

ภาคผนวก จ

เอกสารสอบเทียบเครื่องมือที่ใช้ในการตรวจวิเคราะห์
(Calibration)



Thai Environmental Technic Limited
บริษัท เทคนิคสิ่งแวดล้อมไทย จำกัด

ตารางการสอบเทียบเครื่องมือที่ใช้ในการตรวจวัดและวิเคราะห์

Item	Description	Parameter	List of Equipment	Equipment No.	Calibration	Next Calibration
1.	Stack Air	Particulate	Dry Gas Meter/SK25EX	S/N 1169	08/02/2024	February 2025
			Humidity/Barometer/Temp./PHB-318	S/N B011412	15/03/2024	March 2025
			Digital Thermometer/DP-52	S/N L.411635	04-10/04/2024	April 2025
			Electronic Balance/METTLER TOLEDO	S/N 1116392227	10/04/2024	April 2025
		NO _x as NO ₂	Gas Analyzer (E-instruments)/4400S	S/N 2763	01/06/2024	December 2024
			Gas Analyzer (E-instruments)/4400S	S/N 6159	01/06/2024	December 2024
			Gas Analyzer (Sauer mann)/SICA-230	S/N 1021405000337	03/01/2024	January 2025
		Fume Al	Dry Gas Meter/SK25EX	S/N 1169	08/02/2024	February 2025
			Humidity/Barometer/Temp./PHB-318	S/N B011412	15/03/2024	March 2025
			Digital Thermometer/DP-52	S/N L.411635	04-10/04/2024	April 2025
			ICP394/PerkinElmer/OPTIMA8000	S/N 078N1310024C	27/09/2024	March 2025
		HF	Personal Air Sampler/Gilian	S/N 20151003020	15/11/2024	December 2024
			Ion Chromatograph/ICS-1100	S/N 10010987	20/09/2024	September 2025
		HCL	Personal Air Sampler/Gilian	S/N 20151003020	15/11/2024	December 2024
			Ion Chromatograph/ICS-1100	S/N 10010987	20/09/2024	September 2025
2.	Ambient Air	TSP	CERTIFICATE OF CALIBRATION/Tisch TE-5025A	S/N 0068	17/08/2023	August 2024
			High Volume Air Sampler/TET	S/N TSP-24	03/07/2024	July 2025
			High Volume Air Sampler/TET	S/N TSP-34	01/07/2024	July 2025
			Electronic Balance/METTLER TOLEDO	S/N 1116392227	10/04/2024	April 2025
		NO ₂	CERTIFICATE OF ANALYSIS : Linde	S/N A00917SK	05/07/2023	July 2026
			NO _x Analyzer/API 200E	S/N 1732	25/09/2024	March 2024
			NO _x Analyzer/API TML-41-H-02	S/N 495	03/10/2024	April 2025
		WS & WD	Wind speed and wind direction/Weather Wizard III	S/N WC41020A38	29/08/2024	August 2025
			Wind speed and wind direction/Weather Wizard III	S/N WE61121A25A	29/08/2024	August 2025



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Item	Description	Parameter	List of Equipment	Equipment No.	Calibration	Next Calibration
3.	Water	pH	pH Meter/Horiba	S/N B06D0012	30/10/2024	October 2025
		Temperature	pH Meter/Horiba (Temperature)	S/N B06D0012	30/10/2024	October 2025
		TSS, SS	Electronic Balance/METTLER TOLEDO	S/N 1116392227	10/04/2024	April 2025
		BOD	BOD Incubator/Model i250-DS	S/N 2059-1017-0029	24/06/2024	June 2025
		TDS	Electronic Balance/METTLER TOLEDO	S/N 1116392227	10/04/2024	April 2025
		Oil & Grease	Electronic Balance/METTLER TOLEDO	S/N 1116392227	10/04/2024	April 2025
		DO	DO Meter/HORIBA	S/N D75J0012	09/02/2024	February 2025
		Al	ICP394/PerkinElmer/OPTIMA8000	S/N 078N1310024C	27/09/2024	March 2025
4.	Sound Level	Leq 24 hr	Sound Level Calibrator/ST-120	S/N ST120C0263E	21/12/2023	December 2024
			Sound Level Meter/ACO 6226	S/N 110098	01/11/2024	30/11/2024
			Sound Level Meter/ACO 6226	S/N 110099	01/11/2024	30/11/2024
			Sound Level Meter/ACO 6226	S/N 110097	01/11/2024	30/11/2024
			Sound Level Meter/ACO 6226	S/N 130128	01/11/2024	30/11/2024
			Sound Level Meter/ACO 6226	S/N 160216	01/11/2024	30/11/2024
5.	Soil	pH	pH Meter/Horiba	S/N B06D0012	30/10/2024	October 2025
		Conductivity	Conductivity Meter/Horiba	S/N D66G0003	29/01/2024	January 2025
		Benzene	Gas Chromatograph/GC 7890	S/N CN10723012	26/06/2024	June 2025
			Mass Spectrometry/MS 5975	US 71236314	26/06/2024	June 2025
		Toluene	Gas Chromatograph/GC 7890	S/N CN10723012	26/06/2024	June 2025
			Mass Spectrometry/MS 5975	US 71236314	26/06/2024	June 2025
		Xylene	Gas Chromatograph/GC 7890	S/N CN10723012	26/06/2024	June 2025
			Mass Spectrometry/MS 5975	US 71236314	26/06/2024	June 2025
		Al	ICP394/PerkinElmer/OPTIMA8000	S/N 078N1310024C	27/09/2024	March 2025



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Item	Description	Parameter	List of Equipment	Equipment No.	Calibration	Next Calibration
6.	Occupational Health and Safety	Leq 8 hr	Sound Level Calibrator/TENMARS TM-100	S/N 180501628	13/08/2024	August 2025
			Integrated Sound Level/ACO TYPE 6226	S/N 100102	01/08/2024	31/08/2024
			Integrated Sound Level/ACO TYPE 6236	S/N 152076	01/08/2024	31/08/2024
			Integrated Sound Level/ACO TYPE 6236	S/N 222036	01/08/2024	31/08/2024
			Integrated Sound Level/ACO TYPE 6236	S/N 222037	01/08/2024	31/08/2024
			Integrated Sound Level/ACO TYPE 6236	S/N 222039	01/08/2024	31/08/2024
			Integrated Sound Level/ACO TYPE 6236	S/N 152075	01/11/2024	30/11/2024
			Integrated Sound Level/ACO TYPE 6236	S/N 222040	01/11/2024	30/11/2024
			Integrated Sound Level/ACO TYPE 6236	S/N 222245	01/11/2024	30/11/2024
			Integrated Sound Level/ACO TYPE 6236	S/N 222247	01/11/2024	30/11/2024
		Noise Dose	Noise Dose Meter/SOUNDTEK ST-130	S/N 170400163	15/02/2024	February 2025
			Noise Dose Meter/SOUNDTEK ST-130	S/N 220100050	15/02/2024	February 2025
			Noise Dose Meter/SOUNDTEK ST-130	S/N 220100051	15/02/2024	February 2025
			Noise Dose Meter/SOUNDTEK ST-130	S/N 220100052	15/02/2024	February 2025
			Noise Dose Meter/SOUNDTEK ST-130	S/N 170800191	08/02/2024	February 2025
			Noise Dose Meter/SOUNDTEK ST-130	S/N 170800193	08/02/2024	February 2025
			Noise Dose Meter/SOUNDTEK ST-130	S/N 220100055	11/03/2024	March 2025
		Heat	Thermal Environment Monitor/JANTYTECH JT 2011-E2A	S/N 3522210143	18/03/2024	March 2025
			Thermal Environment Monitor/JANTYTECH JT 2011-E2A	S/N 3522210144	19/03/2024	March 2025
		Light Intensity	Digital Lux Meter/Digicon LX-50	S/N AD.60206	09/11/2023	November 2024
			Digital Lux Meter/Digicon LX-50	S/N AC.76003	14/08/2024	August 2025
		Air Ventilation	HOT WIRE ANEMONETER/Testo 425	S/N 03314614	18/03/2024	March 2025
			HOT WIRE ANEMONETER/Testo 425	S/N 03684054	29/08/2024	August 2025



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Item	Description	Parameter	List of Equipment	Equipment No.	Calibration	Next Calibration
7.	Working Air	Xylene	Personal Air Sampler/Gilian	S/N 20110605020	04/08/2024	September 2024
			Personal Air Sampler/Gilian	S/N 101159	04/08/2024	September 2024
			Personal Air Sampler/Gilian	S/N 101157	04/08/2024	September 2024
			Personal Air Sampler/Gilian	S/N 20080703007	04/08/2024	September 2024
			Personal Air Sampler/Gilian	S/N 20151003007	04/08/2024	September 2024
			Personal Air Sampler/Gilian	S/N 20111203067	04/08/2024	September 2024
			Personal Air Sampler/Gilian	S/N 20140605013	04/08/2024	September 2024
			Personal Air Sampler/Gilian	S/N 20151102087	04/08/2024	September 2024
			Personal Air Sampler/Gilian	S/N 101156	08/11/2024	December 2024
			Personal Air Sampler/Gilian	S/N 20140605001	08/11/2024	December 2024
			Personal Air Sampler/Gilian	S/N 20110605047	08/11/2024	December 2024
			Personal Air Sampler/Gilian	S/N 20151002106	08/11/2024	December 2024
			Personal Air Sampler/Gilian	S/N 20111203067	11/11/2024	December 2024
			Personal Air Sampler/Gilian	S/N 20140505023	11/11/2024	December 2024
			Personal Air Sampler/Gilian	S/N 101148	11/11/2024	December 2024
			Gas Chromatograph/GC7890B	S/N CN16343040	25/09/2024	September 2025
		Fume Al	Personal Air Sampler/Gilian	S/N 20151003044	31/07/2024	August 2024
			Personal Air Sampler/Gilian	S/N 20080703019	18/11/2024	December 2024
			ICP394/PerkinElmer/OPTIMA8000	S/N 078N1310024C	27/09/2024	March 2025
		HF	ICP394/PerkinElmer/OPTIMA8000	S/N 078N1310024C	27/09/2024	March 2025
			Personal Air Sampler/Gilian	S/N 20151002110	31/07/2024	August 2024
		HCL	Personal Air Sampler/Gilian	S/N 20080703020	18/11/2024	December 2024
			Personal Air Sampler/Gilian	S/N 20110605104	31/07/2024	August 2024
			Personal Air Sampler/Gilian	S/N 20080703007	18/11/2024	December 2024
			Ion Chromatograph/ICS-1100	S/N 10010987	28/03/2024	September 2024
			Ion Chromatograph/ICS-1100	S/N 10010987	20/09/2024	September 2025



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Item	Description	Parameter	List of Equipment	Equipment No.	Calibration	Next Calibration
7.	Working Air (Cont.)	Total Dust	Personal Air Sampler/Gilian	S/N 20151003042	31/07/2024	August 2024
			Personal Air Sampler/Gilian	S/N 20151002111	18/11/2024	December 2024
		Respirable Dust	Electronic Balance/XP 205	S/N 1129273885	10/04/2024	April 2025
			Personal Air Sampler/Gilian	S/N 20031009020	31/07/2024	August 2024
			Personal Air Sampler/Gilian	S/N 20111203066	18/11/2024	December 2024
			Electronic Balance/XP 205	S/N 1129273885	10/04/2024	April 2025



THAI ENVIRONMENTAL TECHNIC LIMITED
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CONTROL UNIT CALIBRATION

(Metric units , mm)

Date **8-Feb-24**

Initial Final Average
Barometric press, Pb **758.9** **758.7** **758.8** mmHg

Dry Gas Meter Data

Console No. **M50-03**

Metering System ID

DGM Number **1169**

DGM Model **SK25EX**

Reference Dry Gas Meter Data

Serial No. **913428**

Model **S-110**

Correction factor(Yr) **1.0209**

Last Calibration Data **26-May-23**

Orifice manometer setting ΔH mm H2O	Ref .	DGM	Temperature (° C)				Time min	DGM Correction factor (Y)	ΔH@ mm H2O
	DMG Volume V _r Liters	Volume V _m Liters	Ref	Dry Gas Meter					
			DGM T _r	Inlet T _i	Outlet T _o	Avg T _m			
15.00	100.00	100.05	28.00	28.00	29.00	28.50	8.36	1.0206	46.0447
25.00	100.00	99.95	28.00	28.00	29.00	28.50	6.49	1.0206	46.2941
50.00	100.00	99.72	28.00	28.00	29.00	28.50	4.58	1.0205	46.2216
80.00	100.00	99.45	28.00	28.00	29.00	28.50	3.59	1.0203	45.5699
100.00	100.00	99.20	28.00	28.00	29.00	28.50	3.23	1.0209	46.1996

Average **1.0206** **46.0660**

Dued Date of Calibrate **9-Feb-25**

Calibrated by : *J. S.*

Approved : *Pramua M.*

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is ± 0.02 .

Note: For $\Delta H@$, Orifice pressure differential that equates to 0.75cfm (0.0212m³/min) at standard temperature and pressure, acceptable tolerance of individual values from the average is ± 0.2 inches (5.1mm)H₂O.



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



Certificate of Calibration

Certificate No. : 24P896

Page : 1 of 2

Equipment : Humidity/Barometer/Temp.

Manufacturer: Lutron

Model : PHB-318

Serial No.: B011412

ID No.: NO.5

Condition As-Received: Used Item

Received Date: 12 March 2024

Calibration Date: 15 March 2024

Reference: 2403-0381DSC

Submitted by: Thai Environmental Technic Limited

Ambient Temperature: (23 \pm 2) °C

Relative Humidity: (50 \pm 15) %

Atmospheric Pressure: 1012 mbar

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Corporate Services 3: Equipment Calibration and Testing Services.

1/6 Soi Ramkhamhaeng 145, Khwaeng/Khet Saphan Sung,
Bangkok 10240

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments
Standard according to calibration procedure CP-P10, using " DKD-R 6-1 ; Calibration of Pressure Gauges " as
a guidelines.

Condition of this result of calibration

1.Reference standards instruments :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
1) Standard Barometer	DPI142	1422505046	MP-0094-23	03 May 2024

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

3.Scale and conversion factor is 1 kPa = 7.50062 mmHg

4.This result of calibration instrument was in absolute pressure.

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

6.This instrument was installed in vertical orientation and center of the device 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 through:-

-National Institute of Metrology Thailand (NIMT)

Calibrated by : Suksan Khankaew

Issue Date : 18 March 2024

Approved Signatory : Attapol P.

[] Phalinee Prabpaipal

[] Sura Suwannasri

[x] Attapol Panurach

B 0337434



Cert.No.: 24P896

Page: 2 of 2

Result of calibration:- Without adjustment

Range : 730 mmHg to 770 mmHg

Function:- Absolute Pressure Measurement

Resolution : 0.1 mmHg

Increasing Pressure

Applied Pressure (mmHg)	729.90	739.90	749.89	759.89	769.89
UUC* Indication (mmHg)	730.5	740.5	750.5	760.5	770.5
Error (mmHg)	0.60	0.60	0.61	0.61	0.61

Decreasing Pressure

Applied Pressure (mmHg)	769.89	759.89	749.89	739.90	729.90
UUC* Indication (mmHg)	770.5	760.5	750.5	740.5	730.5
Error (mmHg)	0.61	0.61	0.61	0.60	0.60

The uncertainty of measurement was ± 0.12 mmHg

* UUC = Unit Under Calibration

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

-000-

Attapoli P.

a 1206581



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



Certificate of Calibration

Certificate No. : 24T625

Page : 1 of 2

Equipment : Digital Thermometer With Sensor

Manufacturer: Digicon

Model : DP-52

Serial No.: L411635

ID No.: No.10

Condition As-Received: Used Item

Received Date: 12 March 2024

Calibration Date: 04 April 2024
to 10 April 2024

Reference: 2403-0381DSC

Ambient Temperature: (25 \pm 3) °C

Relative Humidity: (50 \pm 20) %

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Corporate Services 3: Equipment Calibration and Testing Services.

Submitted by: Thai Environmental Technic Limited

1/6 Soi Ramkhamhaeng 145, Khwaeng/Khet Saphan Sung,
Bangkok 10240

Procedure used: Calibration were conducted using in-house calibration procedure CP-T01 according to comparison with Industrial Platinum Resistance Thermometer (IPRT) into liquid bath temperature controller and comparison with Standard Thermocouple (Type R/S) into high temperature furnace.
The temperature scale used was based on ITS-90.

Condition of this result of calibration

1.Reference standards instruments :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
1) Digital Thermometer	1529	A4B760	23I1123	21 Sep 2024
2) Industrial Platinum Resistance Thermometer	5627	824302	23I1123	21 Sep 2024
3) Digital Multimeter	2700	4016315	23EH24	06 Oct 2024
4) Standard Thermocouple Probe (Type S)	TCS	TCS-001	TT-0004-24	09 Jan 2025

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 through:-

- Technology Promotion Association (Thailand-Japan), NSC-ONSC Accredited No. Calibration 0008
- National Institute of Metrology Thailand (NIMT)

Calibrated by : Anuchit Pangchata
Issue Date : 19 April 2024

Approved Signatory :

[] Phalinee Prabpaipal
[] Chatchawan Khunpiluek
[✓] Wanlop Larpkern

B 0339236



Cert. No.: 24T625

Page.: 2 of 2

Result of Calibration:-

Without Adjustment

Function: Temperature measurement for Channel T1

This equipment was connected with Thermocouple Type K S/N. 11005001 ID No. NO.10

Dimension of probe : Diameter 8 mm., Length 1030 mm. Sheath material : Stainless Steel

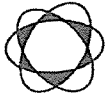
Immersion Depth (mm.)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (±°C)
180	200.0012	200.0	-0.0012	0.74
180	400.0019	399.9	-0.1019	1.4
180	599.98	601.9	1.9200	3.1

UUC* : Unit Under Calibration

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

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a 1210754



Portable Gas Calibration Report

Manufacturer : E-instruments
Instrument Model : 4400S
Instrument serial no. : 2763
Instrument ID : 2

Date of Calibration: 1-Jun-24
Ambient Condition
Temperature (23±5 °C) : 25.0 °C
Humidity (55±15 % RH) : 50.0 % RH
Barometer (mmHg) : 759.5 mmHg

Standard gas References

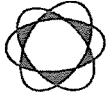
Standard gas	Cylinder No.	Traceability	Due date
Oxygen (O ₂)	36232	Linde	June 26, 2031
Nitric Oxide(NO)	D824463	Linde	June 5, 2026
	D824524	Linde	August 22, 2025
Sulfur Dioxide (SO ₂)	D824500	Linde	October 11, 2024
	D271305	Linde	October 11, 2024
Carbon Monoxide(CO)	D824500	Linde	October 11, 2024
	D271305	Linde	October 11, 2024

Calibration Results

Parameter	Standard gas	Reading	Actual Error	Test Limit	Results
O ₂ (%vol)	0.0	0.0	0.0	±0.2 % vol	PASS
	14.0	14.0	0.0		
NO (ppm)	0.0	0.0	0.0	±5.0 ppm 0...100 ppm ±5% measured Value 101....5000 ppm	PASS
	198.0	198.2	0.2		
	392.0	393.1	1.1		
SO ₂ (ppm)	0.0	0.0	0.0		PASS
	406.0	404.0	-2.0		
	804.0	804.3	0.3		
CO (ppm)	0.0	0.0	0.0		PASS
	404.0	402.8	-1.2		
	793.0	794.1	1.1		

Calibrate by:

Approved by:



Portable Gas Calibration Report

Manufacturer : <u>E-instruments</u>	Date of Calibration: <u>1-Jun-24</u>
Instrument Model : <u>4400S</u>	Ambient Condition
Instrument serial no. : <u>6159</u>	Temperature (23±5 °C) : <u>25.0</u> ° C
Instrument ID : <u>7</u>	Humidity (55±15 % RH) : <u>50.0</u> % RH
	Barometer (mmHg) : <u>758.7</u> mmHg

Standard gas References

Standard gas	Cylinder No.	Traceability	Due date
Oxygen (O ₂)	36232	Linde	June 26, 2031
Nitric Oxide(NO)	D824463	Linde	June 5, 2026
	D824524	Linde	August 22, 2025
Sulfer Dioxide (SO ₂)	D824500	Linde	October 11, 2024
	D271305	Linde	October 11, 2024
Carbon Monoxide(CO)	D824500	Linde	October 11, 2024
	D271305	Linde	October 11, 2024

Calibration Results

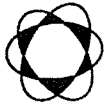
Parameter	Standard gas	Reading	Actual Error	Test Limit	Results
O ₂ (%vol)	0.0	0.0	0.0	±0.2 % vol	PASS
	14.0	14.0	0.0		
NO (ppm)	0.0	0.0	0.0	±5.0 ppm 0...100 ppm ±5% measured Value 101....5000 ppm	PASS
	198.0	199.0	1.0		
	392.0	392.0	0.0		
SO ₂ (ppm)	0.0	0.0	0.0		PASS
	406.0	405.0	-1.0		
	804.0	805.0	1.0		
CO (ppm)	0.0	0.0	0.0		PASS
	404.0	403.0	-1.0		
	793.0	792.0	-1.0		

