / Technique Used
2 (cont.)	Wastewater	Chlorophenol - 4-Chloro-3-methylphenol - 2-Chlorophenol - 3-Chlorophenol - 4-Chlorophenol - 2,4-Dichlorophenol - 2,5-Dichlorophenol - 2,6-Dichlorophenol - 3,5-Dichlorophenol - 2,3-Dichlorophenol - 3,4-Dichlorophenol - Pentachlorophenol - 2,3,4,6-Tetrachlorophenol - 2,4,5-Trichlorophenol - 2,4,6-Trichlorophenol - 2,3,4-Trichlorophenol 0.5 µg/L to 20.0 µg/L	In - house method : SOP LBGC-18003 based on ISO 17070 : 2015

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Laboratory Status : ☒ Permanent ☐ Site ☐ Temporary ☐ Mobile

Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
2 (cont.)	Wastewater	Chlorophenol - 2,3,4,5-Tetrachlorophenol - 2,3,5-Trichlorophenol - 2,3,5,6-Tetrachlorophenol - 2,3,6-Trichlorophenol - 3,4,5-Trichlorophenol 0.5 µg/L to 20.0 µg/L Phthalates - Dimethyl phthalate - Diethyl phthalate - Bis-iso-butyl ester phthalate - Benzyl buthyl phthalate - Di-n-octyl phthalate - Di-2-ethyl hexyl phthalate - Diisononyl phthalate - Bis methylglycol ester phthalate 5 µg/L to 30 µg/L	In - house method : SOP LBGC-18003 based on ISO 17070 : 2015 In - house method : LBGC-18007 based on ISO 18856 : 2004

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Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
2 (cont.)	Wastewater	Phthalates - Di-isoheptyl phthalate - Bis cyclohexyl phthalate - Di-n-octyl phthalate - Bis-(2-propylheptyl) phthalate - Bis-nonyl phthalate - Bis-propyl phthalate - Bis-iso-pentyl phthalate - n-pentyl-iso-pentyl phthalate - Bis-n-pentyl phthalate - Di-n-hexyl phthalate - Bis-iso-octyl phthalate - Di-isodecyl phthalate 5 µg/L to 30 µg/L	In - house method : LBGC-18007 based on ISO 18856 : 2004

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2 (cont.)	Wastewater	Volatile organic compounds - Methylene Chloride - Benzene - 1,2-Dichloroethane - Trichloroethylene - Tetrachloroethylene - Total Xylene 5 µg/L to 20 µg/L p-Cresol o-Cresol m-Cresol 5 µg/L to 25 µg/L	In - house method : SOP LBGC-18009 based on United States Environmental Protection Agency, 1996, EPA, Method 8260B, Revision 2.0 In - house method : LBGC-18010 based on United States Environmental Protection Agency, 1996, EPA, Method 8250B, Revision 2.0

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Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
2 (cont.)	Wastewater	Perfluorocarbons (PFCs) : - 6:2 FTOH - 8:2 FTOH - 10:2 FTOH - 6:2 FTA - 8:2 FTA - 10:2 FTA 5 µg/L to 25 µg/L Coliforms MPN/100 ml Detected or not detected Coliforms cfu/100 ml	In - house method : LBGC-18011 based on DIN 58407-42 : 2011 Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed, 2017, part 5221.8 ISO 9308 -1: 2014 / Amd 1: 2016

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Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
3	Surface water	- Ammonia-Nitrogen 0.02 mg/L to 20 mg/L - Chloride 1 mg/L to 20 000 mg/L - Total phosphorus 0.01 mg/L to 40 mg/L	In - house method : LBEN-11158 based on ASTM D1626-08 In - house method : LBEN-11157 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 - C ⁻ D In - house method : LBEN-97037 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 - P B4, E

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Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
3 (cont.)	Surface water	- Dissolved phosphorus 0.005 mg/L to 20 mg/L	In - house method : LBEN-97037 based on Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500 - P B1, E
4	Sea water	- Total petroleum hydrocarbon 0.03 µg/L to 2.5 µg/L	In - house method : LBAG-08251 based on Methods of Seawater Analysis, 3 rd Completely Revised and Extended Edition, 1999, chapter 21
5	Sludge	- Mercury 0.1 mg/kg to 4.0 mg/kg	In - house method : LBEN-18008 based on United States Environmental Protection Agency, 2007, EPA, Method 7473, Revision 0

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Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
5 (cont.)	Sludge	- Hexavalent chromium 1.0 mg/kg to 40.0 mg/kg - Arsenic 0.50 mg/kg to 5.00 mg/kg - Cadmium 0.50 mg/kg to 5.00 mg/kg - Lead 0.50 mg/kg to 5.00 mg/kg	In - house method : LBEN 18003 based on United States Environmental Protection Agency, 1992, EPA, Method 7196A, Revision 1 In - house method : LBEN 18007 based on United States Environmental Protection Agency, 2014, EPA, Method 6020B, Revision 2

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Item Number	Test Material / Product	Test Item / Range of Testing	Test Method / Technique Used
5 (cont.)	Sludge	- Cadmium 10 mg/kg to 1 000 mg/kg - Lead 10 mg/kg to 1 000 mg/kg - Cyanide 0.5 mg/kg to 10.0 mg/kg	In - house method : LBEN 18007 based on United States Environmental Protection Agency, 2007, EPA Method 6010C, Revision 3 In - house method : SOP LBEN-19001 based on ISO 11262 : 2011
6	Chemical fertilizer	- Water soluble potassium (Calculated as K ₂ O) 1.0 g/100 g to 60.4 g/100 g - Total Nitrogen 1.0 g/100 g to 46.5 g/100 g	In - house method : SOP LBAG-99246 based on Notification of Ministry of Agriculture and Cooperatives Re: Prescribing the methods of analysis of chemical fertilizers, B.E. 2559, method 1.12.02 In - house method : SOP LBAG-12216 based on Notification of Ministry of Agriculture and Cooperatives Re: Prescribing the methods of analysis of chemical fertilizers, B.E. 2559, method 1.05.01