Calibrate by:

Jarant Jarant

Approved by:

Pramual M



Thai Environmental Technic Limited
บริษัท เทคนิคสิ่งแวดล้อมไทย จำกัด

Personal Pump Calibration Report

Equipment Type : Personal Pump/Parameter
Equipment Range : 0.1-7.0 l/min
Calibration Range : 0.1-4.0 l/min
Calibration Type : Drycal
Calibration S/N : 4491

Item	Personal Pump S/N	Hi Flow/Low Flow	ครั้งที่ 1	ครั้งที่ 2	ครั้งที่ 3	Average	Uncertainty
1.	20110605104	0.5	0.4985	0.4982	0.4986	0.4984	±0.0002
2.	20151002110	1.5	1.4940	1.4980	1.4990	1.4970	±0.0026
3.	20031009020	2.5	2.4940	2.4950	2.4960	2.4950	±0.0010
4.	20151003042	2.0	1.9920	1.9960	1.9930	1.9937	±0.0021
5.	20151003044	2.0	1.9920	1.9950	1.9910	1.9927	±0.0021

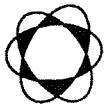
Calibration Date 31 / 07 / 67

Calibration By สมชาย

Remark : Uncertainty Type A = $\frac{\sigma}{\sqrt{n}}$ = SD

: SD = Standard deviation

: \bar{X} = Mean



Personal Pump Calibration Report

Equipment Type : Personal Pump/Parameter
Equipment Range : 0.1-7.0 l/min
Calibration Range : 0.1-4.0 l/min
Calibration Type : Drycal
Calibration S/N : 4491

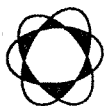
Item	Personal Pump S/N	Hi Flow/Low Flow	ครั้งที่ 1	ครั้งที่ 2	ครั้งที่ 3	Average	Uncertainty
1.	20110605020	0.2	0.1996	0.1988	0.1993	0.1992	±0.0004
2.	101159	0.2	0.1994	0.1986	0.1998	0.1993	±0.0006
3.	101157	0.2	0.1985	0.1991	0.1998	0.1991	±0.0007
4.	20080703007	0.2	0.1988	0.1998	0.1999	0.1995	±0.0006
5.	20151003007	0.2	0.1989	0.1991	0.1994	0.1991	±0.0003
6.	20111203067	0.2	0.1991	0.1995	0.1996	0.1994	±0.0003
7.	20140605013	0.2	0.1989	0.1994	0.1996	0.1993	±0.0004
8.	20151102087	0.2	0.1995	0.1996	0.1994	0.1995	±0.0001

Calibration Date 04 / 08 / 67

Calibration By สมานิต

Remark : Uncertainty Type A = $\frac{\sigma}{\sqrt{n}}$ = SD

: SD = Standard deviation
: \bar{X} = Mean



Personal Pump Calibration Report

Equipment Type : Personal Pump/Parameter
Equipment Range : 0.1-7.0 L/min
Calibration Range : 0.1-4.0 L/min
Calibration Type : Drycal
Calibration S/N : 109698

Item	Personal Pump S/N	Hi Flow/Low Flow	ครั้งที่ 1	ครั้งที่ 2	ครั้งที่ 3	Average	Uncertainty
1.	101156	0.2	0.1989	0.1995	0.1992	0.1992	±0.0003
2.	20140605001	0.2	0.1997	0.1992	0.1993	0.1994	±0.0003
3.	20110605047	0.2	0.1983	0.1994	0.1997	0.1991	±0.0007
4.	20151002106	0.2	0.1983	0.1988	0.1991	0.1987	±0.0004

Calibration Date 08 / 11 / 67

Calibration By ฐานวิจัย

Remark : Uncertainty Type A = $\frac{\sigma}{\sqrt{n}}$ = SD

: SD = Standard deviation
: \bar{X} = Mean



Personal Pump Calibration Report

[illegible]

Calibration By สมชาย ตรี

$$\sqrt{n}$$
$$\bar{X} = \text{Mean}$$



Thai Environmental Technic Limited
บริษัท เทคนิกล้างแวล้อมไทย จำกัด

Personal Pump Calibration Report

Equipment Type : Personal Pump/Parameter
Equipment Range : 0.1-7.0 l/min
Calibration Range : 0.1-4.0 l/min
Calibration Type : Drycal
Calibration S/N : 4491

Item	Personal Pump S/N	Hi Flow/Low Flow	ครั้งที่ 1	ครั้งที่ 2	ครั้งที่ 3	Average	Uncertainty
1.	20151003020	2.0	1.9990	1.9980	1.9980	1.9983	±0.0006

Calibration Date 15 / 11 / 67

Calibration By สมบัติ

Remark : Uncertainty Type A = $\frac{\sigma}{\sqrt{n}}$ = SD

: SD = Standard deviation

: \bar{X} = Mean



Personal Pump Calibration Report

Equipment Type : Personal Pump/Parameter
Equipment Range : 0.1-7.0 l/min
Calibration Range : 0.1-4.0 l/min
Calibration Type : Drycal
Calibration S/N : 4491

Item	Personal Pump S/N	Hi Flow/Low Flow	ครั้งที่ 1	ครั้งที่ 2	ครั้งที่ 3	Average	Uncertainty
1.	20080703007	0.5	0.4999	0.4998	0.4998	0.4998	±0.0001
2.	20080703020	1.5	1.4930	1.4930	1.4930	1.4930	±0.0000
3.	20080703019	2.0	1.9980	1.9960	1.9980	1.9973	±0.0012
4.	20151002111	2.0	1.9930	1.9930	1.9930	1.9930	±0.0000
5.	20111203066	2.5	2.4930	2.4920	2.4920	2.4923	±0.0006

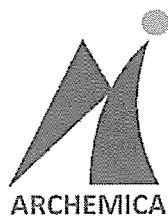
Calibration Date 18 / 11 / 67

Calibration By คณิศร

Remark : Uncertainty Type A = $\frac{\sigma}{\sqrt{n}}$ = SD

: SD = Standard deviation

: \bar{X} = Mean



Certificate of Calibration

ICS-1100 : Anion (ID#377)

This certificate is to verify that instrument below are calibrated

by Archemica Lab Co.,Ltd.

ICS-1100 S/N : 10010987

AS-DV S/N : 10010912

for

Thai Environmental Technic Co., Ltd

ARCHEMICA LAB

บริษัท อาร์เคมีโก้ แล็บ จำกัด
ARCHEMICA LAB CO.,LTD.

Operator Signature : K. Channarong Khiao-Un Date : Sep 20, 2024

(Mr. Channarong Khiao-Un)

Test Engineer

Qualification Report

PM Check list , CM_OQ and PQ

ICS-1100 : Anion (ID#377)

For

Thai Environmental Technic Co., Ltd.

(2nd Contract)

PM

Preventive Maintenance Check List



Dionex Ion Chromatography Preventive Maintenance Report

Customer Organization	Name/ Department
Thai Environmental Technic Co.,Ltd (2nd Contract)	Khun.Ketsarin / Lab
Engineer	Date
Mr.Channarong Khiao-Un	20-Sep-2024

Instrument Detail

Instrument Model	Application
ICS-1100 (ID#377)	Anion
Instrument components	Serial Number
ICS-1100	10010987
AS-DV	10010912

Consumable Detail

Columns	Guard Columns	Suppressors	Concentrators	Etc.
AS22	AG22	AERS 500	-	-

Remark: แนะนำเปลี่ยน piston pump,piston seal,piston rinse seal ของ pump head อย่างละ 2 ตัว
Pressure System สูง จาก Column แต่ยังไม่ใช้งานได้

Perform By Archemica



K. Channarong
Archemica
Date *20/Sep/2024*

บริษัท อาร์เคมีกา แล็บ จำกัด
ARCHEMICA LAB CO.,LTD

Customer

Date

General ICS Maintenance Checklist

No.	Description	Result			
Power on & Connection		Checked	Cleaned	Replaced	N.A.
1	Instrument power on	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
2	Instrument connection	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
Injection Valve Rebuild		Checked	Cleaned	Replaced	N.A.
3	Rebuilt injection valve 6 port	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	- Rotor seal	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	- Stator face	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(Optional) Auxiliary Valve Rebuild		Checked	Cleaned	Replaced	N.A.
6	Rebuilt auxiliary valve - port	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7	- Rotor seal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
8	- Stator face	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Check Valve Cartridge		Checked	Cleaned	Replaced	N.A.
9	Inlet check valve assembly	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	Outlet check valve assembly	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11	Verified correct flow orientation	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
Pump Piston Rinse Seal, Piston Seal and Piston		Checked	Cleaned	Replaced	N.A.
12	Piston rinse seal in <i>primary</i> pump head	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13	Piston seal in <i>primary</i> pump head	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14	Piston in <i>primary</i> pump head	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15	Piston rinse seal in <i>secondary</i> pump head	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16	Piston seal in <i>secondary</i> pump head	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17	Piston in <i>secondary</i> pump head	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Waste Valve and Priming Valve		Checked	Cleaned	Replaced	N.A.
18	Waste valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19	Priming valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cell Detector		Checked	Cleaned	Replaced	N.A.
20	Check conductivity cell	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21	Check electrochemical cell	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
22	- Working electrode	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
23	- Reference electrode	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
24	- Gasket	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
25	- Cell body	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Other		Checked	Cleaned	Replaced	N.A.
26	Sample Loop	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27	End-line filter	<input checked="" type="checkbox"/>	-	<input type="checkbox"/>	<input type="checkbox"/>
28	Leak sensor	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29	Lubricate pump mechanic	<input type="checkbox"/>	<input checked="" type="checkbox"/>	-	<input type="checkbox"/>
30	Reconnected liquid lines to the valve	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
31	Reconnected liquid lines to pump heads	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
32	Primed pump	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
33	Checked pump for leaks	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
34	Checked gas for leaks	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>



AS-DV Autosampler Preventive Maintenance Checklist

Model	Serial number	Firmware Version
<input checked="" type="checkbox"/> AS-DV	10010987	-

No.	Description	Result			
Power on & Connection		Checked	Cleaned	Replaced	N.A.
1.	AS-DV power on	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
2.	AS-DV connection	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
Sampling Tip		Checked	Cleaned	Replaced	N.A.
3.	Sampling needle	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.	Sampling tubing (Transfer line)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.	Reconnect sampling needle & tubing	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
Other		Checked	Cleaned	Replaced	N.A.
6.	Check carousel movement	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
7.	Check needle movement	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
8.	Lubricate needle drive	<input type="checkbox"/>	<input checked="" type="checkbox"/> Lubricated	-	<input type="checkbox"/>
9.	AS-DV cover	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(Optional) High Pressure Valve		Checked	Cleaned	Replaced	N.A.
10.	High pressure valve Port	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
11.	- Rotor seal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
12.	- Stator face	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
13.	- Reconnected liquid line to the valve	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Others / comments

CM OQ

Chromeleon

Operation Qualification



Chromeleon Operational Qualification

General Information

Computer Name (Server): USERICU
Computer Name (Client): USERICU
Version Number: 6.80 SR8 Build 2623 (156243)
Operator: Mr.Channarong Khiao-Un

General System Suitability Test: *Test passed*

Comparison Formats:

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



บริษัท อาร์เคมีคัล แล็บ จำกัด
ARCHEMICA LAB CO.,LTD.

K.Channarong 20/Sep/2024

Reviewer's Signature // Date

Operator's Signature // Date



Chromeleon Operational Qualification, Part 1

Verification of Selected Results

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

<i>Report Variable</i>	<i>Peak Name</i>	<i>Status</i>
Offset (c0)	n.a.	ok
	n.a.	ok
	n.a.	ok
Slope (c1)	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok
Correlation Coeffi.	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

**Chromeleon Operational Qualification, Part 1****Verification of Selected Results**

<i>Report Variable</i>	<i>Peak Name</i>	<i>Status</i>
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 (AIA)	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok



Chromeleon Operational Qualification, Part 1

Verification of Selected Results

<u>Report Variable</u>	<u>Peak Name</u>	<u>Status</u>
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

Test Result: **Passed**



K. Hongsakorn 20/Sep/2024

Reviewer's Signature // Date

Operator's Signature // Date



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

<i>Variable Category</i>	<i>Report Variable</i>	<i>Peak Name</i>	<i>Status</i>
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
	Noise 2.1-2.3		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



Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

<i>Variable Category</i>	<i>Report Variable</i>	<i>Peak Name</i>	<i>Status</i>
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



Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

<i>Variable Category</i>	<i>Report Variable</i>	<i>Peak Name</i>	<i>Status</i>
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



Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

<i>Variable Category</i>	<i>Report Variable</i>	<i>Peak Name</i>	<i>Status</i>
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)	Methylparabene	ok
	Theoretical Plates(USP)	Ethylparabene	ok
	Theoretical Plates(USP)	Propylparabene	ok
	Theoretical Plates(JP)	Methylparabene	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
	Weights	Propylparabene	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



Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

<i>Variable Category</i>	<i>Report Variable</i>	<i>Peak Name</i>	<i>Status</i>
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
	F(X)	Methylparabene	ok
	F(X)	Ethylparabene	ok
	F(X)	Propylparabene	ok



Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

<i>Variable Category</i>	<i>Report Variable</i>	<i>Peak Name</i>	<i>Status</i>
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
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



Chromeleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

<i>Variable Category</i>	<i>Report Variable</i>	<i>Peak Name</i>	<i>Status</i>
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	ok
	RSD Match	Ethylparabene	ok
	RSD Match	Propylparabene	ok
	Rel.Max at	Methylparabene	ok
	Rel.Max at	Ethylparabene	ok
	Rel.Max at	Propylparabene	ok

Test Result: **Passed**



K. A. [Signature] 24/Sep/2024

Reviewer's Signature // Date

Operator's Signature // Date



Chromeleon Operational Qualification, Part 3

Post-Acquisition Steps: Comparison with Expected Results

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

<i>Channel Name</i>	<i>Report Variable</i>	<i>Peak Name</i>	<i>Status</i>
<i>Extract UV Channel:</i>			
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
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
<i>Smooth Data:</i>			
UV_VIS_1_MA_005_001	Noise (1.9-2.4 min)		ok
UV_VIS_1_OL_051_001	Noise (1.9-2.4 min)		ok
EXT290NM_SG_005_010	Noise (1.9-2.4 min)		ok

Smp: Parabenes

Runtime: 9/20/2024 9:47:10 AM

**Chromeleon Operational Qualification, Part 3****Post-Acquisition Steps: Comparison with Expected Results**

<i>Channel Name</i>	<i>Report Variable</i>	<i>Peak Name</i>	<i>Status</i>
<i>Arith. Comb. of Channels:</i>			
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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ARCHEMICA LAB CO.,LTD.

K. Hanaoka 20/sep/2024

Reviewer's Signature // Date_____
Operator's Signature // Date

Smp: Parabenes

Runtime: 9/20/2024 9:47:10 AM



Chromeleon Operational Qualification, Part 4

System Suitability Test: Comparison with Expected Results

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

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

Test Result: **Passed**



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Operator's Signature // Date

**DIONEX**

Chromeleon Operational Qualification, Part 5

Fraction Collection: Comparison with Expected Results

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

<i>Variable Category</i>	<i>Report Variable</i>	<i>Status</i>
Fraction Report	Fract. No.	ok
	Fract. Starttime *)	ok
	Fract. Endtime *)	ok
	No. of Tubes	ok
	Position	ok
	Peak Name	ok
	No. of Peaks	ok
Tube Report	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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ARCHEMICA LAB CO.,LTD.

K. Hanwong 20/sep/2024

Reviewer's Signature // Date

Operator's Signature // Date

PQ

Performance Qualification



Performance Qualification Rev. 6.10

• Instruments

Instrument Name	Model	Supplier	Serial Number	Moduleware Version
Pump	ICS-1100	Dionex	10010987	1. 1. 0
Detector	ICS-1100	Dionex	10010987	1. 1. 0
Autosampler	AS-DV	Dionex	10010912	1. 5. 0
Eluent Generator	EG40 with n.a.	Dionex	10010987	1. 1. 0
Chromeleon	6.80 SR8 Build 2623 (156243)	Dionex	62483	n.a.

• Accessories

Name	Description		Lot / Serial	Exp. Date
Backpressure Tubing	0.13 mm (0.005") ID PEEK, 13 m (512")	n.a.	n.a.	n.a.
Blank	Water	n.a.	n.a.	n.a.
Sample 1	Nitrate, 5 ppm	Thermo	231226	Dec-2024
Sample 2	Nitrate, 10 ppm	Thermo	231226	Dec-2024
Sample 3	Nitrate, 25 ppm	Thermo	231226	Dec-2024
Sample 4	Nitrate, 50 ppm	Thermo	231226	Dec-2024
Sample 5	Nitrate, 100 ppm	Thermo	231226	Dec-2024
Sample 6	Nitrate, 1000 ppm	Thermo	231226	Dec-2024
Eluent	Water	Water	n.a.	n.a.
Autosampler Reservoir A	Water	Water	n.a.	n.a.
Balance	Mettler Toledo	XP 205	1129273885	n.a.
Temperature Probe	-	-	-	-
IC Validation Test Box	-	-	-	-
Ammeter / Multimeter	-	-	-	-



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K. Channakorn 20/sep/2024
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Customer Signature Date

• Limits

Test	Customized Limits	Dionex Recommended Limits
ICS-1100 Conductivity Noise (nS)	≤ 2.0	≤ 2.0
ICS-1100 Conductivity Drift (nS/hr)	≤ 20	≤ 20
Injector Precision (Area %RSD)	≤ 1.0	≤ 1.0
Injector Carryover (Area %)	≤ 0.1	≤ 0.1
ICS-1100 Detector Linearity (Corr.)	≥ 0.999	≥ 0.999
ICS-1100 Detector Linearity (%RSD)	≤ 5.0	≤ 5.0
ICS-1100 Pump Flow Rate Accuracy (mL/min)	≤ 0.05	≤ 0.05
ICS-1100 Pump Flow Rate Precision (%RSD)	≤ 2.0	≤ 2.0

• Additional Information

Customer/Company:	Khun.Ketsarin/Thai Environmental Technic Co.,Ltd	Date:	20-Sep-2024
Qualification Executor/Company:	Mr. Channarong / Archemica	Period between Qualifications:	6 months
		Next Qualification:	Mar-2025



K. Channarong 20/Sep/2024

Executor Signature Date

Customer Signature Date



Performance Qualification Rev. 6.10

Detector Noise and Drift:

• Instruments

Instrument Name	Model	Supplier	Serial Number	Moduleware Version
Pump	ICS-1100	Dionex	10010987	1. 1. 0
Detector	ICS-1100	Dionex	10010987	1. 1. 0
Autosampler	AS-DV	Dionex	10010912	1. 5. 0
Eluent Generator	EG40 with n.a.	Dionex	10010987	1. 1. 0

• Accessories

Name	Description	Lot / Serial
Backpressure Tubing	0.13 mm (0.005") ID PEEK, 13 m (512")	n.a.
Eluent	Water	n.a.