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Item Number	Test Material / Product	Test item / Range of Testing	Test Method / Technique Used
6 (cont.)	Chemical fertilizer	- Total phosphorus (Calculated P_2O_5) 2.00 g/100 g to 61.68 g/100 g - Calcium oxide (Calculated from total calcium) 0.02 g/100 g to 51.8 g/100 g - Magnesium oxide (Calculated from total magnesium) 0.02 g/100 g to 81.04 g/100 g	In - house method : SOP LBA6-00106 based on Notification of Ministry of Agriculture and Cooperatives Re: Prescribing the methods of analysis of chemical fertilizers, B.E. 2559, method 1.09.01 In - house method : SOP LBCH-16010 based on Notification of Ministry of Agriculture and Cooperatives Re: Prescribing the methods of analysis of chemical fertilizers, B.E. 2559, method 1.13.01 In - house method : SOP LBCH-16010 based on Notification of Ministry of Agriculture and Cooperatives Re: Prescribing the methods of analysis of chemical fertilizers, B.E. 2559, method 1.14.01

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 Laboratory Status : ☒ Permanent ☐ Site ☐ Temporary ☐ Mobile

Item Number	Test Material / Product	Test item / Range of Testing	Test Method / Technique Used
6 (cont.)	Chemical fertilizer	- Total sulfur 0.02 g/100 g to 32.76 g/100 g	In - house method : SOP LBCH-16010 based on Notification of Ministry of Agriculture and Cooperatives Re: Prescribing the methods of analysis of chemical fertilizers, B.E. 2559, method 1.15.01

Issue Date : 21st April 2020

Signature :

(Mrs. Puchamen Tagheer)

Director of Bureau of Laboratory Accreditation

Initial Issue Date 22nd June 2007

Issue Number 10

Bureau of Laboratory Accreditation, Department of Science Service, Ministry of Higher Education, Science, Research and Innovation

LAF-BL/11-19

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แบบ ปสส.ปสอ. ๒

ใบรับรองเลขที่ 19T184/0960

ใบรับรองห้องปฏิบัติการ

อาศัยอำนาจตามความในพระราชบัญญัติการมาตรฐานแห่งชาติ พ.ศ. ๒๕๕๑

เลขาธิการสำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม

ออกใบรับรองฉบับนี้ให้

บริษัท เอสซีเอส (ประเทศไทย) จำกัด
ห้องปฏิบัติการทดสอบสิ่งแวดล้อม (สาขาของ)

มีห้องปฏิบัติการตั้งอยู่เลขที่

๑/๒๐๙, ๑/๒๑๑ หมู่ที่ ๑ ซอยสุขุมวิท ๒ ถนนสุขุมวิท

ตำบลบ้านขวาง อำเภอบ้านฉาง จังหวัดระยอง

ได้รับการรับรองความสามารถห้องปฏิบัติการทดสอบ

ตามมาตรฐานเลขที่ มอก. 17025-2561 (ISO/IEC 17025 : 2017)

ข้อกำหนดทั่วไปว่าด้วยความสามารถห้องปฏิบัติการทดสอบและสอบเทียบ

หมายเลขการรับรองที่ ทดสอบ ๐๔๗๐

โดยมีสาขาการรับรองตามรายละเอียดแนบท้ายใบรับรอง

ตั้งแต่วันที่ ๑๓ พฤศจิกายน พ.ศ. ๒๕๖๒

ถึง วันที่ ๑๐ พฤศจิกายน พ.ศ. ๒๕๖๕

ออกให้ ณ วันที่ ๒๕ พฤศจิกายน พ.ศ. ๒๕๖๒

ลงชื่อ



รองเลขาธิการ ปฏิบัติราชการแทน

เลขาธิการสำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม



กระทรวงอุตสาหกรรม สำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม

รายละเอียดแนบท้ายใบรับรองห้องปฏิบัติการทดสอบ

ใบรับรองเลขที่ 19T184/0960

ห้องปฏิบัติการ

ห้องปฏิบัติการทดสอบสิ่งแวดล้อม (สาขาของ)

ที่อยู่

บริษัท เอสซีเอส (ประเทศไทย) จำกัด
เลขที่ 1/209, 1/211 หมู่ที่ 1 ซอยสุขุมวิท 2 ถนนสุขุมวิท ตำบลบ้านขวาง

หมายเลขการรับรองที่

ทดสอบ 0470

สถานภาพห้องปฏิบัติการ

☒ กวาร์ ☐ นอกสถานที่ ☐ชั่วคราว ☐เคลื่อนที่

รายการทดสอบ	รายการทดสอบ	วิธีทดสอบ
สารเคมีในสิ่งแวดล้อม น้ำและน้ำเสีย (water and wastewater)	- Arsenic 0.01 mg/l to 0.50 mg/l - Barium 0.01 mg/l to 10 mg/l - Cadmium 0.002 mg/l to 10 mg/l - Chromium 0.01 mg/l to 10 mg/l - Copper 0.01 mg/l to 10 mg/l - Iron 0.02 mg/l to 10 mg/l - Lead 0.01 mg/l to 10 mg/l - Manganese 0.01 mg/l to 5 mg/l - Nickel 0.004 mg/l to 10 mg/l - Selenium 0.01 mg/l to 0.50 mg/l - Silver 0.01 mg/l to 10 mg/l - Zinc 0.02 mg/l to 10 mg/l	- Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WEF, 23 rd edition, 2017, part 3120 B, part 3030 F and part 3030 K

ฉบับที่ : ตั้งแต่วันที่ 11 พฤศจิกายน พ.ศ. 2562 หน้า 1/4
กระทรวงอุตสาหกรรม สำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม

รายละเอียดแนบท้ายใบรับรองห้องปฏิบัติการทดสอบ
ใบรับรองเลขที่ 19T184/0960

หมายเลขการรับรองที่ ทดสอบ 0470
สถานภาพห้องปฏิบัติการ ☒ ถาวร ☐ นอกสถานที่ ☐ ชั่วคราว ☐ เคลื่อนที่

สาขาการทดสอบ	รายการทดสอบ	วิธีทดสอบ
สาขาสิ่งแวดล้อม น้ำและน้ำเสีย (water and wastewater) (ค่อ)	<ul style="list-style-type: none"> Biochemical oxygen demand (BOD) 2 mg/l to 5 000 mg/l Chemical oxygen demand (COD) 40 mg/l to 10 000 mg/l Chloride 1 mg/l to 10 000 mg/l Chromium hexavalent 0.01 mg/l to 2.00 mg/l Oil and grease 2 mg/l to 100 mg/l pH 2.0 to 11.0 	<ul style="list-style-type: none"> Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WEF, 23rd edition, 2017, part 5210 B and part 4500-O G Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WEF, 23rd edition, 2017, part 5220 C Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WEF, 23rd edition, 2017, part 4500-Cl D Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WEF, 23rd edition, 2017, part 3500-Cl B Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WEF, 23rd edition, 2017, part 5520 B Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WEF, 23rd edition, 2017, part 4500-H F B

ฉบับที่ 1 ตั้งแต่วันที่ 11 พฤศจิกายน พ.ศ. 2562 หน้า 2/4
กระทรวงอุตสาหกรรม สำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม

รายละเอียดแนบท้ายใบรับรองห้องปฏิบัติการทดสอบ
ใบรับรองเลขที่ 19T184/0960

หมายเลขการรับรองที่ ทดสอบ 0470
สถานภาพห้องปฏิบัติการ ☒ ถาวร ☐ นอกสถานที่ ☐ ชั่วคราว ☐ เคลื่อนที่

สาขาการทดสอบ	รายการทดสอบ	วิธีทดสอบ
สาขาสิ่งแวดล้อม น้ำและน้ำเสีย (water and wastewater) (ค่อ)	<ul style="list-style-type: none"> Phenol 0.01 mg/l to 1.00 mg/l Sulfate 1 mg/l to 40 mg/l Total hardness 1 mg/l to 1 000 mg/l (expressed as CaCO₃) Total solids (TS) 2.5 mg/l to 10 000 mg/l Total dissolved solids (TDS) 2.5 mg/l to 20 000 mg/l 	<ul style="list-style-type: none"> Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WEF, 23rd edition, 2017, part 5530 D Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WEF, 23rd edition, 2017, part 4500-SO₄²⁻ E Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WEF, 23rd edition, 2017, part 2360 C Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WEF, 23rd edition, 2017, part 2540 B Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WEF, 23rd edition, 2017, part 2540 C (dried at 180 °C and at 103 – 105 °C)

ฉบับที่ 1 ตั้งแต่วันที่ 11 พฤศจิกายน พ.ศ. 2562 หน้า 3/4
กระทรวงอุตสาหกรรม สำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม

รายละเอียดแนบท้ายใบรับรองห้องปฏิบัติการทดสอบ
ใบรับรองเลขที่ 19T184/0960

หมายเลขการรับรองที่ ทดสอบ 0470
สถานภาพห้องปฏิบัติการ ☒ ถาวร ☐ นอกสถานที่ ☐ ชั่วคราว ☐ เคลื่อนที่

สาขาการทดสอบ	รายการทดสอบ	วิธีทดสอบ
สาขาสิ่งแวดล้อม น้ำและน้ำเสีย (water and wastewater) (ค่อ)	<ul style="list-style-type: none"> Total suspended solids (TSS) 2.5 mg/l to 10 000 mg/l 	<ul style="list-style-type: none"> Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WEF, 23rd edition, 2017, part 2540 D

ออกให้ ณ วันที่ ๑๖ พฤศจิกายน พ.ศ. 2562

ลงชื่อ

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เลขาธิการสำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม

ฉบับที่ 1 ตั้งแต่วันที่ 11 ตุลาคม พ.ศ. 2562 หน้า 4/4
กระทรวงอุตสาหกรรม สำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม

วันที่ ๑๖/๑๑/๖๒
Form MCT/TSI 2



ใบรับรองระบบงาน
(Certificate of Accreditation)

อาศัยอำนาจตามความในพระราชบัญญัติการมาตรฐานแห่งชาติ พ.ศ. ๒๕๕๑
(By Virtue of National Standardisation Act B.E. 2551 (2008))

เลขาธิการสำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม
(Secretary General, Thai Industrial Standards Institute)

ออกใบรับรองฉบับนี้ให้
(Issues this certificate to)

บริษัท เอสจีเอส (ประเทศไทย) จำกัด
SGS (Thailand) Limited

ตั้งอยู่เลขที่
(Address)