• Additional Information

Customer/Company:	Khun.Ketsarin/Thai Environmental Technic Co.,Ltd	Date:	20-Sep-2024
Qualification Executor/Company:	Mr. Channarong / Archemica	Next Qualification:	Mar-2025

• Test Results Summary

Test	Result
ICS-1100 Conductivity Noise (nS)	PASS
ICS-1100 Conductivity Drift (nS/hr)	PASS



Customer Signature _____ Date _____

K.Channarong 20/Sep/2024
Executor Signature _____ Date _____

<i>Segment number</i>	<i>Noise, nS</i>
1	0.37
2	0.28
3	0.32
4	0.31
5	0.28
6	0.31
7	0.27
8	0.30
9	0.31
10	0.29
11	0.29
12	0.33
13	0.30
14	0.80
15	0.33
16	1.20
17	0.89
18	0.89
19	1.06
20	0.79
<i>Average, nS</i>	<i>0.5</i>
<i>Limit, nS</i>	<i>2.0</i>
<i>Result</i>	<i>PASS</i>

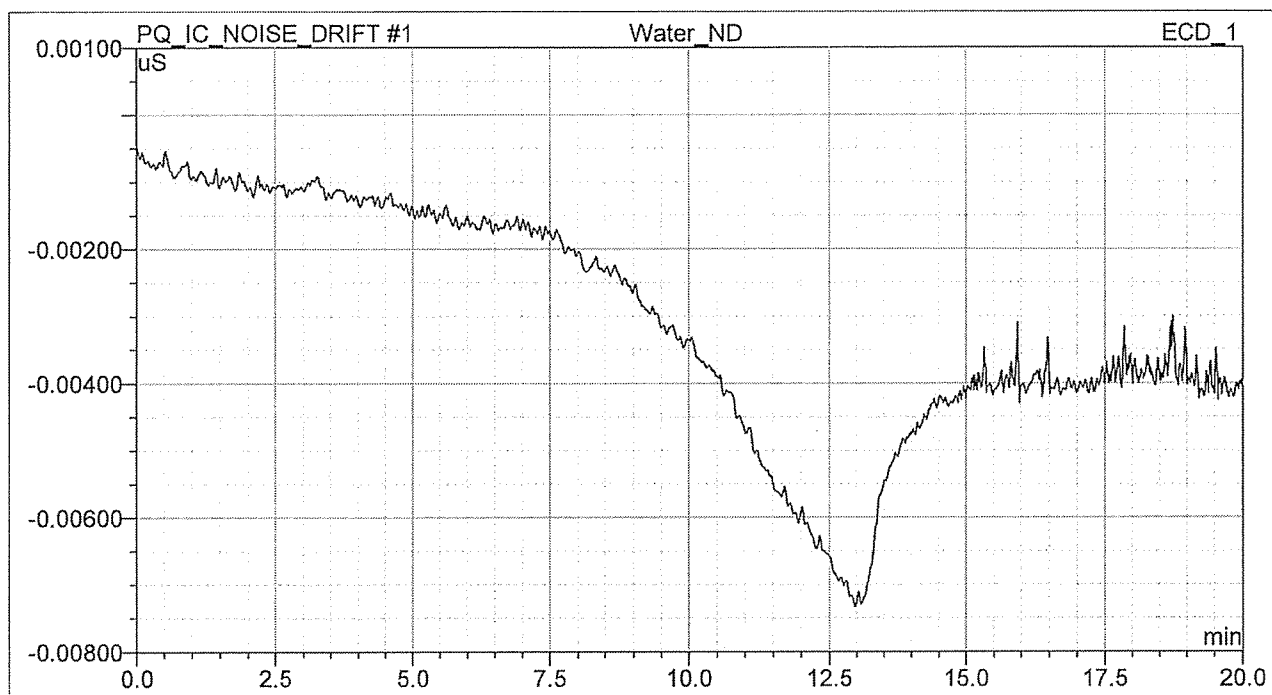
<i>20 Minute drift, nS</i>	<i>Drift, nS/hr</i>	<i>Limit, nS/hr</i>	<i>Result</i>
-4.6	13.8	20.0	PASS


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ARCHÉMICA LAB CO.,LTD

K. Giamprong 20/Sep/2024

Executer Signature Date

• **Chromatogram of Detector Noise and Drift**



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K. Chomprapong 20/Sep/2024

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Executor Signature Date



Performance Qualification Rev. 6.10

Injector Precision:

• Instruments

Instrument Name	Model	Supplier	Serial Number	Moduleware Version
Pump	ICS-1100	Dionex	10010987	1. 1. 0
Detector	ICS-1100	Dionex	10010987	1. 1. 0
Autosampler	AS-DV	Dionex	10010912	1. 5. 0
Eluent Generator	EG40 with n.a.	Dionex	10010987	1. 1. 0

• Accessories

Name	Description	Lot / Serial
Backpressure Tubing	0.13 mm (0.005") ID PEEK, 13 m (512")	n.a.
Sample 4	Nitrate, 50 ppm	231226
Eluent	Water	n.a.

• Additional Information

Customer/Company:	Khun.Ketsarin/Thai Environmental Technic Co.,Ltd	Date:	20-Sep-2024
Qualification Executor/Company:	Mr. Channarong / Arche mica	Next Qualification:	Mar-2025

• Test Results Summary

Test	Result
Injector Precision (Area %RSD)	PASS



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KCHANNARONG 20/Sep/2024
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Customer Signature Date

Sample: Inj Precision_10

Date: 9/23/2024

- **Data for Injector Precision test**

<i>Name</i>	<i>Area</i> <i>uS*min</i> <i>Nitrate</i> <i>ECD_1</i>
Inj Precision_1	3.284
Inj Precision_2	3.288
Inj Precision_3	3.302
Inj Precision_4	3.300
Inj Precision_5	3.299
Inj Precision_6	3.290
Inj Precision_7	3.298
Inj Precision_8	3.294
Inj Precision_9	3.292
Inj Precision_10	3.291
Average:	3.294
Std. Dev:	0.006
% RSD:	0.2
Limit (%)	1.0
Result:	PASS

Customer Signature _____ Date _____

Chromeleon (c) DIONEX 2011
v.6.80 SR8 Build 2623 (15624)

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K. A. ... 20/Sep/2024

Executor Signature Date

OQ_PQ_Integrated_Validation / Injector Precision
Printed: 9/23/2024 9:50 AM



Performance Qualification Rev. 6.10

Injector Carryover:

• Instruments

Instrument Name	Model	Supplier	Serial Number	Moduleware Version
Pump	ICS-1100	Dionex	10010987	1. 1. 0
Detector	ICS-1100	Dionex	10010987	1. 1. 0
Autosampler	AS-DV	Dionex	10010912	1. 5. 0
Eluent Generator	EG40 with n.a.	Dionex	10010987	1. 1. 0

• Accessories

Name	Description	Lot / Serial
Backpressure Tubing	0.13 mm (0.005") ID PEEK, 13 m (512")	n.a.
Sample 6	Nitrate, 1000 ppm	231226
Blank	Water	n.a.
Eluent	Water	n.a.

• Additional Information

Customer/Company:	Khun.Ketsarin/Thai Environmental Technic Co.,Ltd	Date:	20-Sep-2024
Qualification Executor/Company:	Mr. Channarong / Archemica	Next Qualification:	Mar-2025

• Test Results Summary

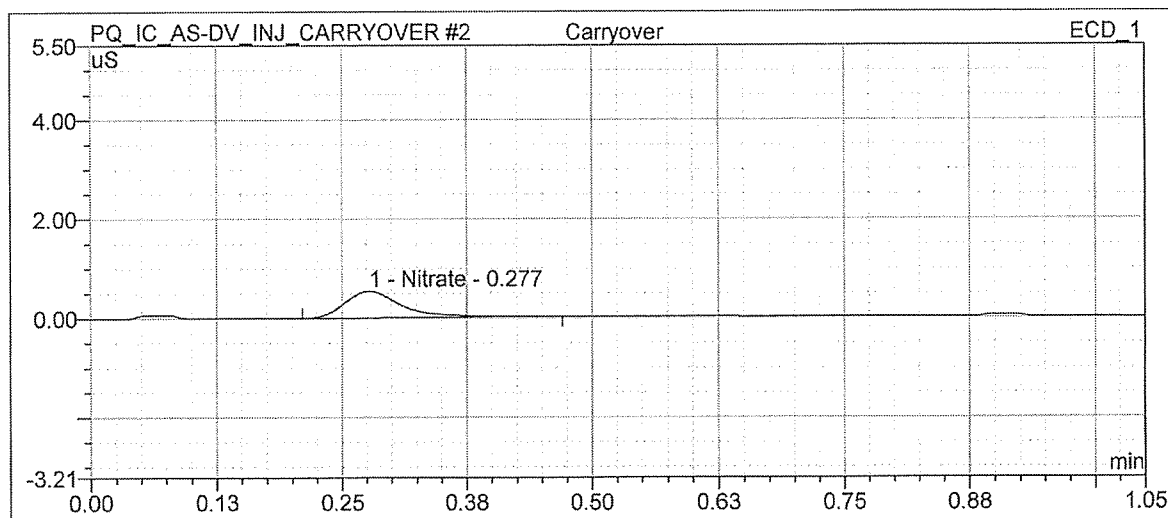
Test	Result
Injector Carryover (Area %)	PASS



Customer Signature _____ Date _____

K. Channarong 20/Sep/2024
Executor Signature _____ Date _____

• **Chromatogram for Carryover test**



• **Data for Carryover test**

Name	Ret.Time (detected) min Nitrate ECD_1	Area uS*min Nitrate ECD_1
High Level	0.27	48.558
Carryover	0.28	0.035
Water	0.27	0.029
Carryover (%):		0.013
Limit (%):		0.100
Result:		PASS



K. Sarnrak 20/sep/2024

Customer Signature _____ Date _____

Executor Signature _____ Date _____



Performance Qualification Rev. 6.10

Detector Linearity:

• Instruments:

Instrument Name	Model	Supplier	Serial Number	Moduleware Version
Pump	ICS-1100	Dionex	10010987	1. 1. 0
Detector	ICS-1100	Dionex	10010987	1. 1. 0
Autosampler	AS-DV	Dionex	10010912	1. 5. 0
Eluent Generator	EG40 with n.a.	Dionex	10010987	1. 1. 0

• Accessories

Name	Description	Lot / Serial
Backpressure Tubing	0.13 mm (0.005") ID PEEK, 13 m (512")	n.a.
Sample 1	Nitrate, 5 ppm	231226
Sample 2	Nitrate, 10 ppm	231226
Sample 3	Nitrate, 25 ppm	231226
Sample 4	Nitrate, 50 ppm	231226
Sample 5	Nitrate, 100 ppm	231226
Eluent	Water	n.a.

• Additional Information

Customer/Company:	Khun.Ketsarin/Thai Environmental Technic Co.,Ltd	Date:	20-Sep-2024
Qualification Executor/Company:	Mr. Channarong / Archemica	Next Qualification:	Mar-2025

• Test Results Summary

Test	Result
ICS-1100 Detector Linearity (Corr.)	PASS
ICS-1100 Detector Linearity (%RSD)	PASS



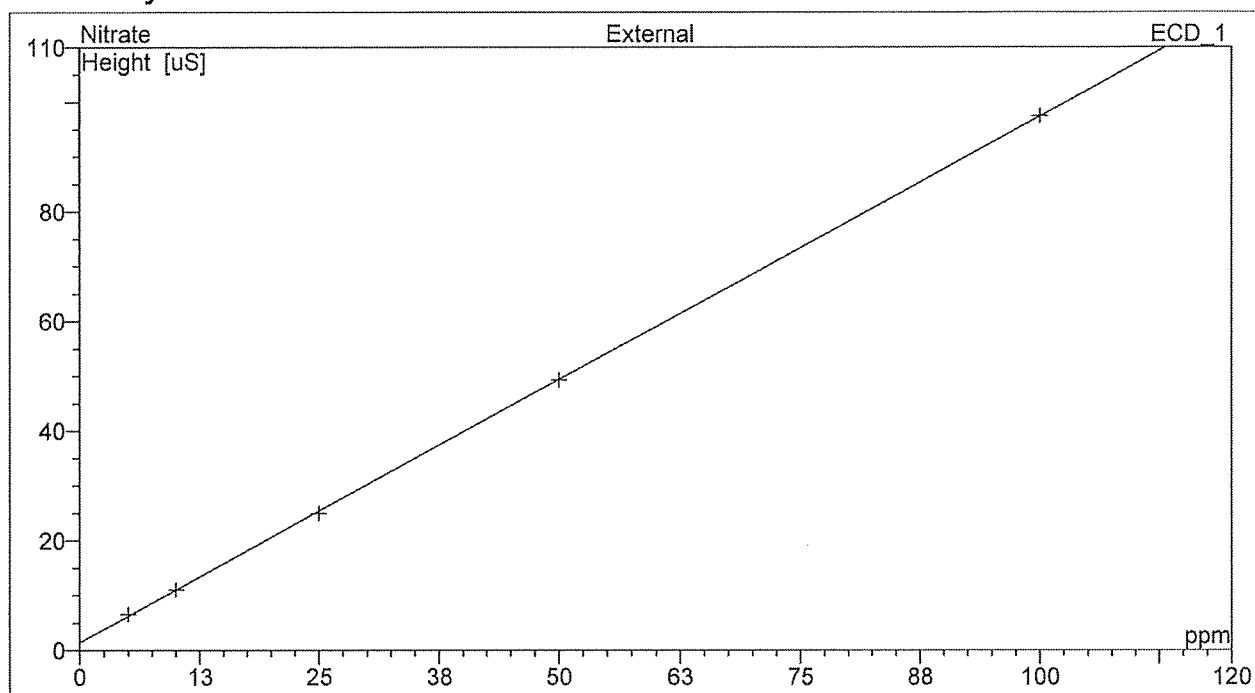
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K.Channarong 20/Sep/2024
Executor Signature _____ Date _____

• **Data for Detector Linearity**

Name	Amount ppm Nitrate ECD_1	Height uS Nitrate ECD_1
Detector linearity_1	5.000	6.557
Detector linearity_2	10.000	11.078
Detector linearity_3	25.000	25.002
Detector linearity_4	50.000	49.317
Detector linearity_5	100.000	97.513

• **Linearity Plot**



Calibration Type	Number of Points	Offset	Slope
LOff	5	1.431	0.960

	Correlation Coefficient	% RSD
Linearity:	1.000	0.8
Limit:	0.999	5.0
Result:	PASS	PASS



K. Harnarong 29/Sep/2024

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Executor Signature _____ Date _____



Performance Qualification Rev. 6.10

Pump Flow Rate Accuracy and Precision Test:

• Instruments

Instrument Name	Model	Supplier	Serial Number	Moduleware Version
Pump	ICS-1100	Dionex	10010987	1. 1. 0
Detector	ICS-1100	Dionex	10010987	1. 1. 0
Autosampler	AS-DV	Dionex	10010912	1. 5. 0
Eluent Generator	EG40 with n.a.	Dionex	10010987	1. 1. 0

• Accessories

Name	Description	Lot / Serial
Backpressure Tubing	0.13 mm (0.005") ID PEEK, 13 m (512")	n.a.
Eluent	Water	n.a.
Balance	Mettler Toledo	XP 205

• Additional Information

Customer/Company:	Khun.Ketsarin/Thai Environmental Technic Co.,Ltd	Date:	20-Sep-2024
Qualification Executor/Company:	Mr. Channarong / Archemica	Next Qualification:	Mar-2025

• Test Results Summary

Test	Result
ICS-1100 Pump Flow Rate Accuracy (mL/min)	PASS
ICS-1100 Pump Flow Rate Precision (%RSD)	PASS



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K. Channarong 20/Sep/2024

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Executor Signature _____ Date _____

• **Data for Pump Flow Rate Accuracy and Precision Test**

Ambient Temperature (°C)		24			
Segment	Measured Eluent Weight (g)	Calculated Eluent Flow Rate (mL/min)	Deviation from 1.00 mL/min	Limit (mL/min)	Result
0	34.490	-	-	-	-
1	39.296	0.964	0.036	0.05	PASS
2	44.088	0.961	0.039	0.05	PASS
3	48.906	0.966	0.034	0.05	PASS
4	53.708	0.963	0.037	0.05	PASS
5	58.533	0.967	0.033	0.05	PASS
Average		0.964		Overall	PASS
Standard Deviation		0.003			
% RSD		0.3			
Limit (%)		2.0			
Result		PASS			

Customer Signature _____ Date _____



K. Chantaporn 29/Sep/2024

Executor Signature Date

Certificate

**Certificate of Standards and
Instruments for Qualification**

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 231226

Expiration of Certification
December 2024

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

<u>Vial #</u>	<u>Concentration</u> (mg/L)
1	5.08 \pm 0.03
2	10.03 \pm 0.14
3	25.16 \pm 0.65
4	50.43 \pm 0.09
5	99.7 \pm 3
6	1014 \pm 17

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ARCHEMICA LAB CO.,LTD.

K. Rasmussen
20/Sep/2024

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. 078690-01

20-Dec-2011

thermoscientific.com/dionex

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Sunnyvale, CA 94088-3603
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Certificate of Completion

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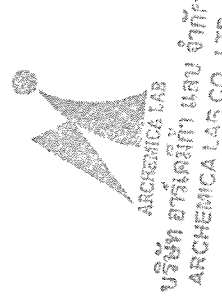
Channarong Khiao-Un

Has successfully completed

eLearn: RPG IC-Specific Qualification Service Training

Valid for 3 years from:

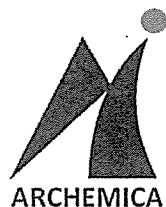
Nov/19/2021



K. Channarong 20/Sep/2021

Issued electronically and
approved by:

TFS - Learning Management
System, Training, Mentoring,
and Certification Group
tmc.training@thermofisher.com



Certificate of Calibration

ICS-1100 : Anion (ID#377)

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

ICS-1100 S/N : 10010987

AS-DV S/N : 10010912

for

Thai Environmental Technic Co., Ltd



Operator Signature : K. CHANNARONG

Date : Mar 28, 2024

(Mr. Channarong Khiao-Un)

Test Engineer

Qualification Report

**PM Check list,CM OQ and PQ
ICS-1100 : Anion (ID#377)**

For

**Thai Environmental Technic Co.,Ltd.
(1st Contract)**

Preventive Maintenance Check List



Dionex Ion Chromatography Preventive Maintenance Report

Customer Organization	Name/ Department
Thai Environmental Technic Co.,Ltd.	Khun,Ketsarin / Lab
Engineer	Date
Mr.Channarong Khiao-Un	28/Mar/2024

Instrument Detail

Instrument Model	Application
ICS-1100 (ID#377)	Anion
Instrument components	Serial Number
ICS-1100	10010987
AS-DV	10010912

Consumable Detail

Columns	Guard Columns	Suppressors	Concentrators	Etc.
AS22	AG22	AERS 500	-	-
Remark:				

Perform By Archemica

บริษัท อาร์เคมีกา แล็บ จำกัด
ARCHEMICA LAB CO.,LTD

Archemica

Date

28/Mar/2024

Customer

Date



General ICS Maintenance Checklist

No.	Description	Result			
Power on & Connection		Checked	Cleaned	Replaced	N.A.
1	Instrument power on	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
2	Instrument connection	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
Injection Valve Rebuild		Checked	Cleaned	Replaced	N.A.
3	Rebuilt injection valve 6 port	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	- Rotor seal	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	- Stator face	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(Optional) Auxiliary Valve Rebuild		Checked	Cleaned	Replaced	N.A.
6	Rebuilt auxiliary valve - port	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7	- Rotor seal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
8	- Stator face	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Check Valve Cartridge		Checked	Cleaned	Replaced	N.A.
9	Inlet check valve assembly	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	Outlet check valve assembly	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11	Verified correct flow orientation	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
Pump Piston Rinse Seal, Piston Seal and Piston		Checked	Cleaned	Replaced	N.A.
12	Piston rinse seal in <i>primary</i> pump head	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13	Piston seal in <i>primary</i> pump head	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14	Piston in <i>primary</i> pump head	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15	Piston rinse seal in <i>secondary</i> pump head	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16	Piston seal in <i>secondary</i> pump head	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17	Piston in <i>secondary</i> pump head	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Waste Valve and Priming Valve		Checked	Cleaned	Replaced	N.A.
18	Waste valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19	Priming valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cell Detector		Checked	Cleaned	Replaced	N.A.
20	Check conductivity cell	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21	Check electrochemical cell	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
22	- Working electrode	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
23	- Reference electrode	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
24	- Gasket	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
25	- Cell body	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Other		Checked	Cleaned	Replaced	N.A.
26	Sample Loop Size 25 uL	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27	End-line filter	<input checked="" type="checkbox"/>	-	<input type="checkbox"/>	<input type="checkbox"/>
28	Leak sensor	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29	Lubricate pump mechanic	<input type="checkbox"/>	<input checked="" type="checkbox"/> Lubricated	-	<input type="checkbox"/>
30	Reconnected liquid lines to the valve	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
31	Reconnected liquid lines to pump heads	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
32	Primed pump	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
33	Checked pump for leaks	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
34	Checked gas for leaks	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>



AS-DV Autosampler Preventive Maintenance Checklist

Model	Serial number	Firmware Version
<input checked="" type="checkbox"/> AS-DV	10010987	-

No.	Description	Result			
Power on & Connection		Checked	Cleaned	Replaced	N.A.
1.	AS-DV power on	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
2.	AS-DV connection	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
Sampling Tip		Checked	Cleaned	Replaced	N.A.
3.	Sampling needle	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.	Sampling tubing (Transfer line)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.	Reconnect sampling needle & tubing	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
Other		Checked	Cleaned	Replaced	N.A.
6.	Check carousel movement	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
7.	Check needle movement	<input checked="" type="checkbox"/>	-	-	<input type="checkbox"/>
8.	Lubricate needle drive	<input type="checkbox"/>	<input checked="" type="checkbox"/> Lubricated	-	<input type="checkbox"/>
9.	AS-DV cover	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(Optional) High Pressure Valve		Checked	Cleaned	Replaced	N.A.
10.	High pressure valve Port	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
11.	- Rotor seal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
12.	- Stator face	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
13.	- Reconnected liquid line to the valve	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Others / comments

Chromeleon Operational Qualification (CM_OQ)



Chromeleon Operational Qualification

General Information

Computer Name (Server): USERICU
Computer Name (Client): USERICU
Version Number: 6.80 SR8
Operator: Mr.Channarong Khiao-Un

General System Suitability Test: *Test passed*

Comparison Formats:

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



Reviewer's Signature // Date

K. CHANNARONG 28/Mar/2024

Operator's Signature // Date



Chromeleon Operational Qualification, Part 1

Verification of Selected Results

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

<i>Report Variable</i>	<i>Peak Name</i>	<i>Status</i>
Offset (c0)	n.a.	ok
	n.a.	ok
	n.a.	ok
Slope (c1)	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok
Correlation Coeffi.	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



Chromeleon Operational Qualification, Part 1

Verification of Selected Results

<i>Report Variable</i>	<i>Peak Name</i>	<i>Status</i>
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 (AIA)	Methylparabene	ok
	Ethylparabene	ok
	Propylparabene	ok

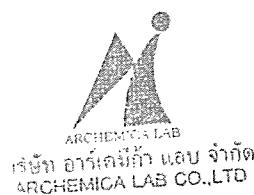


Chromeleon Operational Qualification, Part 1

Verification of Selected Results

<i>Report Variable</i>	<i>Peak Name</i>	<i>Status</i>
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

Test Result: **Passed**



K. Chanwong 28/Mar/2024

Reviewer's Signature // Date

Operator's Signature // Date



Chromeleon Operational Qualification, Part 3

Post-Acquisition Steps: Comparison with Expected Results

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

<i>Channel Name</i>	<i>Report Variable</i>	<i>Peak Name</i>	<i>Status</i>
<i>Extract UV Channel:</i>			
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
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
<i>Smooth Data:</i>			
UV_VIS_1_MA_005_001	Noise (1.9-2.4 min)		ok
UV_VIS_1_OL_051_001	Noise (1.9-2.4 min)		ok
EXT290NM_SG_005_010	Noise (1.9-2.4 min)		ok



Chromeleon Operational Qualification, Part 3

Post-Acquisition Steps: Comparison with Expected Results

<i>Channel Name</i>	<i>Report Variable</i>	<i>Peak Name</i>	<i>Status</i>
<i>Arith. Comb. of Channels:</i>			
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**K. Chanharoon 28/Mar/2024_____
Reviewer's Signature // Date_____
Operator's Signature // Date



Chromeleon Operational Qualification, Part 4

System Suitability Test: Comparison with Expected Results

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

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

Test Result: Passed



K. Harnprasit 28/Mar/2024

Reviewer's Signature // Date

Operator's Signature // Date



Chromeleon Operational Qualification, Part 5

Fraction Collection: Comparison with Expected Results

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

<i>Variable Category</i>	<i>Report Variable</i>	<i>Status</i>
Fraction Report	Fract. No.	ok
	Fract. Starttime *)	ok
	Fract. Endtime *)	ok
	No. of Tubes	ok
	Position	ok
	Peak Name	ok
	No. of Peaks	ok
Tube Report	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**



K. G. H. R. O. G. 28/Mar/2024

Reviewer's Signature // Date

Operator's Signature // Date

Performance Qualification (PQ)
(Anion)



Performance Qualification Rev. 6.10

• Instruments

Instrument Name	Model	Supplier	Serial Number	Moduleware Version
Pump	ICS-1100	Dionex	10010987	1. 1. 0
Detector	ICS-1100	Dionex	10010987	1. 1. 0
Autosampler	AS-DV	Dionex	10010912	1. 5. 0
Eluent Generator	EG40 with n.a.	Dionex	10010987	1. 1. 0
Chromeleon	6.80 SR8	Dionex	62483	n.a.