๑๐๐ ถนนบางลิ้งษ์ แขวงหนองปรือ เขตยานนาวา กรุงเทพมหานคร
(100 Banglieng Road, Chongnonsi, Yananawa, Bangkok)

ได้รับการรับรองความสามารถ
(Certificate of competence)

ตามมาตรฐานเลขที่ มอก. ๓๙๐๖๐-๒๕๕๖
(Standard No. (ISIRI) 1759-2013)

การตรวจสอบและรับรอง-ข้อกำหนดสำหรับหน่วยตรวจ
(Certainty assessment - Requirements for the operation of various types of bodies performing inspection)

หมายเลขการรับรองที่ หน่วยตรวจ ๐๓๓๔
(Accreditation No. (MPC/TSI) 0334)

โดยมีรายละเอียดสาขาและขอบข่ายที่ใบรับรอง แสดงไว้ใน QR CODE และ www.tsi.go.th
(Details of the scheme and scope of the certificate are shown in QR CODE and www.tsi.go.th)

ออกให้ ณ วันที่ ๑๑ มกราคม พ.ศ. ๒๕๖๔
(Issue date: 11 January B.E. 2564 02028)



ลงนาม
 ปฏิบัติราชการแทน
 เลขาธิการสำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม




กระทรวงอุตสาหกรรม สำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม
(Ministry of Industry (Thailand), Thai Industrial Standards Institute)



ชื่อหน่วยตรวจ : บริษัท เอสซีเอส (ประเทศไทย) จำกัด
 ที่ตั้งสถานประกอบการของหน่วยตรวจและข้อมูลติดต่อ
 ที่ตั้งสำนักงานใหญ่ : ที่ตั้งสำนักงาน
 เลขที่ 100 ถนนบางลำไย แขวงจันทบุรี เขตจันทบุรี 1) สำนักงาน
 กรุงเทพมหานคร เลขที่

ที่ตั้งสำนักงานสาขา (กรณีแยกต่างหากจากที่ตั้งสำนักงานใหญ่)

- 1) สำนักงานศรีราชา
เลขที่ 104-106 ถนนศรีราชาศรี 1 ตำบลศรีราชา อำเภอศรีราชา
จังหวัดชลบุรี
- 2) สำนักงานนครราชสีมา
เลขที่ 130/40 ถนนสุรนารายณ์ ตำบลในเมือง อำเภอเมือง
จังหวัดนครราชสีมา
- 3) สาขาขนาดใหญ่
เลขที่ 57, 59, 61 ซอย 10 ถนนเพชรเกษม ตำบลท่าเตียน
อำเภอคลองเตย จังหวัดปทุมธานี

หมายเลขการรับรอง : หน้าตรวจ 0034
ประเภทของหน่วยตรวจ : ประเภท A

หมวดหมู่ / สาขาการตรวจ	ขั้นตอนและรายการตรวจ	ข้อกำหนดที่ใช้
1. เครื่องยนต์ภายใน : เสียด้านล่างซ้าย (เฉพาะสำนักงานใหญ่)	การตรวจสภาพการผลิตและการตรวจก่อนการ ส่งมอบ ในรายการต่อไปนี้ - ลักษณะทั่วไป - รูปแบบและขนาด - ปริมาณและการบรรจุ (เฉพาะการ ตรวจก่อนการส่งมอบ)	- วิธีปฏิบัติงานของบริษัทมหาชน P-INSP-W-SL-001 - ข้อกำหนดของสัญญา
2. ผลิตภัณฑ์ในอาหาร : การตรวจผลิตภัณฑ์ในอาหาร (เฉพาะสำนักงานใหญ่และ สาขาภาคใหญ่)	การตรวจระหว่างการผลิตและการตรวจก่อน การส่งมอบ สำหรับใบรุ่นผลิตภัณฑ์อาหารแช่ แข็งและกลุ่มผลิตภัณฑ์อาหารกระป๋อง	- ขั้นตอนการดำเนินงานของบริษัท มหาชน P-CORP-I-09 - ข้อกำหนดของสัญญา
3. ยานยนต์ : รถยนต์ (เฉพาะสำนักงานใหญ่)	การตรวจสภาพทั่วไปก่อนการส่งมอบ ใน รายการต่อไปนี้ - จำนวน - สภาพการประเมินภายนอกของ รถยนต์ เช่น สภาพภายนอก สภาพ ทั่วไปของตัวถัง สภาพทางและล้อ ความสะอาด และอื่น ๆ ที่ผู้จำหน่าย	- ขั้นตอนการดำเนินงานของบริษัท มหาชน PR TH-NR-OGC-IN-001 และ PR TH-NR-OGC-IN-002 - เกตสาร New Vehicle Receiving and Inspection Procedures Issued May 1, 1989 from Federal Department of Automotive Industries

ออกให้ครั้งแรกเมื่อวันที่ 11 กันยายน พ.ศ. 2561
กระทรวงอุตสาหกรรม สำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม

หน้า 1/5

รายละเอียดแนบท้ายใบรับรองระบบงานหน่วยตรวจ
ใบรับรองเลขที่ 22-B0007



ชื่อหน่วยตรวจ : บริษัท เอลซีเอส (ประเทศไทย) จำกัด
หมายเลขการรับรอง : หน่วยตรวจ 0034
ประเภทของหน่วยตรวจ : ประเภท A