• Accessories

Name	Description		Lot / Serial	Exp. Date
Backpressure Tubing	0.13 mm (0.005") ID PEEK, 13 m (512")	n.a.	n.a.	n.a.
Blank	Water	n.a.	n.a.	n.a.
Sample 1	Nitrate, 5 ppm	Thermo	231226	Dec-2024
Sample 2	Nitrate, 10 ppm	Thermo	231226	Dec-2024
Sample 3	Nitrate, 25 ppm	Thermo	231226	Dec-2024
Sample 4	Nitrate, 50 ppm	Thermo	231226	Dec-2024
Sample 5	Nitrate, 100 ppm	Thermo	231226	Dec-2024
Sample 6	Nitrate, 1000 ppm	Thermo	231226	Dec-2024
Eluent	Water	Water	n.a.	n.a.
Autosampler Reservoir A	Water	Water	n.a.	n.a.
Balance	Mettler Toledo	XP 205	1129273885	n.a.
Temperature Probe	-	-	-	-
IC Validation Test Box	-	-	-	-
Ammeter / Multimeter	-	-	-	-



Customer Signature _____ Date _____

Chromeleon (c) DIONEX 2011
Version 6.8 SR 8

K. Khamlae 28/Mar/2024
Executer Signature _____ Date _____

OQ_PQ_Integrated_Validation / Specification
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• Limits

Test	Customized Limits	Dionex Recommended Limits
ICS-1100 Conductivity Noise (nS)	≤ 2.0	≤ 2.0
ICS-1100 Conductivity Drift (nS/hr)	≤ 20	≤ 20
Injector Precision (Area %RSD)	≤ 1.0	≤ 1.0
Injector Carryover (Area %)	≤ 0.1	≤ 0.1
ICS-1100 Detector Linearity (Corr.)	≥ 0.999	≥ 0.999
ICS-1100 Detector Linearity (%RSD)	≤ 5.0	≤ 5.0
ICS-1100 Pump Flow Rate Accuracy (mL/min)	≤ 0.05	≤ 0.05
ICS-1100 Pump Flow Rate Precision (%RSD)	≤ 2.0	≤ 2.0

• Additional Information

Customer/Company:	Khun.Ketsarin/Thai Environmental Technic Co.,Ltd	Date:	28-Mar-2024
Qualification Executor/Company:	Mr. Channarong / Archemica	Period between Qualifications:	6 months
		Next Qualification:	Sep-2024



Customer Signature _____ Date _____

K. Channarong 28/Mar/2024
Executor Signature _____ Date _____



Performance Qualification Rev. 6.10

Detector Noise and Drift:

• Instruments

Instrument Name	Model	Supplier	Serial Number	Moduleware Version
Pump	ICS-1100	Dionex	10010987	1. 1. 0
Detector	ICS-1100	Dionex	10010987	1. 1. 0
Autosampler	AS-DV	Dionex	10010912	1. 5. 0
Eluent Generator	EG40 with n.a.	Dionex	10010987	1. 1. 0

• Accessories

Name	Description	Lot / Serial
Backpressure Tubing	0.13 mm (0.005") ID PEEK, 13 m (512")	n.a.
Eluent	Water	n.a.

• Additional Information

Customer/Company:	Khun.Ketsarin/Thai Environmental Technic Co.,Ltd	Date:	28-Mar-2024
Qualification Executor/Company:	Mr. Channarong / Archemica	Next Qualification:	Sep-2024

• Test Results Summary

Test	Result
ICS-1100 Conductivity Noise (nS)	PASS
ICS-1100 Conductivity Drift (nS/hr)	PASS



Customer Signature _____ Date _____

Chromeleon (c) DIONEX 2011
Version 6.8 SR 8

K. Channarong 28/Mar/2024
Executor Signature _____ Date _____

OQ_PQ_Integrated_Validation / Detector Noise and Drift
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• **Data for detector noise**

Segment number	Noise, nS
1	0.46
2	0.38
3	0.46
4	0.51
5	0.40
6	0.54
7	0.51
8	0.44
9	0.48
10	0.38
11	0.50
12	0.38
13	0.57
14	0.42
15	0.41
16	0.36
17	0.41
18	0.43
19	0.44
20	0.44
Average, nS	0.4
Limit, nS	2.0
Result	PASS

• **Data for detector drift**

20 Minute drift, nS	Drift, nS/hr	Limit, nS/hr	Result
-4.6	13.9	20.0	PASS

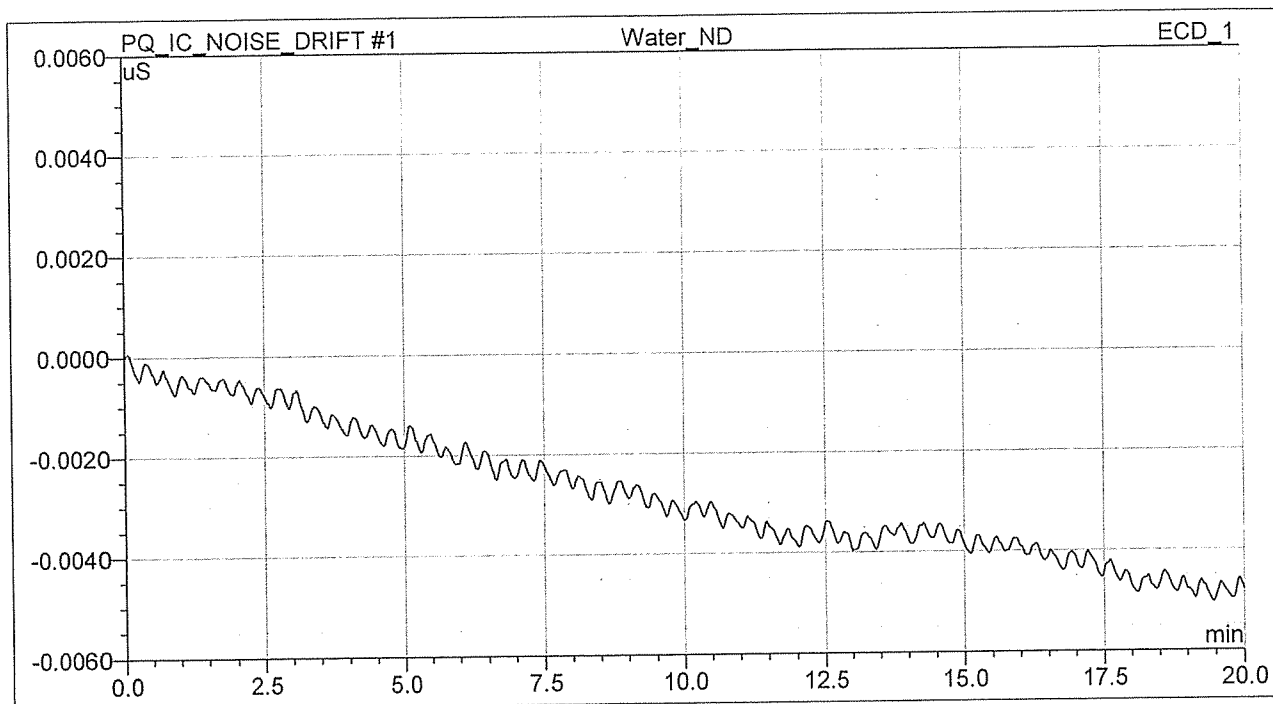


Customer Signature _____ Date _____

K. Chuanlaporn 28/May/2024

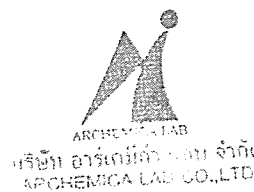
Executor Signature Date

• **Chromatogram of Detector Noise and Drift**



Customer Signature _____ Date _____

Chromeleon (c) DIONEX 2011
Version 6.8 SR 8



K. Gammay 28/Mar/2024

Executor Signature _____ Date _____

OQ_PQ_Integrated_Validation / Detector Noise and Drift
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Performance Qualification Rev. 6.10

Injector Precision:

• Instruments

Instrument Name	Model	Supplier	Serial Number	Moduleware Version
Pump	ICS-1100	Dionex	10010987	1. 1. 0
Detector	ICS-1100	Dionex	10010987	1. 1. 0
Autosampler	AS-DV	Dionex	10010912	1. 5. 0
Eluent Generator	EG40 with n.a.	Dionex	10010987	1. 1. 0

• Accessories

Name	Description	Lot / Serial
Backpressure Tubing	0.13 mm (0.005") ID PEEK, 13 m (512")	n.a.
Sample 4	Nitrate, 50 ppm	231226
Eluent	Water	n.a.

• Additional Information

Customer/Company:	Khun.Ketsarin/Thai Environmental Technic Co.,Ltd	Date:	28-Mar-2024
Qualification Executor/Company:	Mr. Channarong / Archemica	Next Qualification:	Sep-2024

• Test Results Summary

Test	Result
Injector Precision (Area %RSD)	PASS

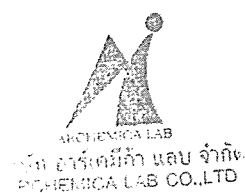


Customer Signature _____ Date _____

K. Channarong 28/Mar/2024
Executor Signature _____ Date _____

• **Data for Injector Precision test**

Name	Area uS*min Nitrate ECD_1
Inj Precision_1	2.875
Inj Precision_2	2.841
Inj Precision_3	2.854
Inj Precision_4	2.840
Inj Precision_5	2.808
Inj Precision_6	2.853
Inj Precision_7	2.849
Inj Precision_8	2.867
Inj Precision_9	2.859
Inj Precision_10	2.859
Average:	2.850
Std. Dev:	0.018
% RSD:	0.6
Limit (%)	1.0
Result:	PASS



Customer Signature _____ Date _____

Chromeleon (c) DIONEX 2011
Version 6.8 SR 8

K. CHANLAROENG 28/Mar/2024

Executor Signature Date

OQ_PQ_Integrated_Validation / Injector Precision
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Performance Qualification Rev. 6.10

Injector Carryover:

• Instruments

Instrument Name	Model	Supplier	Serial Number	Moduleware Version
Pump	ICS-1100	Dionex	10010987	1. 1. 0
Detector	ICS-1100	Dionex	10010987	1. 1. 0
Autosampler	AS-DV	Dionex	10010912	1. 5. 0
Eluent Generator	EG40 with n.a.	Dionex	10010987	1. 1. 0

• Accessories

Name	Description	Lot / Serial
Backpressure Tubing	0.13 mm (0.005") ID PEEK, 13 m (512")	n.a.
Sample 6	Nitrate, 1000 ppm	231226
Blank	Water	n.a.
Eluent	Water	n.a.

• Additional Information

Customer/Company:	Khun.Ketsarin/Thai Environmental Technic Co.,Ltd	Date:	28-Mar-2024
Qualification Executor/Company:	Mr. Channarong / Archemica	Next Qualification:	Sep-2024

• Test Results Summary

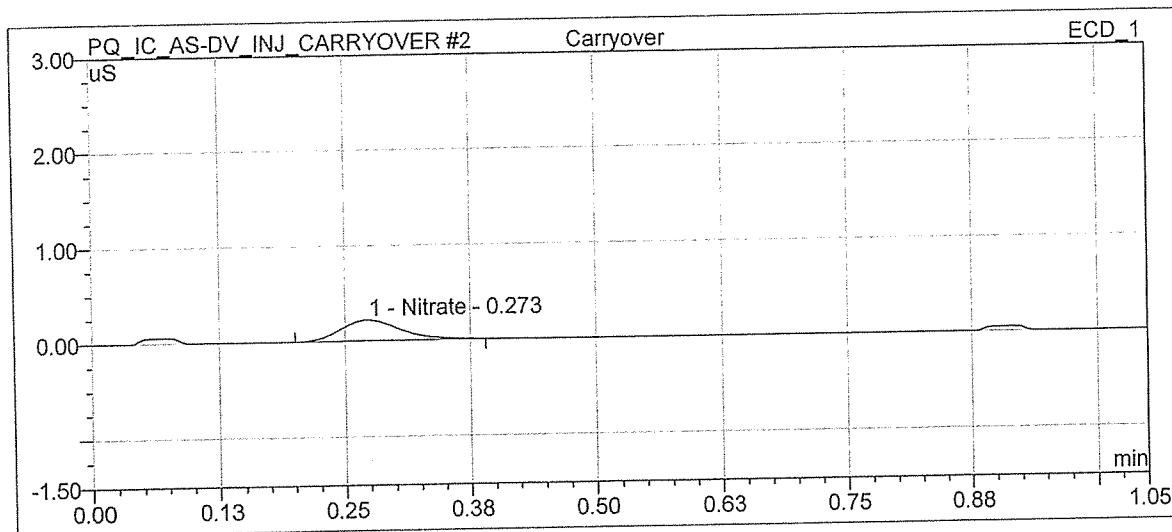
Test	Result
Injector Carryover (Area %)	PASS



K. Channarong 28/Mar/2024
Executor Signature Date

Customer Signature Date

• **Chromatogram for Carryover test**



• **Data for Carryover test**

Name	Ret.Time (detected) min Nitrate ECD_1	Area uS*min Nitrate ECD_1
High Level	0.27	52.058
Carryover	0.27	0.015
Water	0.27	0.011
Carryover (%):		0.008
Limit (%):		0.100
Result:		PASS



K. Chankarong 28/May/2024

Executor Signature Date

Customer Signature Date



Performance Qualification Rev. 6.10

Detector Linearity:

• Instruments:

Instrument Name	Model	Supplier	Serial Number	Moduleware Version
Pump	ICS-1100	Dionex	10010987	1. 1. 0
Detector	ICS-1100	Dionex	10010987	1. 1. 0
Autosampler	AS-DV	Dionex	10010912	1. 5. 0
Eluent Generator	EG40 with n.a.	Dionex	10010987	1. 1. 0

• Accessories


Name	Description	Lot / Serial
Backpressure Tubing	0.13 mm (0.005") ID PEEK, 13 m (512")	n.a.
Sample 1	Nitrate, 5 ppm	231226
Sample 2	Nitrate, 10 ppm	231226
Sample 3	Nitrate, 25 ppm	231226
Sample 4	Nitrate, 50 ppm	231226
Sample 5	Nitrate, 100 ppm	231226
Eluent	Water	n.a.

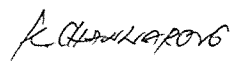
• Additional Information

Customer/Company:	Khun.Ketsarin/Thai Environmental Technic Co.,Ltd	Date:	28-Mar-2024
Qualification Executor/Company:	Mr. Channarong / Archemica	Next Qualification:	Sep-2024

• Test Results Summary

Test	Result
ICS-1100 Detector Linearity (Corr.)	PASS
ICS-1100 Detector Linearity (%RSD)	PASS


ARCHÉMICA LAB
บริษัท อีอาร์เคมิคัล แล็บ จำกัด
ARCHEMICA LAB CO.,LTD

 28/Mar/2024

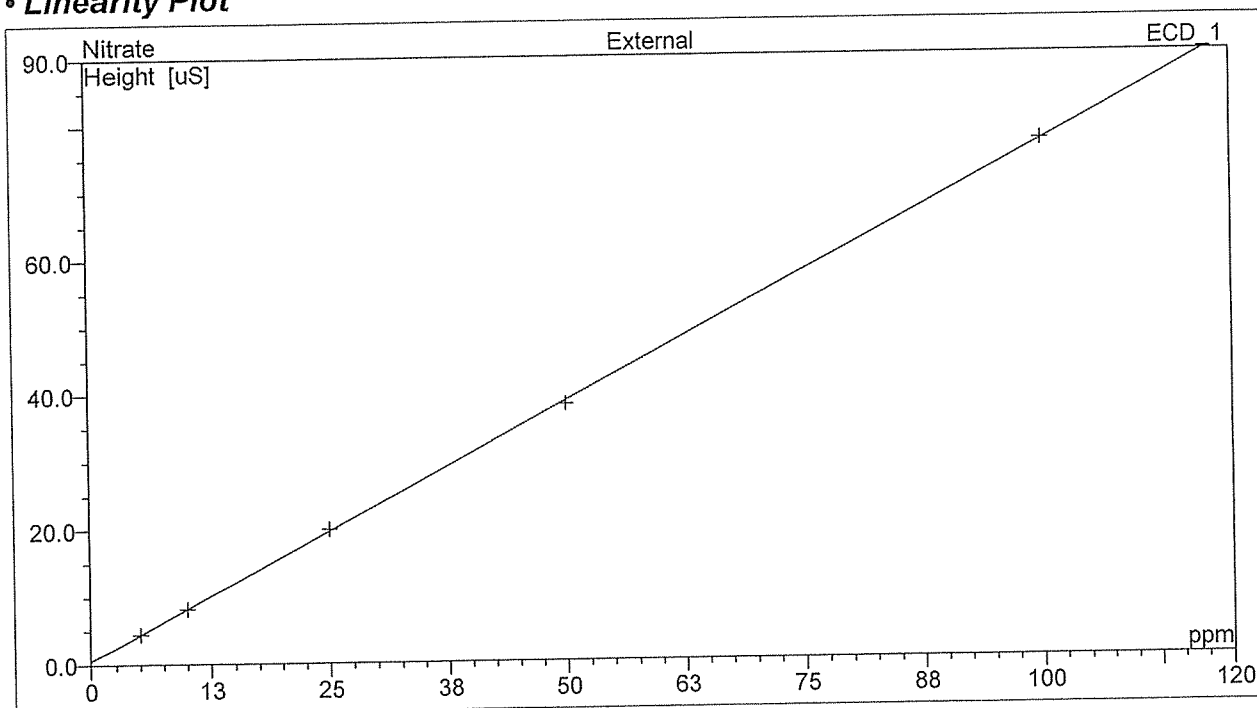
Executor Signature Date

Customer Signature Date

• **Data for Detector Linearity**

Name	Amount ppm Nitrate ECD_1	Height uS Nitrate ECD_1
Detector linearity_1	5.000	4.403
Detector linearity_2	10.000	8.153
Detector linearity_3	25.000	19.920
Detector linearity_4	50.000	38.150
Detector linearity_5	100.000	76.964