หมวดหมู่ / สาขาการตรวจ	ขั้นตอนและช่วงการตรวจ	ข้อกำหนดทั่วไป
4. เครื่องจักรกล : ถังกักขังโดยลิ้นเหล็ก (เฉพาะสำนักงานใหญ่)	การตรวจกระบวนการผลิตและการควบคุมคุณภาพ โดยอาจทำได้ดังนี้ <ul style="list-style-type: none"> - การตรวจชิ้นส่วนประกอบการผลิต - การตรวจระหว่างการผลิตประกอบ - การทำการควบคุมทางทฤษฎีอื่น - การทดสอบเชิงทดลอง การวัด การขยายตัวและการบิด และการตรวจสอบปริมาณ - การตรวจสอบผลการส่งมอบ 	<ul style="list-style-type: none"> - ขั้นตอนการดำเนินงานของบีบีซี หมายเลข PR-TH-IG-IG-071 - ข้อกำหนดของกฎกัก
5. สินค้าบรรจุ : ข้าวหอมมะลิไทย (เฉพาะสำนักงานใหญ่และสำนักงานตรวจสินค้า)	การตรวจในขั้นตรวจสอบโดย อาจทำได้ดังนี้ <ul style="list-style-type: none"> - ปริมาณ - คุณสมบัติทางกายภาพและลักษณะทั่วไป ดังต่อไปนี้ <ul style="list-style-type: none"> • ประเภท ชนิด • ความบริสุทธิ์ • ความชื้น • ขนาดของเมล็ดข้าว • ส่วนผสม (ข้าวต้มเมล็ด ข้าวหัก ดัชนีข้าว) • ข้าวและสิ่งที่มีอาจปนได้ (เมล็ดอื่น เมล็ดพืชอื่น เมล็ดดอกไม้ เมล็ดแมลง ฯลฯ) • ไม่มีแบคทีเรียที่มีชีวิต • ระดับการเจือสี ไม่ตรงตามกฎหรือความบริสุทธิ์ด้วยวิธีวิเคราะห์ในห้องปฏิบัติการในรายการ ปริมาณเมล็ด (Arylose content) และค่าการกลายเมล็ดข้าวในค่า (Alkali spreading value)	<ul style="list-style-type: none"> - ประกาศกระทรวงพาณิชย์ เรื่อง หลักเกณฑ์และวิธีการการขึ้นชื่อการค้า การสงวนตามกฎหมายฉบับที่ ๕ ของกรมการค้าภายในว่าด้วยการควบคุมและตรวจสอบสินค้าข้าวหอมมะลิไทย - ขั้นตอนการดำเนินงานของบีบีซี หมายเลข PR-TH-NR-AGR-IN-004 และ PR-TH-NR-AGR-IN-005 - ข้อกำหนดของกฎกัก

ขอใช้ทั้งเล่มเมื่อวันที่ 11 กันยายน พ.ศ. 2561
 กระทรวงอุตสาหกรรม สำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม

หน้า 2/5

รายละเอียดแบบท้ายใบรับรองระบบงานหน่วยตรวจ
ใบรับรองเลขที่ 22-IB0007



ชื่อหน่วยตรวจ : บริษัท เอสจีเอส (ประเทศไทย) จำกัด
หมายเลขการรับรอง : หน่วยตรวจ 0034
ประเภทของหน่วยตรวจ : ประเภท A

หมวดหมู่ / สาขาการตรวจ	ขั้นตอนและข้อราชการตรวจ	ข้อกำหนดข้อเท็จ
6. สืบค้นภาพ : นำภาพถ่ายขาวและ นำภาพถ่ายสี (เฉพาะสำนักงานใหญ่ และ สำนักงานบรรณาธิการ)	การตรวจสอบลักษณะทั่วไปและปริมาณ ที่เห็นไม่รวมและวิเคราะห์ในห้องปฏิบัติการ	- ขึ้นคอมพิวเตอร์ดำเนินการขอประวัติ หมายเลข PR-TH-NR-AGR-N-002 และ PR-TH-NR-AGR-N-003 - ข้อกำหนดของลูกค้า
7. สืบค้นภาพ : อ่านหิน ขึ้นชั้น อิงชั้น ปูนฉาบ ทินปู และ หินระกอบ (เฉพาะสำนักงานใหญ่ สำนักงาน ตรวจฯ และสาขาภาคใหญ่)	การตรวจสอบสภาพทั่วไปและการเชื่อมต่อข้าง	- ขึ้นคอมพิวเตอร์ดำเนินการขอประวัติ หมายเลข PR-TH-NR-MIN-N-001 และ PR-TH-NR-MIN-N-002
8. การตรวจโครงสร้างเพื่อการรับรอง คุณภาพผลิตภัณฑ์ (เฉพาะสำนักงานใหญ่)	การตรวจสอบกระบวนการผลิต ระบบคุณภาพ และการตรวจประเมินผลิตภัณฑ์ที่ สำคัญกับ ผลิตภัณฑ์ ดังต่อไปนี้ - วัสดุก่อสร้าง คอนกรีต สแตนเลส เหล็ก และเครื่องเรือน - บริเวณที่ก่อสร้าง - ไฟฟ้าฉนวน - เครื่องใช้ไฟฟ้า - เครื่องใช้อิเล็กทรอนิกส์ - โคมไฟ และของตกแต่ง - ยาง ผนัง สีทาสี ไม้เคลือบ และอาคาร - ยานยนต์ ที่ขึ้นสายรถยนต์ และ เครื่องกล	- หลักเกณฑ์การตรวจสอบเพื่อการ อนุญาตของสำนักงานมาตรฐาน ผลิตภัณฑ์อุตสาหกรรม - หลักเกณฑ์เฉพาะในการตรวจสอบเพื่อ การอนุญาตผลิตภัณฑ์ที่เกี่ยวข้อง และ มาตรฐานผลิตภัณฑ์อุตสาหกรรมที่ เกี่ยวข้อง - เอกสารขึ้นตอนการดำเนินงานของ บริษัทมหาชน THPLP.01