• **Linearity Plot**



Calibration Type	Number of Points	Offset	Slope
LOff	5	0.548	0.762

	Correlation Coefficient	% RSD
Linearity:	1.000	1.2
Limit:	0.999	5.0
Result:	PASS	PASS



K. Chartharong 28/Mar/2024

Customer Signature Date

Executor Signature Date



Performance Qualification Rev. 6.10

Pump Flow Rate Accuracy and Precision Test:

• Instruments

Instrument Name	Model	Supplier	Serial Number	Moduleware Version
Pump	ICS-1100	Dionex	10010987	1. 1. 0
Detector	ICS-1100	Dionex	10010987	1. 1. 0
Autosampler	AS-DV	Dionex	10010912	1. 5. 0
Eluent Generator	EG40 with n.a.	Dionex	10010987	1. 1. 0

• Accessories

Name	Description	Lot / Serial
Backpressure Tubing	0.13 mm (0.005") ID PEEK, 13 m (512")	n.a.
Eluent	Water	n.a.
Balance	Mettler Toledo	XP 205
		1129273885

• Additional Information

Customer/Company:	Khun.Ketsarin/Thai Environmental Technic Co.,L	Date:	28-Mar-2024
Qualification Executor/Company:	Mr. Channarong / Archemica	Next Qualification:	Sep-2024

• Test Results Summary

Test	Result
ICS-1100 Pump Flow Rate Accuracy (mL/min)	PASS
ICS-1100 Pump Flow Rate Precision (%RSD)	PASS



K. Channarong 28/Mar/2024

Customer Signature _____ Date _____

Executor Signature _____ Date _____

• Data for Pump Flow Rate Accuracy and Precision Test

Ambient Temperature (°C)	20
--------------------------	----

Segment	Measured Eluent Weight (g)	Calculated Eluent Flow Rate (mL/min)	Deviation from 1.00 mL/min	Limit (mL/min)	Result
0	31.163	-	-	-	-
1	35.996	0.968	0.032	0.05	PASS
2	40.824	0.967	0.033	0.05	PASS
3	45.649	0.967	0.033	0.05	PASS
4	50.479	0.968	0.032	0.05	PASS
5	55.308	0.967	0.033	0.05	PASS
Average		0.968		Overall	PASS
Standard Deviation		0.001			
% RSD		0.1			
Limit (%)		2.0			
Result		PASS			



Customer Signature _____ Date _____

Chromeleon (c) DIONEX 2011
Version 6.8 SR 8

K. Chawngpore 28/May/2024
Executor Signature _____ Date _____

OQ_PQ_Integrated_Validation / Pump Flow Rate
Printed: 3/29/2024 2:04 PM

CERTIFICATE

Better Separations Through
Better Chemistry

Certificate of Completion

This certifies that

Channarong Khiao-Un

Has successfully completed

eLearn: RPG IC-Specific Qualification Service Training

Valid for 3 years from:

Nov/19/2021



K. Channarong Khiao-Un 28/Nov/2024

Issued electronically and
approved by:

TFS - Learning Management
System, Training, Mentoring,
and Certification Group
tmc.training@thermofisher.com

CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

Certificate No. : COF-008-66

MEASUREMENT ITEM : Top Load Orifice
MANUFACTURER : TISCH
MODEL/TYPE : TE-5025A
SERIAL NUMBER : 0068
ID NUMBER : -
CONDITION AS-RECEIVED : Used item
CUSTOMER : Thai Environmental Technic Limited.
1/6 Soi Ramkhamhaeng 145, Khwaeng/Khet Saphan Sung,
Bangkok 10240

RECEIVED DATE : 08 Aug 2023
MEASUREMENT DATE : 17 Aug 2023
ISSUE DATE : 17 Aug 2023

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

Temperature	: 23.0 ± 3.0	°C
Relative Humidity	: 55.0 ± 15.0	%RH
Atmospheric Pressure	: 1010 ± 10	hPa

CALIBRATION CONDITION:

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are 23.8 °C and 54.3 %RH.

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

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibration procedure:

The Orifice gas flow device was calibrated against Standard Rotary Displacement Meter (Roots Meter) Model G65/IMC/W2-dp. The WI-CL-004 was used as a calibration guideline.

Traceability.

This certificate provides a traceability of The measurement to recognized the national standards, and to realization of the international system of units (SI) through the VSL (National Metrology Institute of Netherlands) via Certificate number: G2211901

Uncertainty of Measurement:

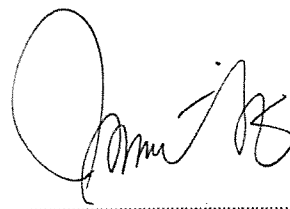
The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor $k=2$, Which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty has been determined in accordance with the GUM 'Evaluation of measurement data - Guide to the expression of uncertainty in measurement'

Calibrated by:

- ☒ Mr. Sorawit Thachalad
☐ Miss Jittrapon Lertsomphol



Approved signatory:



Mr. Parinya Booncharoen
Calibration Department Manager

MEASUREMENT RESULTS:

The Orifice gas flow device was calibrated by direct comparison method with the Standard Rotary Displacement Meter (Roots Meter). The Humid air was used as a medium in the system. The standard conditions are 25°C (298.15 K) and 760 mmHg for standard temperature and standard pressure respectively.

Table 1: The results of Q Standard calibration data

Plate	Flow rate m^3/min	Pressure [Pa] mmHg	Temperature [Ta] °C	Temperature [Tm] °C	Δp_{meter} mmHg	$\Delta p_{Orifice}$ inH ₂ O	y	Standard Flow [Q_s] m^3/min
1	0.700	754.191	23.89	23.40	50.276	1.674	1.291	0.651
2	1.005	754.148	23.80	23.70	54.969	3.395	1.839	0.929
3	1.118	754.084	23.88	23.81	37.664	4.407	2.095	1.058
4	1.175	754.076	23.87	23.79	27.625	5.018	2.236	1.127
5	1.420	754.047	23.89	23.81	27.348	7.362	2.708	1.363

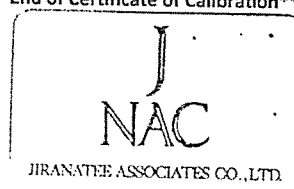
Slope (m): 1.99045
 Intercept (b): -0.00789
 Correlation coefficient (r): 0.99979
 Uncertainty ($k=2$): 0.015 m^3/min

Table 2: The results of Q actual calibration data

Plate	Flow rate m^3/min	Pressure [Pa] mmHg	Temperature [Ta] °C	Temperature [Tm] °C	Δp_{meter} mmHg	$\Delta p_{Orifice}$ inH ₂ O	y	Standard Flow [Q_a] m^3/min
1	0.700	754.191	23.89	23.40	50.276	1.674	0.812	0.654
2	1.005	754.148	23.80	23.70	54.969	3.395	1.156	0.932
3	1.118	754.084	23.88	23.81	37.664	4.407	1.318	1.062
4	1.175	754.076	23.87	23.79	27.625	5.018	1.406	1.132
5	1.420	754.047	23.89	23.81	27.348	7.362	1.703	1.368

Slope (m): 1.24671
 Intercept (b): -0.00497
 Correlation coefficient (r): 0.99979
 Uncertainty ($k=2$): 0.015 m^3/min

End of Certificate of Calibration





Thai Environmental Technic Limited
บริษัท เทคนิคสิ่งแวดล้อมไทย จำกัด

High Volume TSP&PM-10 Calibration Report

Location: Thai Environmental Technic

Site ID: Bangkok

Date: 3-Jul-24

ITEM: TSP

Serial No: (No. 24)

Calibrate By: Pipat

Site Conditions

Barometric Pressure (mm Hg) : 760.00
Temperature (°C) : 25.0
Average Press. (mm Hg) : 754.4
Average Temp (°C) : 30.8

Corrected Pressure (mm Hg) : 760.0
Temperature (deg K) : 298.0
Corrected Average (mm Hg) : -
Average Temp: (Deg K) : -

Calibration Orifice

Make: Tisch
Model: TE-5025A
Serial#: 0068

Qstd Slope : 1.99045
Qstd Intercept : -0.00789
Calibration Due Date : 16-Aug-24

Calibration Information

Plate or Test #	ORIFICE (in H ₂ O)	Qstd (m ³ /min)	Indicate (CFM)	IC (corrected)	Linear Regression Slope : 29.7233 Intercept : 5.5932 Corr. Coeff : 0.9893 # of Observations: 5
1	12.30	1.766	60.0	57.00	
2	9.80	1.577	54.0	52.00	
3	7.20	1.352	50.0	48.00	
4	5.00	1.127	40.0	40.00	
5	3.00	0.874	30.0	30.00	

Calculations

$$Qstd = 1/m[\text{Sqrt}(H_2O(P_a/P_{std}))(T_{std}/T_a)] - b]$$
$$IC = I[\text{Sqrt}(P_a/P_{std}))(T_{std}/T_a)]$$

Qstd = standard flow rate
IC = corrected chart response
I = actual chart response

m = calibrator Qstd slope
b = calibrator Qstd intercept
Ta = actual temperature during calibration (deg K)
Pa = actual pressure during calibration (mm Hg)
Tstd = 298 deg K

Pstd = 760 mm Hg

For subsequent calculation of sampler flow:
 $1/m(I[\text{Sqrt}(298/T_a)](P_a/760)) - b]$

NOTE: Ensure calibration orifice has been certified within 12 months of use

m = sampler slope
b = sampler intercept
I = chart response
Tav = daily average temperature
Pav = daily average pressure

Calibrate By : 

Approve By : 



Thai Environmental Technic Limited
บริษัท เทคนิคสิ่งแวดล้อมไทย จำกัด

High Volume TSP&PM-10 Calibration Report

Location: Thai Environmental Technic

Site ID: Bangkok

Date: 1-Jul-24

ITEM: TSP

Serial No: (No. 34)

Calibrate By: Pipat

Site Conditions

Barometric Pressure (mm Hg) : 760.00
Temperature (°C) : 25.0
Average Press. (mm Hg) : 750.6
Average Temp (°C) : 29.9

Corrected Pressure (mm Hg) : 760.0
Temperature (deg K) : 298.0
Corrected Average (mm Hg) : -
Average Temp (Deg K) : -

Calibration Orifice

Make: Tisch

Model: TE-5025A

Serial#: 0068

Qstd Slope : 1.99045

Qstd Intercept : -0.00789

Calibration Due Date : 16-Aug-24

Calibration Information

Plate or Test #	ORIFICE (in H ₂ O)	Qstd (m ³ /min)	Indicate (CFM)	IC (corrected)	Linear Regression Slope : 29.7516 Intercept : 5.6088 Corr. Coeff : 0.9890 # of Observations: 5
1	12.40	1.773	60.0	57.00	
2	9.60	1.561	54.0	52.00	
3	7.20	1.352	50.0	48.00	
4	5.00	1.127	40.0	40.00	
5	3.00	0.874	30.0	30.00	

Calculations

$$Qstd = 1/m[\text{Sqrt}(H_2O(Pa/Pstd)(Tstd/Ta)) - b]$$

$$IC = [(\text{Sqrt}(Pa/Pstd)(Tstd/Ta))]$$

Qstd = standard flow rate
IC = corrected chart response
I = actual chart response

m = calibrator Qstd slope
b = calibrator Qstd intercept
Ta = actual temperature during calibration (deg K)
Pa = actual pressure during calibration (mm Hg)
Tstd = 298 deg K
Pstd = 760 mm Hg

For subsequent calculation of sampler flow:
 $1/m[(I)[\text{Sqrt}(298/Tav)(Pav/760)] - b]$

NOTE: Ensure calibration orifice has been certified within 12 months of use

m = sampler slope
b = sampler intercept
I = chart response
Tav = daily average temperature
Pav = daily average pressure

Calibrate By : 

Approve By : 

Certificate Of Analysis
Special Gases Mixture

Customer Details

Name:

Thai Environmental Technic Limited

Address:

1/6 Soi Ramkhamhaeng 45, Sapansoong,
Khet Saphan Sung, Bangkok 10240

Customer Tag No.:

Certificate Details

Number:

1734/23

Date of Issue:

5-Jul-2023

Expiry date:

5-Jul-2026

Material Details

Production Order:

90178560

Material Code:

640300-SK-44

Cylinder No.:

A00917SK

Gas content:

5.520 M³

Filling pressure:

145.0 bar

Valve:

CGA 660 SS

Cylinder Owner:

LINDE

Cylinder Material:

Spectra seal

Cylinder Size:

40 L

Laboratory Report

Analytical Result

Component	Normal Concentration	Analysis Result ¹	Uncertainty ²	Method of Analysis ³	Assay Date
Nitric Oxide	40.0 ppm	40.5 ppm	± 1% relative	(6) I-PB-352	28-Jun & 5-Jul-2023
Other NO _x impurity in Nitrogen		Less than 2.0 ppm			

Reference Standard used in Assay

Reference Standard

Nitric Oxide

in Nitrogen

Cylinder number

258013SG

Concentration

25.32 ± 0.25 ppm

Expiry date:

13-Dec-2024

Analytical Instruments used in Assay

Instrument/Make/Model
FTIR Spectrometers Nicolet iS50Analytical Principle
FTIR-NOLast Multipoint Calibration
28-Jun-2023

Recommend usage condition

Minimum utilization: 5% of actual content or before expire date whichever comes first.

Storage condition: Keep in well ventilation and secure area.

Comments

When reordering, please quote the material number

Note:

- All results expressed in this report are on mole/mole basis, unless otherwise specified. Assay of this Standard has been performed in accordance with the EPA Traceability Protocol EPA-600/R-12/531 for the Assay and Certification of Gaseous Calibration Standards using procedure G1
- The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%. The measurement of this material is traceable to the SI through the reference gas standard, which is traceable to Swiss National Standard of Mass or other recognised national metrology institutes.
- (1) Gas Chromatography, (2) Paramagnetic Oxygen Analyzer, (3) Electrochemical Oxygen Analyzer, (4) Electrochemical Moisture Analyzer, (5) Total Hydrocarbon Analyzer, (6) Other - Specified

Page 1 of 1

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บริษัท ลินด์ (ประเทศไทย) จำกัด (มหาชน)

เลขที่เอกสาร: 0107537000783

ชั้น 15 อาคารทาวเวอร์ เอ 2/3 หมู่ 14 ถนนรามคำแหง-ตราด กม. 6.5 บางนา

เลขที่อาคาร: 10540 โทรศัพท์ (66) 2338-6100 โทรสาร (66) 2338-6333

โรงงาน: 105 หมู่ 5 ตำบลบางพลี อำเภอบางพลี จังหวัดสมุทรปราการ 24180

โทรศัพท์ (66) 38-570-479-93

โทรสาร (66) 38-570-323

Sukanya Parinyasoonorn

Signatory for and on behalf of Linde (Thailand) Co., Ltd.

PB-002/FU06

Iss. K/2, 15 Oct 2023

Linde (Thailand) Public Company Limited

PIC registration no. 0107537000783

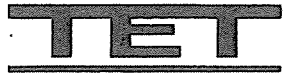
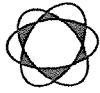
15th Floor, Bangna Tower A, 2/3 Moo 14, Bangna Trad KM. 6.5 Road, Bangkaew

Bangplee, Samutprakarn 10540, Tel (66) 2338-6100 Fax (66) 2338-6333

Wellgrow Plant: 105 Moo 5, T.Bangsamak, A.Bangpakong, Chachoengsao 24180

Thailand, Tel (66) 38-570-479-93

Fax (66) 38-570-323



Thai Environmental Technic Limited
บริษัท เทคนิสิ่งแวดล้อมไทย จำกัด

NOx Analyzer Calibration Report

Calibrate Date : 25-Sep-24
Analyzer Type : NOx
Brand : API
Model : 200 E
Serial Number : 1732 (No. 5)
Range : 500 ppb

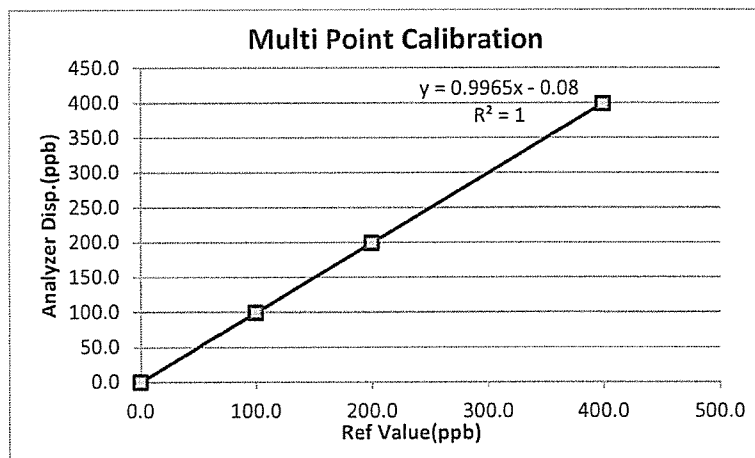
Temperature (°C) : 25 °C
Barometer (mmHg) : 759.9
Humidity (50±15 %) : 50.0%RH
Dilutor : API M700 S/N 625
Zero Air : API M701 S/N 1926
Standard gas : A00917 SK

Calibration of Span

Supply Gas	Ref Value(ppb)	Before of Span.(ppb)			After of Span.(ppb)			% diff of Span
		NOx	NO	NO ₂	NOx	NO	NO ₂	
Zero	0.0	0.7	0.5	0.2	0.1	0.1	0.0	0.1
Span	400.0	429.0	411.0	18.0	400.0	400.0	0.0	0.0

Multi Point Calibration

Ref Value(ppb)	Analyzer Disp.(ppb)			Output Difference		
	NOx	NO	NO ₂	Diff(ppb)	% Diff	Abs (%) Diff
0.0	0.2	0.1	0.1	0.10	0.000	0.03
100.0	99.8	99.4	0.4	-0.60	-0.006	0.60
200.0	199.3	199.1	0.2	-0.90	-0.005	0.45
400.0	399.1	398.6	0.5	-1.40	-0.003	0.35
Average Diff (%)						0.36

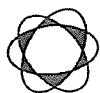


Calibrate by:

[Signature]

Approved by:

[Signature]



Thai Environmental Technic Limited
บริษัท เทคนิคสิ่งแวดล้อมไทย จำกัด

NOx Analyzer Calibration Report

Calibrate Date : 3-Oct-24
Analyzer Type : NOx
Brand : API
Model : TML-41-H-02
Serial Number : 495 (No. 23)
Range : 500 ppb

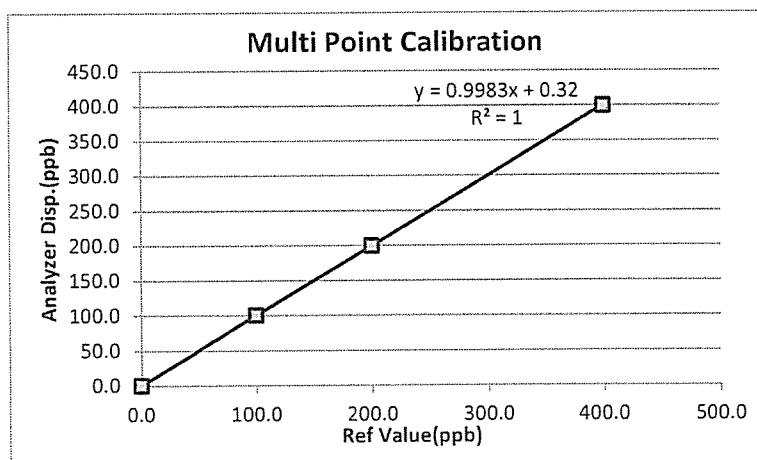
Temperature (°C) : 25°C
Barometer (mmHg) : 759.9
Humidity (50±15 %) : 50.0%RH
Dilutor : API M700 S/N 625
Zero Air : API M701 S/N 1926
Standard gas : A00917 SK

Calibration of Span

Supply Gas	Ref Value(ppb)	Before of Span.(ppb)			After of Span.(ppb)			% diff of Span
		NOx	NO	NO ₂	NOx	NO	NO ₂	
Zero	0.0	3.6	3.1	0.5	0.0	0.0	0.0	0.0
Span	400.0	408.0	401.0	7.0	400.0	400.0	0.0	0.0

Multi Point Calibration

Ref Value(ppb)	Analyzer Disp.(ppb)			Output Difference		
	NOx	NO	NO ₂	Diff(ppb)	% Diff	Abs (%) Diff
0.0	0.4	0.3	0.1	0.30	0.001	0.08
100.0	101.3	100.5	0.8	0.50	0.005	0.50
200.0	200.7	199.5	1.2	-0.50	-0.003	0.25
400.0	401.2	399.8	1.4	-0.20	0.000	0.05
Average Diff (%)						0.22



Calibrate by:

[Signature]

Approved by:

[Signature]



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 29 August, 2024

Certification No. 297/24

Page : 1 of 2

Object : Wind speed and wind direction

Manufacturer : Davis Instruments Inc.