ออกให้เสร็จรบกเมื่อวันที 11 กันยายน พ.ศ. 2561
 กระทรวงอุตสาหกรรม สำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม

หน้า 3/5

รายละเอียดแนบท้ายใบรับรองระบบงานหน่วยตรวจ
ใบรับรองเลขที่ 22-130007



ชื่อหน่วยตรวจ : บริษัท เอสจีเอส (ประเทศไทย) จำกัด
หมายเลขการรับรอง : หน่วยตรวจ 0034
ประเภทของหน่วยตรวจ : ประเภท A

หมวดหมู่ / สาขาการตรวจ	ขั้นตอนและช่วงเวลาการตรวจ	ข้อกำหนดที่ใช้
9. สิ่งแวดล้อม (เฉพาะสำนักงานใหญ่)	<p>การตรวจคุณภาพสิ่งแวดล้อมภายในอาคาร ในรายการต่อไปนี้</p> <ul style="list-style-type: none"> - ชาติพันธุ์ - ความร้อนสะสม - ปริมาณ CO₂, PM-10, Ozone, Total VOCs - อุณหภูมิ - ความชื้นสัมพัทธ์ - ความเร็วลม - ระดับความเข้มแสง 	<ul style="list-style-type: none"> - ขั้นตอนการดำเนินงานของบริษัท พหุผล PR-TH-IE-N-035, PR-TH-IE-IN-036, PR-TH-IE-IN-038, PR-TH-IE-IN-050, PR-TH-IE-IN-051, PR-TH-IE-IN-052, PR-TH-IE-IN-054 และ PR-TH-IE-IN-055 - ข้อกำหนดของลูกค้า - กฎหมาย กฎและระเบียบต่าง ๆ ที่เกี่ยวข้อง
	<p>การตรวจคุณภาพสิ่งแวดล้อมภายนอกอาคาร ในรายการต่อไปนี้</p> <ul style="list-style-type: none"> - ระบบการตรวจสอบคุณภาพอากาศจากห้องระบบอัตโนมัติอย่างต่อเนื่อง (Continuous Emission Monitoring Systems : CEMS) ด้วยเครื่องมือหรืออุปกรณ์พิเศษ (ปริมาณ CO, CO₂, NO₂, O₃, SO₂, NO และ NO_x) 	<ul style="list-style-type: none"> - ขั้นตอนการดำเนินงานของบริษัท พหุผล PR-TH-IE-IN-032 - ข้อกำหนดของลูกค้า - กฎหมาย กฎและระเบียบต่างๆ ที่เกี่ยวข้อง
	<p>การตรวจคุณภาพน้ำ ในรายการ</p> <ul style="list-style-type: none"> - การปนเปื้อนจากน้ำ - ลักษณะทางกายภาพ (สี กลิ่น รส) - ความเป็นกรด-ด่าง - อุณหภูมิ - ปริมาณออกซิเจนที่ละลายน้ำ (Dissolved Oxygen : DO) - ค่าการนำไฟฟ้า - ค่าความเค็ม - ค่าความขุ่น <p>ซึ่งมีหน่วยวิเคราะห์ในห้องปฏิบัติการ</p>	<ul style="list-style-type: none"> - ขั้นตอนการดำเนินงานของบริษัท พหุผล PR-TH-IE-N-043 - ข้อกำหนดของลูกค้า - กฎหมาย กฎและระเบียบต่าง ๆ ที่เกี่ยวข้อง

ออกให้ครั้งแรกเมื่อวันที่ 11 กันยายน พ.ศ. 2561
กระทรวงอุตสาหกรรม สำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม

หน้า ๓๖/๓๖

รายละเอียดแบบฟอร์มใบรับรองระบบงานหน่วยตรวจ
ใบรับรองเลขที่ 22-IB0007



ชื่อหน่วยตรวจ : บริษัท เอสซีเอส (ประเทศไทย) จำกัด
หมายเลขการรับรอง : หน่วยตรวจ 0034
ประเภทของหน่วยตรวจ : ประเมินค่า

หมวดหมู่ / สาขาการตรวจ	ขั้นตอนและช่วงการตรวจ	ข้อกำหนดที่ใช้
10. อินทรีย์สาร : ข้าวสาลีและข้าวสาลีสีทอง* (เฉพาะสำนักงานใหญ่และ สำนักงานศรีราชา)	การตรวจสอบสภาพทั่วไป การสุ่มตัวอย่าง และการส่งมอบการดำเนินการขึ้นบันทึก	- GAFTA Weighing Rules No. 123 - GAFTA Sampling Rules No.124 - วิธีปฏิบัติในการออกใบรับรอง PR-TH-NR-AGR-IN-006 - ข้อกำหนดของกฎการค้า

หมายเหตุ : * สาขาและขอบข่ายนี้ได้รับการรับรองระบบงานเพิ่มเติม วันที่ 8 ธันวาคม 2564

ตั้งแต่ วันที่ 8 ธันวาคม พ.ศ. 2564
ถึง วันที่ 10 กันยายน พ.ศ. 2569
ออกให้ ณ วันที่ 31 มกราคม พ.ศ. 2565

ออกให้ครั้งแรกเมื่อวันที่ 11 กันยายน พ.ศ. 2561
และทวนสอบการประเมินค่าตามมาตรฐานผลิตภัณฑ์อุตสาหกรรม

หน้า 5/5

Scope of Accreditation for Inspection Body
Certificate No. 22-IB0007



Name of Inspection Body : SGS (Thailand) Limited

Addresses and contact details

Head office or primary location
100 Nanglinchee Road, Chonprongsee, Yanawa,
Bangkok

Additional Locations (if different from Head Office)

- 1) Sriracha Office
144, 146 Sriracha Nakhon 1 Road, Sriracha, Sriracha, Chonburi
- 2) Nakhon Ratchasima Office
1340/96 Suranarai Road, Nae-Muang, Muang,
Nakhonratchasima
- 3) Hat Yai Branch
57, 59 and 61 Soi 10, Phetkarn Road, Hat Yai, Hat Yai,
Songkhla

Accreditation No. : INSPECTION 0034

Type of Inspection Body : Type A

Category / Field of Inspection	Stage and Range of Inspection	Inspection Requirements or Criteria
1. Apparel : Readymade Garment (Head office)	In-line process and Pre-shipment inspection of readymade garment with the items as follows : - General appearance - Style, Size and Weight of unit - Quantity and Packing (Pre-shipment inspection)	- Work instruction of SGS (Thailand) Limited : P-INSP-WI-SL-001 - Customer's requirements
2. Food Products : Food Inspection (Head Office and Hat Yai Branch)	During process inspection and Pre-shipment inspection of food products covering frozen food products and canned food products	- Operating procedure of SGS (Thailand) Limited : P-CORP-I-09 - Customer's requirements
3. Motor Vehicle : Automotive (Head Office)	Pre-shipment inspection of general condition of vehicle with the items as follows : - Quantity - Visual inspection of external condition e.g. glass, body, tires, wheels, cleanliness etc.	- Operating procedure of SGS (Thailand) Limited : PR-TH-NR- OGC-IN-001 and PR-TH-NR-OGC- IN-002 - New Vehicle Receiving and Inspection Procedures Issued May 1, 1989 of Federal Chamber of Automotive Industries

Date of Initial Issue: 11 September B.E. 2561 (2018)
Ministry of Industry Thailand, Thai Industrial Standards Institute

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Scope of Accreditation for Inspection Body
Certificate No. 22-IB0007



Name of Inspection Body : SGS (Thailand) Limited

Accreditation No. : INSPECTION 0034

Type of Inspection Body : Type A

Category / Field of Inspection	Stage and Range of Inspection	Inspection Requirements or Criteria
4. Machinery : LPG Cylinder (Head Office)	Production process and quality control inspection with the items as follows : - Component parts - During assembly - Heat treatment - Mechanical, Hydraulic pressure leak, Volumetric expansion, Burst test and Capacity check - Pre-delivery inspection	- Operating procedure of SGS (Thailand) Limited : PR-TH-BE-IN- 071 - Customer's requirements
5. Agricultural Products : Thai Hom Mali Rice (Head Office and Nakhon Ratchasima Office)	Pre-shipment inspection with the items as follows : - Quantity - Physical quality and general feature as follows : • Type, Grade • Purity • Moisture • Kernel size • Composition (whole kernel, broken, head rice) • Rice and matters that may be present (damaged kernel, yellow kernel, chalky kernel, red kernel, etc.) • No live insects • Milling degree Not covering the purity check by laboratory analysis for determination of Amylose content and Alkali spreading value	- Notification of Ministry of Commerce on Criteria and procedures of organizing the inspection of commodity standards and the inspection of the standards of Thai Hom Mali Rice - Operating procedure of SGS (Thailand) Limited : PR-TH-NR-AGR- IN-004 and PR-TH-NR-AGR-IN-005 - Customer's requirements

Date of Initial Issue: 11 September B.E. 2561 (2018)
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Scope of Accreditation for Inspection Body
Certificate No. 22-IB0007



Name of Inspection Body : SGS (Thailand) Limited

Accreditation No. : INSPECTION 0034

Type of Inspection Body : Type A

Category / Field of Inspection	Stage and Range of Inspection	Inspection Requirements or Criteria
6. Agricultural Products : White sugar and raw sugar (Head Office and Nakhon Ratchasima Office)	General appearance and quantity inspection Excluding analysis by laboratory testing	- Operating procedure of SGS (Thailand) Limited : PR-TH-NR-AGR- IN-002 and PR-TH-NR-AGR-IN-003 - Customer's requirements
7. Bulk Solids : Coal, cement, gypsum, clinker, limestone and sedimentary rock (Head Office, Sriracha Office and Hat Yai Branch)	General appearance inspection and sampling	- Operating procedure of SGS (Thailand) Limited : PR-TH-NR-MIN- IN-001 and PR-TH-NR-MIN-IN-002
8. Manufacturing inspection for product certification (Head Office)	Production process and quality control system inspection including the evaluation of the following group of products : - Construction materials, concretes, sanitary wares, ceramics, and furniture - Electrical lighting and similar equipment - Electrical power devices - Electrical appliances - Electronic apparatus, parts, and components - Consumer goods and toys - Rubbers, chemicals, textiles, petroleum, and food products - Automotive products, parts, and mechanical products	- Criteria for product certification of Thai Industrial Standards Institute - Criteria for the relevant particular requirements and Thai Industrial Standards for product certification - Operating procedure of SGS (Thailand) Limited : TH-PP-01

Date of Initial Issue: 11 September B.E. 2561 (2018)
Ministry of Industry Thailand, Thai Industrial Standards Institute

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Scope of Accreditation for Inspection Body
Certificate No. 22-IB0007



Name of Inspection Body : SGS (Thailand) Limited
Accreditation No. : INSPECTION 0034
Type of Inspection Body : Type A