Type : Weather Wizard III

Serial No. : WC41020A38 ID No. : No.20

Customer : Thai Environmental Technic Limited.
1/6 Soi Ramkhamhaeng 145,
Khwaeng/Khet Saphan Sung, Bangkok 10240.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1006.1 hPa

NATIONAL STANDARD WIND TUNNEL :

: Micromanometer Theodor Friedrichs FC014 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)

JAPAN QUALITY ASSURANCE ORGANIZATION : Standard Velocity at 0 - 20 m/sec

Calibrated by :

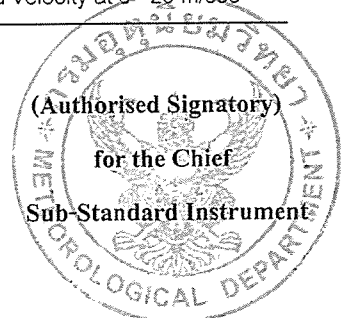
Watchapol

Mr. Watchapol Subwat

Mechanical Engineer

Signed :

Pisoot Promsut
Mr. Pisoot Promsut





THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 297/24

29 August, 2024

Page : 2 of 2

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure inches H2O	Vacumm inches H2O	Velocity m/sec	Velocity m/sec	Correction m/sec
1.00	-	-	-	0.4	0.60
3.02	-	-	-	2.7	0.32
5.00	-	-	-	4.5	0.50
7.00	-	-	-	6.8	0.20
9.02	-	-	-	8.5	0.52
11.01	-	-	-	10.9	0.11
13.01	-	-	-	12.5	0.51
15.01	-	-	-	14.9	0.11
17.02	-	-	-	16.5	0.52
20.02	-	-	-	19.9	0.12

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

Calibrated by :

Watchapol

Mr. Watchapol Subwat
Mechanical Engineer





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 29 August, 2024

Certification No. 298/24

Page : 1 of 2

Object : Wind speed and wind direction

Manufacturer : Davis Instruments Inc.

Type : Weather Wizard III

Serial No. : WE61121A25A ID No. : No.23

Customer : Thai Environmental Technic Limited.
1/6 Soi Ramkhamhaeng 145,
Khwaeng/Khet Saphan Sung, Bangkok 10240.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1006.3 hPa

NATIONAL STANDARD WIND TUNNEL :

: Micromanometer Theodor Friedrichs FC014 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)

JAPAN QUALITY ASSURANCE ORGANIZATION : Standard Velocity at 0 - 20 m/sec

Calibrated by :

Mr. Watcharapol Subwat

Mechanical Engineer

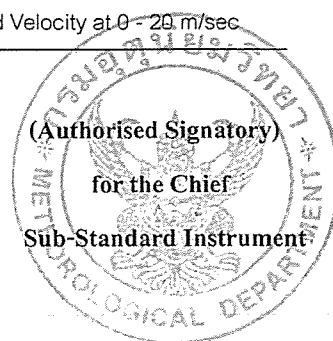
Signed :

Mr. Pisood Promsut

(Authorised Signatory)

for the Chief

Sub-Standard Instrument





THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 298/24

29 August, 2024

Page : 2 of 2

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure inches H2O	Vacumm inches H2O	Velocity m/sec	Velocity m/sec	Correction m/sec
1.00	-	-	-	0.4	0.60
3.02	-	-	-	2.2	0.82
5.00	-	-	-	4.5	0.50
7.00	-	-	-	6.3	0.70
9.02	-	-	-	8.5	0.52
11.01	-	-	-	10.3	0.71
13.01	-	-	-	12.5	0.51
15.01	-	-	-	14.3	0.71
17.02	-	-	-	16.5	0.52
20.02	-	-	-	19.3	0.72

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

Calibrated by :

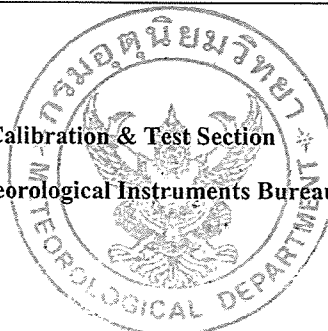
Watchapol

Mr. Watchapol Subwat

Mechanical Engineer

Calibration & Test Section

Meteorological Instruments Bureau





TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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TEL.0-2717-3000-29 FAX.0-2719-9484



Certificate of Calibration

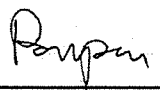
Cert.No.: 24CHO574

Page.: 1 of 2

Equipment : pH Meter
Manufacturer : Horiba
Model : LAQUA-PH1300
Serial No. : B06D0012
ID No. : Ins-LAB-026
Condition As-Received: Used Item
Received Date : 30 October 2024
Calibration Date : 30 October 2024
Reference : 2410-0784OC-6
Submitted by : Thai Environmental Technic Limited
1/6 Soi Ramkhamhaeng 145,
Khwaeng/Khet Saphan Sung,
Bangkok 10240

Calibration Place : Laboratory (Thai Environmental Technic Limitec
Ambient Temperature : (25.3 to 24.8) °C (On-Site)
Relative Humidity : (71.7 to 77.5) % (On-Site)
Calibration Procedure : In - house method :
- CP-OCH2 by direct measurement with DC voltage
standard and direct measurement with
certified reference material (CRM)

Calibrated by : Saithip Meangmai

Approved by : 
Approved Signatory

() Unnopphol Harachai
(✓) Ponpan Paipim
() Saithip Meangmai

Issue Date : 2 November 2024

The Uncertainties are for a confidence probability of approximately 95%

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



Cert.No.: 24CHO574

Page.: 2 of 2

Condition of this calibration result

1. Reference Standard Instrument

<u>Instrument</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Document Process Calibrator	46530031	130RC098	24E3004	12 Sep 2025
2) Digital Thermometer	307901	70RC137	24I973	01 Sep 2025

- This Certification is traceable to SI Through Technology Promotion Association (Thailand - Japan)

2. Certified Reference Materials : The measurement results are traceable to SI through CPA chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835
: The measurement results are traceable to SI through Hach Lenge GmbH Ltd.,
The measurement results are traceable to SI through Hach Lenge GmbH Ltd.,

<u>Buffer Solution</u>	<u>Manufacturer</u>	<u>Lot No.</u>	<u>Exp. date</u>
pH 1.685	CPA chem	1005300	15 June 2026
pH 4.008	CPA chem	1034203	27 Sep 2026
pH 6.876	CPA chem	1005301	15 June 2026
pH 9.174	CPA chem	1005302	15 June 2025
*pH 12.42	Hach Lenge GmbH	C03178	07 June 2026

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

Calibration Results**Function : mV Measurement****Performing standard curve by Document Process Calibrator at pH (1.7,4,7,10,12)**

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (\pm mV)	Coverage factor k
	pH	mV	mV	pH		
pH Meter S/N.: V3B1F8H3	1.680	314.73	314.7	1.680	0.058	2.00
	4.000	177.48	177.4	4.000	0.058	2.00
	6.860	8.28	8.3	6.860	0.058	2.00
	7.000	0.00	0.0	7.000	0.058	2.00
	9.180	-128.97	-128.9	9.180	0.058	2.00
	10.000	-177.48	-177.4	10.000	0.058	2.00
	12.000	-295.80	-295.8	12.000	0.058	2.00

Function : pH Measurement**Performing five buffers standard curve by using buffer nominal pH (1.68,4.01,6.86,9.18,12.42)**

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (\pm)	Coverage factor k
pH Electrode S/N.: 9X3D0537	1.685	1.679	293.0	0.0074	2.18
	4.008	3.981	154.7	0.0057	2.09
	6.876	6.842	-13.2	0.0075	2.05
	9.174	9.151	-148.8	0.013	2.07
	*12.42	12.423	-337.1	0.059	2.05

Remark - * = Not NSC-ONSC Accredited.

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



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TEL.0-2717-3000-29 FAX.0-2719-9484



Certificate of Calibration

Cert.No.: 24MM272

Page.: 1 of 3

Equipment : Electronic Balance

Manufacturer : Mettler Toledo

Model : AB204

Serial No. : 1116392227


ID No. : Ins-LAB-033

Submitted by : Thai Environmental Technic Limited
1/6 Soi Ramkhamhaeng 145,
Khwaeng/Khet Saphan Sung,
Bangkok 10240

Location : Balance Room

Received order : 09 April 2024
Calibration Date : 10 April 2024
Ambient Temperature : 15 °C to 40 °C
Relative Humidity : 30 % to 90 %

Calibrated by : Khit Ruttanaprapachai

Approved by : 
Approved Signatory

() Ponpan Paipim
() Suwit Imjai
(✓) Kunchit Promprat

Issue Date : 12 April 2024

The Uncertainties are for a confidence probability of approximately 95%

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



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2404-0113OC-14

Cert.No.: 24MM272

Page: 2 of 3

Procedure used :-

Calibration were conducted using in-house calibration procedure CP-OB01 based on UKAS LAB 14 according to direct measurement method against standard weight.

Condition of this result of calibration

1. Reference standard instruments:-

<u>Instruments</u>	<u>Model</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Test report No.</u>	<u>Due date</u>
1) Standard Weight Set (E2)	15884	-	70RC138	MM-0020-23	30 Jan 2025

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

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

4. This certificate is not certified for any commercial transaction.

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

Result of calibration () Without Adjustment (*) After Adjustment by External Calibration

Range capacity : 0 g to 210 g **Resolution** 0.0001 g

Before Adjustment :

<u>Applied Weight</u>	<u>Balance Reading</u>	<u>Correction</u>	<u>Measurement Uncertainty</u>	<u>Coverage Factor</u>
(g)	(g)	(g)	(± mg)	(k)
100	100.0000	0.0000	0.19	2
200	200.0001	-0.0001	0.30	2

After Adjustment :

1. **Determination of the standard deviation of weighing machine**

(n = 10)

<u>Applied Weight</u>	<u>Standard Deviation of Reading (g)</u>
(g)	
100	0.00007
200	0.00008



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2404-0113OC-14

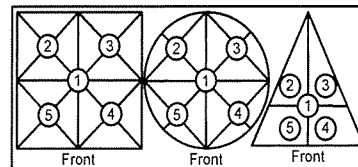
Cert.No.: 24MM272

Page: 3 of 3

Result of calibration

2. Effect of off center loading

A mass of 100 g was placed to various position on the pan.
 The weighing machine reading error obtained is given in the table



**Maximum difference between
off-center and central loading**

Position 1 (g)	Position 2 (g)	Position 3 (g)	Position 4 (g)	Position 5 (g)	(g)
0.0000	+0.0001	0.0000	+0.0001	+0.0003	0.0003

3. Departure from nominal value

<u>Applied Weight</u> (g)	<u>Balance Reading</u> (g)	<u>Correction</u> (g)	<u>Measurement Uncertainty</u> (\pm mg)	<u>Coverage Factor</u> (k)
Unload	0.0000	0.0000	0.14	2.11
0.01	0.0101	-0.0001	0.14	2.11
0.1	0.1001	-0.0001	0.14	2.11
0.5	0.5002	-0.0002	0.14	2.11
1	1.0002	-0.0002	0.14	2.11
5	5.0000	0.0000	0.14	2.11
10	10.0001	-0.0001	0.14	2.11
25	25.0000	0.0000	0.15	2.07
50	49.9999	+0.0001	0.15	2.06
100	100.0002	-0.0002	0.19	2
200	200.0002	-0.0002	0.30	2

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

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TEL.0-2717-3000-29 FAX.0-2719-9484



Certificate of Calibration

Cert. No.: 24TM986

Page : 1 of 3

Equipment : BOD Incubator

Manufacturer : Accuplus

Model : i250-DS

Serial No. : 2059-1017-0029

ID No. : Ins-LAB-047

Submitted by : Thai Environmental Technic Limited
1/6 Soi Ramkhamhaeng 145,
Khwaeng/Khet Saphan Sung,
Bangkok 10240

Location : Laboratory (Thai Environmental Technic Limited)

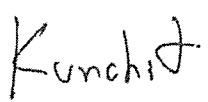
Received Order : 24 June 2024

Calibration Date : 24 June 2024

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Krisda Malee

Approved by : 
Approved Signatory

() Ponpan Paipim
() Suwit Imjai
(✓) Kunchit Promprat

Issue Date : 04 July 2024

The Uncertainties are for a confidence probability of approximately 95%

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



Equipment : BOD Incubator
 Condition As-Received : Used Item
 Reference : 2406-0672OC-3
 Procedure Used :-

Cert. No.: 24TM986
 Page : 2 of 3

Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).
 The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY57013711	23LM115	TPA	11 Jul 2024

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

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

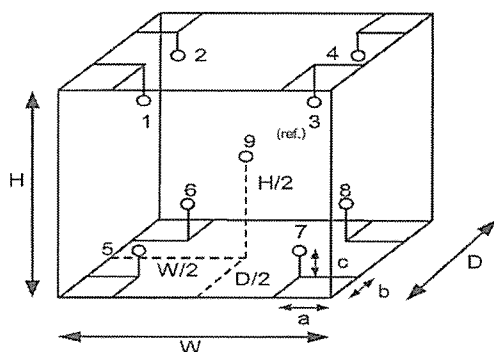
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available

Environment during calibration		
	Beginning	Finished
Temp. (°C)	24	25
REL.Humid. (%)	53	51
AC Supply (Volt)	220	221



Position :	Ref. Std. ID No.:
1	22-18RTD-2/1
2	18RTD-2/2
3	18RTD-2/3
4	18RTD-2/4
5	18RTD-2/5
6	18RTD-2/6
7	18RTD-2/7
8	18RTD-2/8
9 (ref.)	18RTD-2/9

Probe Installation Details :

a = 10 cm
 b = 10 cm
 c = 10 cm

Dimension of Chamber :

D = 0.48 m
 W = 0.50 m
 H = 1.1 m
 Capacity = 0.26 m³



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2406-06720C-3
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Not Available

Cert. No.: 24TM986

Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor <i>k</i>
20.0	20.0	20.0	0.42	0.55	0.99	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	Position									
	1	2	3	4	5	6	7	8	9 (ref.)	
20.0	20.176	20.044	20.228	20.018	20.021	19.995	19.849	19.839	19.863	0.64

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

Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor.

Temperature uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.

Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation.

UUC* : Unit Under Calibration

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

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

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Certificate of Calibration

Certificate Number : SPR24020097-8

Page : 1 of 3

Customer : Thai Environmental Technic Limited.

1/6 Soi Ramkhamhaeng 145, Khwaeng Saphan Sung, Khet Saphan
Sung, Bangkok 10240, Thailand.

Equipment Name : DO Meter

Manufacturer : Horiba

Model : OM-71G

Serial Number : D75J0012

ID. Number : No.07

Environmental Conditions

Ambient Temperature : $23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ Received Date : 07 Feb 2024

Relative Humidity : $50\% \pm 15\%$ Calibration Date : 09 Feb 2024

Location of Calibration : In-Lab Recommend Due Date : 09 Feb 2025

Calibration Procedure : In-House Method Date of Issue : 10 Feb 2024

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by : Mr.Sarawut Khitmai

Calibration Officer

Approved by :

(Mr.Yodyaim Chansang)

Authorized Signatory



Calibration Report

Certificate Number : SPR24020097-8

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Zero Oxygen Solution	HI7040L	Lot S0027-23 _	21C31	21 Mar 2028

Traceability

This certification is traceable to the International System of Unit maintained at :
HANNA - Hanna Instruments (Thailand) Ltd.



Result of Calibration

Certificate Number : SPR24020097-8

Page : 3 of 3

Function : Dissolved Oxygen Permanance Test

Jnit : mg/L

Actual Standard	UUC Reading	Error	Uncertainty (±)
0.00	0.34	0.34	0.13
8.24	8.72	0.48	0.13

Note :

The result of calibration was found accurate as show on date and place of calibration only.
This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.

- End of Certificate -



MAINTENANCE REPORT

OPTIMA 8000

Customer : บริษัท เทคนิคสิ่งแวดล้อมไทย	Date Tested:	<u>September 27, 2024</u>
Address : จำกัด	Recommendation Recertification	
Address : 1/6 ขอยรามคำแหง 145,	Period	<u>6</u> Months
แขวงสะพานสูง, เขตสะพานสูง,	Recertification Due:	<u>March 26, 2568</u>
กรุงเทพฯ 10240 TH	Date Last Certified:	<u>March 28, 2024</u>
User Name: คุณ ณัฐพงศ์ โคตะมา	Visit Number:	<u>2 OF 2</u>
Phone: 02-3737799, 081-1303495	TH ONE SOURCE Phone:	<u>081-7316733, 081-1086572</u>
E-mail: Ketsarin.Chuayphan@eurofinsasia.co	E-mail : thonesource@gmail.com	

CONFIGURATION TESTED

MODEL

OPTIMA 8000

N0772045

SERIAL NUMBER

078S1310024C

1F1380368

ACCESSORIES/COMPONENT NOT INCLUDED

WinLab32 Version 5.5.0

PN:6150T21E4Q1E

TESTED EQUIPMENT

IPV Methods

TEST STANDARD USED

Mixed standard 1/10

Mixed standard 1/100

PE NUMBER

N0691579

N9300221

CUSTOMER SUPPLIED

2 % HNO3

10 % HNO3

COMMENTS



MAINTENANCE REPORT

OPTIMA 8000

SERIAL NUMBER 078S1310024C

DATE TESTED

September 27, 2024

1. MECHANICAL CHECKS

- A. Inspect and clean all fans and filters.
- B. Inspect and replace as necessary, all torch components including the RF Flat coil
- C. Inspect all tubing for sign of clacking or leaking.
- D. Adjust water and gas pressure regulator settings.
- E. Inspect and leak check pneumatics drawers.
- F. Clean the exterior of the instrument.

☐ OK

☐ OK

☐ OK

☐ OK

☐ OK

☐ OK

2. OPTICAL CHECKS

- A. Inspect and clean all optical components.
- B. As required, check and replace all purge filters.
- C. Recheck optical alignment.

☐ OK

☐ OK

☐ OK

3. COOLING SYSTEM CHECKS

- A. Perform preventive maintenance on chiller.
- B. Flush out water the chiller and replace with coolant mix30plus every twelve months

☐ OK

☐ OK

4. PERFORMANCE CHECKS

- A. Torch View Alignment.
- B. Wavelength Calibration.

☐ OK

☐ OK



MAINTENANCE REPORT

OPTIMA 8000

SERIAL NUMBER	078S1310024C	DATE TESTED	September 27, 2024
PARAMETER	SPECIFICATION	FINAL VAULE	
Precision			
Zn 213.856	% RSD ≤ 1.0	0.80	
Mg 280.260	% RSD ≤ 1.0	0.65	
Mg 285.207	% RSD ≤ 1.0	0.96	
Ba 455.403	% RSD ≤ 1.0	0.39	
Detection Limits: Axial			
	As 193 nm, 3(sd) ≤ 10.0 ppb	8.89	
	Se 196 nm, 3(sd) ≤ 5.0 ppb	5	
	Tl 190 nm, 3(sd) ≤ 10.0 ppb	8.49	
	Pb 220 nm, 3(sd) ≤ 3.0 ppb	3.0	
BEC: Axial	Mn 257 nm, ≤ 30 ppb	3.19	
Detection Limits: Radial			
	As 193 nm, 3(sd) ≤ 60.0 ppb	3.05	
	Zn 213 nm, 3(sd) ≤ 2.0 ppb	0.11	
	Mn 257 nm, 3(sd) ≤ 1.0 ppb	0.03	
	La 379 nm, 3(sd) ≤ 3.0 ppb	0.16	
	Ba 455 nm, 3(sd) ≤ 0.3 ppb	0.03	
	Ba 493 nm, 3(sd) ≤ 0.6 ppb	0.04	
BEC: Radial	Mn 257 nm, ≤ 30 ppb	6.73	
Spectral Resolution: UV			
	As 193 nm, ≤ 0.009	0.00770	
	Ni 231 nm, ≤ 0.011	0.00853	
	Ni 341 nm, ≤ 0.015	0.01270	
Spectral Resolution: VIS			
	Ba 455 nm, ≤ 0.020	0.01617	



MAINTENANCE REPORT

OPTIMA 8000

SERIAL NUMBER 078S1310024C

DATE TESTED September 27, 2024

Remarks :

Commissioning follow as commissioning performance sheets.

Calculate MnBEC = $IB * STD \text{ Conc} / IS - IB$, where standard conc = 1000 ug/L

IB = Intensity of blank

IS = Intensity of Standard

Used Mira Mist Nebulizer

This is to certify that the above tests have been performed and the configuration tested



meets



does not meet

This certificate does not modify PerkinElmer's standard terms and condition of sale, including warranty terms.

Service Department TH One Source Co., Ltd.

Krungchai T.

(**Krungchai Treevichien**)

Customer Support Engineer

=====

Align View XY Axial for analyte Mn 257.610

X-position	Y-position	Intensity
-2.0	15.0	1816338.1
-1.6	15.0	2530610.3
-1.2	15.0	3189278.3
-0.8	15.0	3614260.9
-0.4	15.0	3926066.0
0.0	15.0	3834572.0
0.4	15.0	3678909.6
0.8	15.0	3156679.3
1.2	15.0	2495238.4
1.6	15.0	2541267.5
2.0	15.0	1751387.0
-0.4	10.0	55987.3
-0.4	10.5	85699.0
-0.4	11.0	165498.0
-0.4	11.5	368327.5
-0.4	12.0	678081.3
-0.4	12.5	1199292.7
-0.4	13.0	1786433.0
-0.4	13.5	2906912.3
-0.4	14.0	3839977.9
-0.4	14.5	4759744.0
-0.4	15.0	5401740.9
-0.4	15.5	5841016.4
-0.4	16.0	6008449.1
-0.4	16.5	5567893.2
-0.4	17.0	4510535.5
-0.4	17.5	3802817.9
-0.4	18.0	3001780.4
-0.4	18.5	2146077.0
-0.4	19.0	1316878.0
-0.4	19.5	799272.1
-0.4	20.0	463382.8
-1.2	16.0	4859205.2
-0.8	16.0	5531906.7
-0.4	16.0	5846490.8
0.0	16.0	5683533.7
0.4	16.0	5207908.3
-0.4	14.0	4289105.7
-0.4	14.5	4791674.6
-0.4	15.0	5586702.4
-0.4	15.5	5920442.0
-0.4	16.0	5921171.7
-0.4	16.5	5593601.7
-0.4	17.0	4758747.4
-0.4	17.5	3840338.4
-0.4	18.0	3070470.1

27/9/2567 10:25:06 aligned for analyte Mn 257.610

X viewing position set to -0.4 mm having Peak intensity 5921171.7 for Axial viewing

Y viewing position set to 16.0 mm having Peak intensity 5921171.7 for Axial viewing

=====

Align View X Radial for analyte Mn 257.610

X-position	Y-position	Intensity
-7.0	15.0	49486.2
-6.5	15.0	56575.6
-6.0	15.0	69024.4
-5.5	15.0	83981.4
-5.0	15.0	104895.3
-4.5	15.0	131033.5
-4.0	15.0	163001.2
-3.5	15.0	195402.6
-3.0	15.0	249468.8
-2.5	15.0	342466.5
-2.0	15.0	451795.1
-1.5	15.0	553731.8
-1.0	15.0	667318.0

-0.5	15.0	757255.0
0.0	15.0	767649.3
0.5	15.0	735056.1
1.0	15.0	615631.0
1.5	15.0	471489.5
2.0	15.0	333664.2
2.5	15.0	246754.1
3.0	15.0	208559.5
3.5	15.0	163643.5
4.0	15.0	124333.8
4.5	15.0	98031.2
5.0	15.0	75416.8
5.5	15.0	56950.9
6.0	15.0	42516.0
6.5	15.0	32928.9
7.0	15.0	24783.4

27/9/2567 10:28:26 aligned for analyte Mn 257.610

X viewing position set to 0.0 mm having Peak intensity 767649.3 for Radial viewing

=====

=====

Analysis Begun

Start Time: 27/9/2567 10:48:28
 Logged In Analyst: TET
 Spectrometer: Optima 8000

Plasma On Time: 27/9/2567 10:17:24
 Technique: ICP Continuous
 Autosampler: S10

Sample Information File:

Batch ID:
 Results Data Set: DLRL_A270924
 Results Library: C:\Users\Public\PerkinElmer\ICP\Data\Results\Results.mdb

Method Loaded

Method Name: DLRL-Cal Method Last Saved: 27/9/2567 10:48:23
 IEC File: MSF File:
 Method Description: Calibration for later test

Sequence No.: 1

Sample ID: Calib Blank 1

Analyst:

Initial Sample Wt:

Dilution:

Wash Time:

Autosampler Location:

Date Collected: 27/9/2567 10:48:32

Data Type: Original

Initial Sample Vol:

Sample Prep Vol:

Nebulizer Parameters: Calib Blank 1

Analyte	Back Pressure	Flow
All	187.0 kPa	0.55 L/min

Mean Data: Calib Blank 1

Analyte	Mean Corrected Intensity	Std.Dev.	RSD	Conc. Units
As 193.696	24.2	6.15	25.39%	[0.00] mg/L
Zn 213.857	405.8	9.47	2.33%	[0.00] mg/L
Mn 257.610	454.5	55.73	12.26%	[0.00] mg/L
La 379.478	68.3	4.48	6.55%	[0.00] mg/L
Ba 455.403	12522.9	87.42	0.70%	[0.00] mg/L
Ba 493.408	9724.3	90.69	0.93%	[0.00] mg/L

Sequence No.: 2

Sample ID: Calib Std 1

Analyst:

Initial Sample Wt:

Dilution:

Wash Time:

Autosampler Location:

Date Collected: 27/9/2567 10:52:55

Data Type: Original

Initial Sample Vol:

Sample Prep Vol:

Nebulizer Parameters: Calib Std 1

Analyte	Back Pressure	Flow
All	186.0 kPa	0.55 L/min

Mean Data: Calib Std 1

Analyte	Mean Corrected Intensity	Std.Dev.	RSD	Conc. Units
As 193.696	10332.8	118.28	1.14%	[5.0] mg/L
Zn 213.857	114998.8	1360.71	1.18%	[1.0] mg/L
Mn 257.610	1278603.3	34089.13	2.67%	[1.0] mg/L
La 379.478	276804.5	4517.14	1.63%	[1.0] mg/L
Ba 455.403	698163.6	19112.73	2.74%	[0.1] mg/L
Ba 493.408	525803.8	7197.41	1.37%	[0.1] mg/L

Calibration Summary

Analyte	1	Lin, Calc Int	-0.0	2067	0.00000	1.000000
Zn 213.857	1	Lin, Calc Int	0.0	115000	0.00000	1.000000
Mn 257.610	1	Lin, Calc Int	0.0	1279000	0.00000	1.000000
La 379.478	1	Lin, Calc Int	0.0	276800	0.00000	1.000000

Ba 455.403	1	Lin, Calc Int	0.0	6982000	0.00000	1.000000
Ba 493.408	1	Lin, Calc Int	0.0	5258000	0.00000	1.000000

```
=====
Sequence No.: 3                               Autosampler Location:
Sample ID: 10% HNO3                           Date Collected: 27/9/2567 10:55:58
Analyst:                                       Data Type: Original
Initial Sample Wt:                           Initial Sample Vol:
Dilution:                                    Sample Prep Vol:
Wash Time:
=====
```

```
-----
Nebulizer Parameters: 10% HNO3
Analyte                Back Pressure    Flow
All                    187.0 kPa      0.55 L/min
-----
```

```
-----
Mean Data: 10% HNO3
=====
Analyte      Mean Corrected      Calib.      Sample
              Intensity      Conc. Units  Std.Dev.    Conc. Units  Std.Dev.    RSD
As 193.696      988.0      0.5 mg/L    0.29      478.1 g/L    294.98    61.70%
Zn 213.857      485.2      0.0 mg/L    0.00      4.2 g/L      4.00     94.81%
Mn 257.610     1240.6      0.0 mg/L    0.00      1.0 g/L      0.34     34.95%
La 379.478      101.6      0.0 mg/L    0.00      0.4 g/L      0.17     46.17%
Ba 455.403      467.6      0.0 mg/L    0.00      0.1 g/L      0.05     75.51%
Ba 493.408      449.7      0.0 mg/L    0.00      0.1 g/L      0.01      8.86%
=====
```

```
-----
Method Loaded
Method Name: DLRL-Check                      Method Last Saved: 25/2/2543 11:12:48
IEC File:                                    MSF File:
Method Description: As-60,Zn-2, Mn1.0,La-3,Ba455-0.3,Ba493-0.6
=====
```

```
=====
Sequence No.: 4                               Autosampler Location:
Sample ID: 2% HNO3                           Date Collected: 27/9/2567 10:59:33
Analyst:                                       Data Type: Original
Initial Sample Wt:                           Initial Sample Vol:
Dilution:                                    Sample Prep Vol:
Wash Time:
=====
```

```
-----
Nebulizer Parameters: 2% HNO3
Analyte                Back Pressure    Flow
All                    186.0 kPa      0.55 L/min
-----
```

```
-----
Mean Data: 2% HNO3
=====
Analyte      Mean Corrected      Calib.      Sample
              Intensity      Conc. Units  Std.Dev.    Conc. Units  Std.Dev.    RSD
As 193.696     -14.2      -0.0 mg/L    0.00      -6.9 g/L      3.05    44.45%
Zn 213.857     -157.8     -0.0 mg/L    0.00      -1.4 g/L      0.11     7.91%
Mn 257.610     -162.2     -0.0 mg/L    0.00      -0.1 g/L      0.03    24.90%
La 379.478       53.6      0.0 mg/L    0.00      0.2 g/L      0.16    83.90%
Ba 455.403      387.1      0.0 mg/L    0.00      0.1 g/L      0.03    48.81%
Ba 493.408      260.0      0.0 mg/L    0.00      0.0 g/L      0.04    75.57%
=====
```

=====

Analysis Begun

Start Time: 27/9/2567 11:10:10
 Logged In Analyst: TET
 Spectrometer: Optima 8000

Plasma On Time: 27/9/2567 10:17:24
 Technique: ICP Continuous
 Autosampler: S10

Sample Information File:

Batch ID:
 Results Data Set: DLXL_A270924
 Results Library: C:\Users\Public\PerkinElmer\ICP\Data\Results\Results.mdb

Method Loaded

Method Name: DLXL-Cal

Method Last Saved: 5/10/2552 13:39:33

IEC File:

MSF File:

Method Description: Calibration for later test

Sequence No.: 1

Autosampler Location:

Sample ID: Calib Blank 1

Date Collected: 27/9/2567 11:10:14

Analyst:

Data Type: Original

Initial Sample Wt:

Initial Sample Vol:

Dilution:

Sample Prep Vol:

Wash Time:

Nebulizer Parameters: Calib Blank 1

Analyte	Back Pressure	Flow
All	188.0 kPa	0.55 L/min

Mean Data: Calib Blank 1

Analyte	Mean Corrected		Std.Dev.	RSD	Calib	
	Intensity				Conc.	Units
As 193.696	36.8		3.17	8.62%	[0.00]	g/L
Se 196.026	37.0		0.88	2.37%	[0.00]	g/L
Tl 190.801	-63.7		8.31	13.05%	[0.00]	g/L
Pb 220.353	452.0		5.57	1.23%	[0.00]	g/L

Sequence No.: 2

Autosampler Location:

Sample ID: DL-Standard

Date Collected: 27/9/2567 11:12:44

Analyst:

Data Type: Original

Initial Sample Wt:

Initial Sample Vol:

Dilution:

Sample Prep Vol:

Wash Time:

Nebulizer Parameters: DL-Standard

Analyte	Back Pressure	Flow
All	187.0 kPa	0.55 L/min

Mean Data: DL-Standard

Analyte	Mean Corrected		Std.Dev.	RSD	Calib	
	Intensity				Conc.	Units
As 193.696	8456.7		552.97	6.54%	[1000]	g/L
Se 196.026	746.3		33.45	4.48%	[500]	g/L
Tl 190.801	10699.7		205.35	1.92%	[1000]	g/L
Pb 220.353	23233.1		423.05	1.82%	[500]	g/L

Calibration Summary

Analyte	1	Lin, Calc Int	0.0	8.457	0.00000	1.000000
As 193.696	1	Lin, Calc Int	0.0	1.493	0.00000	1.000000
Se 196.026	1	Lin, Calc Int	0.0	10.70	0.00000	1.000000
Tl 190.801	1	Lin, Calc Int	-0.0	46.47	0.00000	1.000000

Sequence No.: 3

Autosampler Location:

Sample ID: 10%HNO3

Date Collected: 27/9/2567 11:15:41

Analyst: Data Type: Original
Initial Sample Wt: Initial Sample Vol:
Dilution: Sample Prep Vol:
Wash Time:

Nebulizer Parameters: 10%HNO3

Analyte	Back Pressure	Flow
All	186.0 kPa	0.55 L/min

Mean Data: 10%HNO3

Analyte	Mean Corrected Intensity	Calib. Conc. Units	Std.Dev.	Sample Conc. Units	Std.Dev.	RSD
As 193.696	91.2	10 g/L	3.00	10 g/L	3.00	27.84%
Se 196.026	41.2	30 g/L	9.83	30 g/L	9.83	35.57%
Tl 190.801	6.5	1 g/L	1.08	1 g/L	1.08	178.82%
Pb 220.353	29.3	1 g/L	0.27	1 g/L	0.27	43.60%

=====

Method Loaded
Method Name: DLXL-Check Method Last Saved: 25/2/2543 10:51:16
IEC File: MSF File:
Method Description: Sample Std.Dev As/Tl <=10 g/l ,Se<=-5 g/l ,Pb<=3 g/l

=====

Sequence No.: 4	Autosampler Location:
Sample ID: 2% <chem>HNO3</chem>	Date Collected: 27/9/2567 11:18:19
Analyst:	Data Type: Original
Initial Sample Wt:	Initial Sample Vol:
Dilution:	Sample Prep Vol:
Wash Time:	

Nebulizer Parameters: 2%HNO3

Analyte	Back Pressure	Flow
All	188.0 kPa	0.55 L/min

Mean Data: 2%HNO3

Analyte	Mean Corrected Intensity	Calib. Conc. Units	Std.Dev.	Sample Conc. Units	Std.Dev.	RSD
As 193.696	23.1				8.89	38.48%
Se 196.026	54.0				5.00	13.59%
Tl 190.801	-58.5				8.49	14.53%
Pb 220.353	434.8				0.17	4.18%

=====
Method Loaded
Method Name: Precision
IEC File:
Method Description: N=10- 1.0% RSD
Method Last Saved: 22/4/2554 10:20:08
MSF File:

=====
Sequence No.: 3
Sample ID: Precision
Analyst:
Initial Sample Wt:
Dilution:
Wash Time:
Autosampler Location:
Date Collected: 27/9/2567 10:36:22
Data Type: Original
Initial Sample Vol:
Sample Prep Vol:

Nebulizer Parameters: Precision
Analyte Back Pressure Flow
All 188.0 kPa 0.55 L/min

Mean Data: Precision

Analyte	Mean Corrected Intensity	Calib. Conc. Units	Std.Dev.	Sample Conc. Units	Std.Dev.	RSD
Zn 206.200	242436.8			1928.28	0.80%	
Mg 280.271	2192985.1			14305.05	0.65%	
Mg 285.213	122825.5			1173.82	0.96%	
Ba 455.403	5765331.2			22705.37	0.39%	

=====



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES

534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250

TEL. 0-2717-3000-29 FAX. 0-2719-9484

Cert.No.: 24CH140

Page.: 1 of 2

Certificate of Calibration

Equipment :	Conductivity Meter
Manufacturer :	Horiba
Model :	ES-71
Serial No. :	D66G0003
ID No. :	No.3
Condition As-Received:	Used Item
Received Date :	26 January 2024
Calibration Date :	29 January 2024
Reference :	2401-0902DSC-1
Submitted by :	Thai Environmental Technic Limited 1/6 Soi Ramkhamhaeng 145, Khwaeng/Khet Saphan Sung, Bangkok 10240
Ambient Temperature :	(25 ± 2.5) °C
Relative Humidity :	(50 ± 15) %
Calibration Procedure:	In -house method : - CP-CH6 : based on direct measurement with reference material (RM)

Calibrated by : Walalak Sirithean

Approved by :

Warakorn

Approved Signatory

- () Saithip Meangmai
(☒) Warakorn Lerngagtrakul
() Ponpan Paipim

Issue Date :

6 February 2024

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

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

A 0012884



Cert.No.: 24CH140

Page.: 2 of 2

Condition of this result of calibration

1. Reference Standard Instrument :-

<u>Instrument</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Certificate No.</u>	<u>Due date</u>
1) Thermometer	9549224	130RC003	23I435	10 Apr 2024
- This Certification is traceable to SI Through Technology Promotion Association (Thailand - Japan)				

2. Certified Reference Materials :-

- Conductivity calibration solution, Thermo Scientific (Traceable to NIST)

<u>Conductivity Solution</u>	<u>Manufacturer</u>	<u>Lot No.</u>	<u>Exp. date</u>
84 μ S/cm	Thermo Scientific	193/02	12 May 2024
1.413 mS/cm	Thermo Scientific	392/01	30 Sep 2025
12.88 mS/cm	Thermo Scientific	351/01	03 Sep 2024

- Control Conductivity calibration solution temperature by Water bath (25 ± 0.1) °C

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

Calibration results

Function : Conductivity Measurement

(*) After Adjustment at 1.413 mS/cm

Conductivity Electrode Serial No.: 9C6E0212

Standard Conductivity Solution	Before Adjustment UUC* Reading	After Adjustment UUC* Reading	Uncertainty of Measurement (\pm)	Coverage factor k
84 μ S/cm	90.6 μ S/cm	88.0 μ S/cm	4.3 μ S/cm	2.00
1.413 mS/cm	1.422 mS/cm	1.413 mS/cm	0.015 mS/cm	2.00
12.88 mS/cm	12.54 mS/cm	12.50 mS/cm	0.14 mS/cm	2.00

Remark : - UUC* = Unit Under Calibration

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

-o0o-

Warakorn

a 1201045

Agilent CrossLab Start Up Services

Agilent 7890 Gas Chromatograph

Preventive Maintenance Checklist



Agilent Preventive Maintenance provides factory recommended service for your analytical instruments to assure reliable operation and the accuracy of your results.

Delivered by highly trained and certified service engineers using genuine Agilent parts and supplies, Agilent Preventive Maintenance provides 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 preventive maintenance activities.

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.

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>
- The **Agilent Community** is an excellent place to get answers, collaborate with others about applications and Agilent products, and find in-depth documents and videos relevant to Agilent technologies. Visit <https://community.agilent.com/welcome>.
- 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** <http://www.agilent.com/search/support>.
- **Videos** about specific preparation requirements for your instrument can be found by searching the **Agilent YouTube** channel at <https://www.youtube.com/user/agilent>.
- **7890B Manuals** are also available on Agilent.com:
 - **Safety**
https://www.agilent.com/cs/library/usermanuals/public/7890B_Safety.pdf
 - **Installation and First Startup**
https://www.agilent.com/cs/library/usermanuals/Public/7890B_Installation.pdf
 - **Operation Manual**
https://www.agilent.com/cs/library/usermanuals/Public/7890B_Operation.pdf
 - **Maintaining Your GC**
https://www.agilent.com/cs/library/usermanuals/public/G3430-90052%207890B_Maintaining%20Guide.pdf

Service Engineer's Responsibilities

- Contact the customer and ensure that all necessary supplies are available before the preventive maintenance visit.
- Only select those pages that relate to the system or module being serviced.
- Complete empty fields with the relevant information.
- Complete the relevant checkboxes in the checklist using either a "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.***

Additional Instruction Notes

- Check for any active service notes for this unit. If there are any applicable "Safety" or "Modification Recommended" Service notes, plan to implement the changes on this unit before doing any qualification service.
- Do not implement firmware updates, unless you get approval from the customer and are sure that they are compatible with the instrument control software.

System Information

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

Instrument System Name and ID

GC 7890 A

Instrument System Site and Location

Lab

List System Component Product Numbers	List the Serial Numbers of each Component
1. G3440 A	CN 10723012
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	

Preparation

- ☒ Discuss any specific issues with the customer before starting.
- ☒ Review the instrument logbook for recorded problems and comments.
- ☒ Save instrument control settings before starting the procedure.
- ☒ Perform a general inspection of the system for cleanliness.
- ☒ Check for proper installation of parts, assemblies, sensors etc.
- ☒ Check system for 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.
- ☒ Before starting the following procedures, record the Detector Signal Output(s) in the results table. If the GC is turned OFF or in a service mode, comparing the detector outputs before and after the service is not possible.

Preventive Maintenance Procedure

Clean and inspect GC

- ☒ Unplug power cord from the power source.
- ☒ Open GC covers and vacuum/remove any dust/debris. Pay particular attention to cooling fans.
- ☒ Inspect internal connectors for proper contact and placement.
- ☒ Reconnect Power to the GC. Power the GC on and verify the power on self-test passed.
- ☒ Verify oven motor spins freely and turns on with the oven door closed; off when the door is opened.
- ☒ Verify operation of all other fans - the inlet and EPC cooling fans.
- ☒ Verify oven intake/outlet flap assembly is operating smoothly while heating and cooling the oven

Inlet and detector consumable replacement

- ☒ For the inlets installed, perform inlet maintenance as defined in the 7890 manual – “Maintaining Your GC” - for the inlet(s) installed.
- ☒ Replace the split vent trap cartridge filter on units with these inlets: Split/Splitless Capillary (SSL), Multi-Mode Inlet (MMI), Programmed Temperature Vaporizer (PTV), Volatiles Interface (VI).
- ☒ If the inlet system is used in Split Mode with viscous samples, inspect and clean the split vent tube on the inlet and flush or replace the tubing between the inlet and the split vent trap.
- ☐ If the GC includes a Flame Ionization Detector (FID), replace the jet. If the ignitor shows any buildup of sample or corrosion, replace the ignitor. Examine the FID collector and castle assemblies for contamination – clean as necessary.