Category / Field of Inspection	Stage and Range of Inspection	Inspection Requirements or Criteria
9. Environmental (Head Office)	Indoor Environment Inspection with the items as follows : - Sound level - Heat stress - CO, CO ₂ , PM-10, Ozone, Total VOCs - Temperature - Relative humidity - Air velocity - Light intensity	- Operating procedure of SGS (Thailand) Limited ; PR-TH-ISE-IN-035, PR-TH-ISE-IN-036, PR-TH-ISE-IN-038, PR-TH-ISE-IN-050, PR-TH-ISE-IN-051, PR-TH-ISE-IN-052, PR-TH-ISE-IN-054, and PR-TH-ISE-IN-055 - Customer's requirement - Related laws and regulations
	Outdoor Environment Inspection, the items as follows : - Continuous Emission Monitoring System : CEMS (CO, SO ₂ , NO ₂ , O ₃ , CO ₂ , NO, and NO _x)	- Operating procedure of SGS (Thailand) Limited : PR-TH-ISE-IN-015 and PR-TH-ISE-IN-032 - Customer's requirement - Related laws and regulations
	Water Inspection, the items as follows : - Water sampling - Physical appearance (Color, Suspended Solids) - pH - Temperature - Dissolved Oxygen : DO - Conductivity - Salinity - Turbidity Excludes laboratory analysis result	- Operating procedure of SGS (Thailand) Limited : PR-TH-ISE-IN-045 - Customer's requirement - Related laws and regulations

Date of Initial Issue: 11 September B.E. 2561 (2018)
Ministry of Industry Thailand, Thai Industrial Standards Institute

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Scope of Accreditation for Inspection Body
Certificate No. 22-IB0007



Name of Inspection Body : SGS (Thailand) Limited
Accreditation No. : INSPECTION 0034
Type of Inspection Body : Type A

Category / Field of Inspection	Stage and Range of Inspection	Inspection Requirements or Criteria
10. Agricultural Products : Wheat and soybean meal* (Head Office and Siracha Office)	General appearance inspection, Sampling, and weighing observation	- GAFTA Weighing Rules No. 123 - GAFTA Sampling Rules No.124 - Operating procedure of SGS (Thailand) Limited : PR-TH-NR-AGR-IN-006 - Customer's requirement

Note : * Extent scope: 8 December B.E. 2564 (2021)

Valid from : 8 December B.E. 2564 (2021)
Until : 10 September B.E. 2569 (2026)
Issue Date : 31 January B.E. 2565 (2022)

Date of Initial Issue: 11 September B.E. 2561 (2018)
Ministry of Industry Thailand, Thai Industrial Standards Institute

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ABS Quality Evaluations

Certificate Of Conformance

This is to certify that the Quality Management System of:

SGS (Thailand) Ltd.

**100 Nanglinchee Road, Chongnonsee, Yannawa,
Bangkok 10120
Thailand**

(WITH ADDITIONAL FACILITIES LISTED ON ATTACHED ANNEX)

has been assessed by ABS Quality Evaluations, Inc. and found to be in conformance with the requirements set forth by:

ISO 9001:2015

The Quality Management System is applicable to:

PROVISION OF PHYSICAL INSPECTION, FUMIGATION, PEST CONTROL AND LABORATORY TESTING AND CALIBRATION

This certificate may be found on the ABS QC Website (www.abs-qc.com). For certificates issued in the People's Republic of China information may also be verified on the CNCA website (www.cnca.gov.cn).

Certificate No: 52229
Certification Date: 30 July 2015
Effective Date: 23 July 2020
Expiration Date: 24 July 2023
Revision Date: 23 July 2020



Validity of this certificate is based on the successful completion of the periodic surveillance audits of the management system defined by the above scope and is contingent upon prompt written notification to ABS Quality Evaluations, Inc. of significant changes to the management system or components thereof.

ABS Quality Evaluations Inc. 1701 City Plaza Drive, Spring, TX 77080, U.S.A.
Validity of this certificate may be confirmed at www.abs-qc.com/cert_validation

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ABS Quality Evaluations

ISO 9001:2015

Certificate Of Conformance

ANNEX

Certificate No. 52229

SGS (Thailand) Ltd.

At Below Facilities:

Facility	Facility 1 - Rayong Branch 1055 and 1011 Moo 1 T. Ban Chiang A. Ban Chiang Rayong 21130 Thailand	Facility	Facility 2 - Sriracha Office 144, 145 Srisaeng-Nakorn 1 Road 1. Sriracha A. Sriracha Chonburi 20110 Thailand
Activity	Inspection & Testing	Activity	Inspection, Fumigation & Pest Control
Facility	Facility 3 - Nakhon Phanom Office 134088 Sunnont Road, T. Nong Maeng A. Nong Maeng Nakhon Phanom 49000 Thailand	Facility	Facility 4 - Nakhon Phanom Office 17, 51 and 511 Moo 10 Thelassan Road T. Nong Maeng A. Nong Maeng Nakhon Phanom 49000 Thailand
Activity	Inspection & Fumigation	Activity	Inspection, Fumigation, Pest Control & Testing
Facility	Facility 5 - Rama III Branch, Laboratory Services 41/15-26, 41/23 Rama III Road So. 52 Chongnonsee, Yannawa Bangkok 10120 Thailand	Facility	Facility 6 - SGSS (Cambodia) Limited No. 1176 A.D. Street 371 Phnom Penh Sangkat Sreng Monivong, Khan Monivong, Phnom Penh, Cambodia
Activity	Testing	Activity	Inspection



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