Zero Sensors and Leak test

- ☒ Zero all pressure sensors per the procedure in the 7890 “Advanced User Guide”.
- ☒ Perform inlet pressure decay test(s) as defined in the 7890 “Troubleshooting Manual”.
If the PM is done in preparation for an Operational Qualification, then the pressure decay test defined within that protocol can be used for the PM.
- ☒ Record if test passed or failed in the results table.

ALS Maintenance

- ☒ **Section NOT applicable**
- ☐ Check all cabling and configuration settings between GC, tray, and injectors.
- ☐ Vacuum or remove any dust, especially around fans.
- ☐ Check operation of all fans.
- ☐ Check syringe for smooth plunger operation.
- ☐ Check for smooth operation of the needle support – clean if necessary

Restore Instrument

- ☒ Restore the normal operating conditions or customer method using the Browser interface or Data System.
- ☒ Purge the system with carrier flow for 15 minutes
- ☒ Bake out the system, then restore the normal operating conditions
- ☒ After equilibration, check and record the post PM detector signal output values. Results should be similar or lower than the detector outputs recorded prior to PM.
- ☒ Perform a chemical checkout. If this is a routine PM, inject the customer's sample using the ALS if applicable. This will act as a final checkout of both the ALS and the GC.

Note: 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.

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 with the customer this service, parts replaced, and test results obtained.
- ☐ 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.
- ☐ Supply the customer with a copy of the Smart Alerts flyer.
- ☐ Describe Smart Alerts to the customer.
- ☐ Install Smart Alerts if requested.

7890 GC Test Results Table

Detector Signal Outputs	Before PM Service	After PM Service
Front detector output	N/A	N/A
Back detector output	N/A	N/A
AUX detector output	N/A	N/A
Pressure decay test	Expected test result	Actual test result
Front inlet pressure decay test	Pass	Pass
Back inlet pressure decay test	Pass	Pass

7890 Parts List Table

The following kits are recommended for capillary and purged packed inlets. If this is a general PM and the customer has a preferred set of consumables, you may use the customer's consumables.

Part description	Part number	Product or model# where used	Quantity consumed
SSL Capillary Inlet PM kit, Splitless	5188-6497	7890A/B	1
SSL Capillary Inlet PM kit, split	5188-6496	7890A/B	1
SSL Capillary Ultra Inert Inlet Gold Seal with Washer	5190-6144	7890A/B	N/A
SSL Capillary Ultra Inert Inlet Splitless Liner - Single taper with Glass Wool	5190-2293	7890A/B	N/A
SSL Capillary Ultra Inert Inlet Low Pressure Drop Split Liner - with Glass Wool	5190-2295	7890A/B	N/A
PP Inlet PM kit	5188-6498	7890A/B	N/A
Split vent trap PM kit, single cartridge (for MMI, PTV & VI)	5188-6495	7890A/B	N/A
MMI Cleaning Kit	G3510-60820	7890A/B	N/A
PTV Septumless Head Rebuild Kit	5182-9747	7890A/B	N/A
PTV Septumless Head Teflon Guide	5182-9748	7890A/B	N/A
Ignitor (glow plug) assembly with O-ring	19231-60680	7890A/B	N/A
FID Collector Rebuild/Cleaning Kit	G1531-67000	7890A/B	N/A
Standard .011-inch FID Jet for capillary FID base	G1531-80560	7890A/B	N/A
High Temperature .018-inch FID Jet for capillary FID base	G1531-80620	7890A/B	N/A
Standard .018-inch FID Jet for packed column with packed FID base	18710-20119	7890A/B	N/A
Standard .011-inch FID Jet for capillary column with packed/adaptable FID base	19244-80560	7890A/B	N/A
High Temperature .018-inch FID Jet for capillary column with packed/adaptable FID base	19244-80620	7890A/B	N/A
NPD Jet, universal fit, .011-inch ID	G1534-80580	7890A/B	N/A
NPD Jet, universal fit, .011-inch ID Extended tip	G1534-80590	7890A/B	N/A
SSL Capillary Ultra Inert Inlet Gold Seal with Washer	5190-6144	7890A/B	N/A
SSL Capillary Ultra Inert Inlet Splitless Liner - Single taper with Glass Wool	5190-2293	7890A/B	N/A
**FID Collector Replacement Kit, if needed	G1531-67001	7890A/B	N/A

Service Engineer Comments

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

Service Completion

Service request number 6007047419 Date service completed 26 Jun 2024

Agilent signature Adirek D. Customer signature 100

Total number of pages in this document 8

Agilent CrossLab Start Up Services

Agilent GCMS Preventive Maintenance Checklist

Agilent Preventive Maintenance provides factory recommended service for your analytical instruments to assure reliable operation and the accuracy of your results.

Delivered by highly trained and certified service engineers using genuine Agilent parts and supplies, Agilent Preventive Maintenance provides 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 preventive maintenance activities.

Introduction

Select the appropriate PM to be done and then perform the checklist under that section

- ☐ Interim Preventive Maintenance 6 months
- ☒ Major Preventive Maintenance Yearly

This checklist covers the following model(s):

Type	Model
SQ	5973 Series MSD
SQ	5975 Series MSD
SQ	5977 Series MSD
TQ	7000 Series MS/MS
TQ	7010 Series MS/MS
QTOF	7200 Series QTOF
QTOF	7250 Series QTOF

Customer Information

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

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.
- 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 services in the most logical order relevant to the individual system service in the order of the tasks listed.
- Complete the **Service Review** section together with the customer.
- Ask the customer to sign the **Service Completion** section including the customer's and your signature.

Additional Instruction Notes

- Preventive maintenance is a factory recommended procedure designed to reduce the likelihood of electromechanical failures. Failure to perform preventive maintenance may reduce the long-term reliability of certain instruments and systems. **Two preventative maintenances (PMs) per year are recommended, the Major PM Service will be performed annually with an Interim PM performed 6 months after the Major PM.**

System Information

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

Instrument System Name and ID	MS 5 975 C
Instrument System Site and Location	Lab

List System Component Product Numbers	List the Serial Numbers of each Component
1. G 3 172 A	US 712363 14
2.	
3.	
4.	
5.	
6.	
7.	
8.	

Preparation

- ☒ Discuss any specific issues with the customer before starting.
- ☒ Review the instrument logbook for recorded problems and comments.
- ☒ Save instrument control settings before starting the procedure.
- ☒ Perform a general inspection of the system for cleanliness.
- ☒ Check for proper installation of parts, assemblies, sensors etc.
- ☒ Check system for required installation of components and settings as defined by current Service Notes
- ☒ Check for firmware updates and verify with customers if they would like them installed.
Firmware update(s) are strongly recommended.

Customer Responsibilities

Customers should ensure that all necessary operating supplies, consumables, and usage-dependent items such as gases, vials, syringes, calibrant solution and solvents required for successful preventive maintenance are available. A customer representative should be available while the preventive maintenance is being performed.

Important notice for customers

The customer should complete the following before the Support Provider arrives on site:

- ☐ Perform an autotune and retain the printed tune report just prior to the start of the PM to verify performance of the equipment.

Note: it is recommended to have the customer run the autotune and tune evaluation prior to the PM and then start the vent cycle so that the instrument will be ready for the service representative.

Definition of the Task/Recommended items within the document

Task		Recommended			
Yes	No	Interim	Major	As needed	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Yes selected means that the task was done or the part was required.
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	No selected means that the task was not done or the part was not required.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Interim selected means that this task is recommended to be done at 6-month intervals.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Major selected means that this task is recommended to be done yearly; if the customer would like a service to be done at the 6-month interval then the service could be purchased.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	As needed selected means that the task was done or the part was used as needed. For example, there could be two types of filters that could be used and this was the one selected.

Preventive Maintenance Procedures

Yes/No				Interim/Major				Description
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Perform general inspection of system for cleanliness				
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Discuss any problems the customer is having with the instrument				
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Review customer maintenance records and exclude maintenance on recently serviced items				
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Review the most recent autotune report. This will give a starting point for evaluating spectral peaks, baseline noise, peak shape, mass assignments and resolution.				

				GCMS
Yes/No	Interim/Major	Description		
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Record Instrument model no.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Record Instrument serial no.
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Record Rough Vacuum
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Record Manifold Vacuum
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Type of Column installed

				System Checks
Yes/No	Interim	Major		Description
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Verify that calibration peaks were seen prior to starting the PM
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Vent the instrument
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Inspect vacuum hoses, pump, exhaust tubing, and power cords for excessive wear.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Visually inspect calibrant levels – PFTBA PFDTD (if appl.), IRM (if appl.). Refill if available.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Look for any obvious external damage or problems.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Clean air intake(s). Cosmetic cover(s) may need to be removed.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Verify system line voltage meets instrument specifications: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>

				Wet Mechanical vacuum pumps
Yes/No	Interim	Major		Description
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Check for evidence of oil leakage. Check pump gasket for leakage.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Drain and replace mechanical pump oil.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Replace Oil Mist Filter if applicable.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Discuss with customer the need for more frequent oil changes if the oil is dirty
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Don't use mist filters with Chemical Ionization.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Perform anti-suckback valve test. Power on until side plate is held closed, power off and check that side plate holds closed. Visually confirm that no oil returns up vacuum hose.
Yes/No	Interim	Major		Dry Mechanical vacuum pumps - Diaphragm
Yes/No	Interim	Major		Description
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Check for evidence of poor vacuum – Turbo power demand, poor manifold vacuum, etc.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Clear air flow paths of dust.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	If vacuum is poor, then replace the diaphragm pump.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Perform anti-suckback valve test. Power on until side plate is held closed, power off and check that side plate holds closed.

				Dry Mechanical vacuum pumps - Scroll
Yes/No	Interim	Major		Description
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Replace the tips seal on the IDP pump.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Check for evidence of poor vacuum – Turbo power demand, poor manifold vacuum, etc.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Replace the Exhaust Filter if required.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Discuss with customer the need for more frequent changes, if needed.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Inform customer that pump gas ballast should be installed all the time.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Perform anti-suckback valve test. Power on until side plate is held closed, power off and check that side plate holds closed.

				Cleaning System and Filters
Yes/No	Interim	Major		Description
				Fans
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Remove dust from fans and vent covers.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Verify fans are functional and that there is enough space around the instrument for proper cooling.
				Source cleaning
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Open analyzer and remove the source.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Disassemble, Clean, Re-assemble source.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Re-install source and close analyzer.
				Filters
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Replace RMSH-2 Helium gas filter – if applicable.
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Replace RMSN-2 Nitrogen gas filter – if applicable.
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Replace RMSHY-2 Hydrogen gas filter – if applicable.
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	CP17988 – Gas Clean Carrier Gas Kit for 7890 for Nitrogen or Helium; Bracket, Mount, and Filter – if applicable.
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	CP17974 – Gas Clean Filter Kit GC/MS 1/8"; Mount and Filter – if applicable.
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	CP17973 – Gas Clean Filter; Replacement Filter – if applicable.
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	5190-9071 – Methane Gas Filter – if applicable

Guidance: If gas filter is replaced, write the change date on the filter using a permanent marker.

				System post-check
Yes/No	Interim/Major			Description
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Pump system back down. Wait until system stability has been achieved.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Verify system vacuum reading(s) via the gauge controller.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Leak Check
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Verify system in manual tune
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Compare against previous tune file report(s)
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Change to Tune and verify that all temperatures, pressures, and gas flows reach method set points
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Check manually that you have calibration peaks.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	EI Autotune Performed

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

Service Review

- ☒ Attach available reports/printouts of all tests to this documentation.
- ☒ Record the Preventive Maintenance service activity in the customer's records/logbook. Record the PM event in the Smart Alerts logbook, if applicable.
- ☒ Update/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 Comment box. Systems in a compliant environment may need additional documentation.

Agilent Test Results Table

Test Description	Expected Test Result	Actual Test Result

Agilent Consumed Parts List Table

☐ Section not applicable

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

Signature Page

Service Engineer Comments (optional)

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

Service Completion

Service request number 6007047419 Date service completed 26 Jun 2024

Agilent signature Adirek R. Customer signature [Signature]

Total number of pages in this document 11

Parts – As needed as part of the PM

Common MS Filters and Seals – 5973/5975/5977/7000/7010/7200/7250 Series

Supplies						
Yes/No	Interim/Major/As needed	Description	Part number			
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Helium gas filter – if required	RMSH-2
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Nitrogen gas filter – if required	RMSN-2
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Big Universal Trap, 1/8" fittings, Hydrogen, if required	RMSHY-2
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Gas Clean Carrier Gas Kit for 7890 for Nitrogen or Helium; Bracket, Mount and Filter – if required	CP17988
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Gas Clean Filter Kit GC/MS 1/8 in (complete replacement kit) – if required	CP17974
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Gas Clean GS/MS Filter – if required	CP17973
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Chemical Ionization Gas Purifier (CI systems) – if required	5190-9071
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Agilent AVF Platinum, 1 quart	5191-5851

Gas filters need to be changed only if required

MS Maintenance Supplies for 5973/5975/5977 Series

Supplies						
Yes/No	Interim/Major/As needed	Description	Part number			
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Diffusion pump fluid (Diffusion Pump Models)	6040-0809 Qty 2
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	IDP-3 Tip Seal Replacement Kit (IDP-3 Dry Pump Models)	G7077-67018
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	IDP-3 Tip Seal Replacement Kit (no tools – CSD P/N)	5190-9561
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	IDP-3 Tip Seal Replacement Kit (no tools – VPD P/N)	IDP3TS
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Filter element for IDP-3	REPLSLRFILTER2
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DS42 Oil Mist Eliminator 3/4G & 3/8	SR03706556
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Exhaust oil mist trap (thread) Edwards/Pfeiffer	G1099-80039

MS Maintenance Supplies for 7000/7010 Series

Supplies						
Yes/No	Interim/Major/As needed	Description	Part number			
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Nitrogen gas filter	RMSN-2
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	IDP-10 Tip Seal Replacement Kit (IDP-10 Dry Scroll Pump Models)	G7004-67023
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	IDP-10 Tip Seal Replacement Kit (no tools – VPD P/N)	X3807-67000
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Oil Mist Filter RV5	G6600-80043
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Filter element for the IDP-10	REPLSLRFILTER1

MS Maintenance Supplies for 7200/7250 Series

Supplies						
Yes/No	Interim/Major/As needed	Description	Part number			
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Nitrogen gas filter – if required	RMSN-2
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	RIS Probe Maintenance Kit (7200 Series only)	G7005-60170
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DS202 Oil Mist Eliminator	SR03706800
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	IDP-15 Tip Seal Replacement Kit (IDP-15 Dry Pump Models)	5190-9613
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	IDP-15 Tip Seal Replacement Kit (no tools – VPD P/N)	X3815-67000
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Filter element, for SH-110/SH-112/IDP-15 exhaust silencer	REPLSLRFILTER
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DS 3/8 MAG. PLUG AND GASKET	SR03701824

MS Maintenance Supplies for JetClean

Supplies						
Yes/No	Interim/Major/As needed	Description	Part number			

<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	Big Universal Trap, 1/8" fittings, Hydrogen, if required	RMSHY-2
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Consumable Parts Reference – Purchasable by customer, not included as part of PM

Common MSD Maintenance Supplies 5973/5975/5977/7000/7010/7200/7250 Series

Common Recommended Consumables Parts					
Yes/No	Interim/Major/As needed	Description	Part number		
<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>		EI High Temperature Filaments	G7005-60061	Qty 2	
<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>		HES EI Filaments	G7002-60001		
<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>		LE-EI Filaments	G3850-60021		
<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>		CI High Temperature Filament – all MSDs	G7005-60072		
<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>		PFTBA GCMS Tuning Standard calibrant	05971-60571		
<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>		PFDTD calibrant, 1 mL	8500-8510		
<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>		PFET, IRM calibrant for GC QTOF 0.5 mL	5190-0531		

MSD Maintenance Supplies 5973/5975/5977 Series

Supplies					
Yes/No	Interim/Major/As needed	Description	Part number		
<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>		CI Interface tip seal (tip and spring combo)	G1999-60412		
<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>		CI Interface tip seal (tip only)	G3870-20542		
<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>		CI Interface tip seal spring (spring only)	G1999-20023		
<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>		Repeller insulator	G1099-20133	Qty 2	
<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>		Lens insulator/holder (HES)	G7002-20074		
<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>		Ring heater/sensor assembly (HES)	G7002-60043		
<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>		Ceramic insulator for Extractor (HES)	G7002-20064		
<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>		Transfer-Line Tip Cap, Threaded	G3870-20547		
<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>		Transfer-Line Tip Base, Threaded	G3870-20548		

MS Maintenance Supplies for 7000/7010 Series

Supplies					
Yes/No	Interim/Major/As needed	Description	Part number		
<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>		CI Interface tip seal - 7000	G1999-60412		
<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>		CI Interface tip seal - 7010	G7002-60412		
<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>		CI Interface tip seal (tip only)	G3870-20542		
<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>		CI Interface tip seal spring (spring only)	G1999-20023		
<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>		Repeller insulator - 7000	G1099-20133	Qty 2	
<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>		Lens insulator/holder (HES)	G7002-20074		
<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>		Ring heater/sensor assembly (HES)	G7002-60043		
<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>		Ceramic insulator for Extractor (HES)	G7002-20064		
<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>		Transfer-Line Tip Cap, Threaded	G3870-20547		
<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>		Transfer-Line Tip Base, Threaded	G3870-20548		

MS Maintenance Supplies for 7200 Series

Supplies					
Yes/No	Interim/Major/As needed	Description	Part number		
<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>		Extractor Lens Insulator	G7005-20133		
<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>		Ion Focus Insulator	G7005-20442		
<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>		Ring Heater/Sensor Assembly	G7005-60110		
<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>		RIS Xfer Tip	G7005-20542		
<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>		RIS Xfer Tip Spring	G7005-20024		

MS Maintenance Supplies for 7250 Series

MS Maintenance Supplies for 7250 Series						
Yes/No <input type="checkbox"/> <input type="checkbox"/>					Supplies	
Yes/No Interim/Major/As needed					Description	Part number
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Lens insulator/holder (HES)	G7002-20074
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Ring heater/sensor assembly (HES)	G7002-60043
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Ceramic insulator for Extractor (HES)	G7002-20064
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Transfer-Line Tip Cap, Threaded	G3870-20547
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Transfer-Line Tip Base, Threaded	G3870-20548
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	EI Extractor Transfer Tip	G3870-20542
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	CI Tip Compression Spring	G1999-20023

MS Maintenance Supplies for Intuvo 9000 MS Systems

MS Maintenance Supplies for Intuvo 9000 MS Systems					
Yes/No <input type="checkbox"/> <input type="checkbox"/>			Supplies		
Yes/No	Interim/Major/As needed		Description	Part number	
<input type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input checked="" type="checkbox"/>	Swaged MS Tail - Packaged	G4590-60009	
<input type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input checked="" type="checkbox"/>	Swaged MS Tail (HES) - Packaged	G4590-60109	

Common MS Maintenance Supplies

Parts required					
Yes/No	Interim	Major	As needed	Description	Part number
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Abrasive paper, 30 um	5061-5896
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Alumina powder	393706201
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Cloths, clean (pkg of 15)	05980-60051
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Cloths, cleaning (pkg of 300)	9310-4828
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Cotton swabs (pkg of 100)	5080-5400
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Gloves, clean, large	8650-0030
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Gloves, clean, small	8650-0029

25/9/24



Agilent CrossLab Start Up Services Agilent 7890 Gas Chromatograph Preventive Maintenance Checklist



Agilent Preventive Maintenance provides factory recommended service for your analytical instruments to assure reliable operation and the accuracy of your results.

Delivered by highly trained and certified service engineers using genuine Agilent parts and supplies, Agilent Preventive Maintenance provides 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 preventive maintenance activities.



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.

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>
- The **Agilent Community** is an excellent place to get answers, collaborate with others about applications and Agilent products, and find in-depth documents and videos relevant to Agilent technologies. Visit <https://community.agilent.com/welcome>.
- 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** <http://www.agilent.com/search/support>.
- **Videos** about specific preparation requirements for your instrument can be found by searching the **Agilent YouTube** channel at <https://www.youtube.com/user/agilent>.
- **7890B Manuals** are also available on Agilent.com:
 - **Safety**
https://www.agilent.com/cs/library/usermanuals/public/7890B_Safety.pdf
 - **Installation and First Startup**
https://www.agilent.com/cs/library/usermanuals/Public/7890B_Installation.pdf
 - **Operation Manual**
https://www.agilent.com/cs/library/usermanuals/Public/7890B_Operation.pdf
 - **Maintaining Your GC**
https://www.agilent.com/cs/library/usermanuals/public/G3430-90052%207890B_Maintaining%20Guide.pdf

Service Engineer's Responsibilities

- Contact the customer and ensure that all necessary supplies are available before the preventive maintenance visit.
- Only select those pages that relate to the system or module being serviced.
- Complete empty fields with the relevant information.
- Complete the relevant checkboxes in the checklist using either a "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.**

Additional Instruction Notes

- Check for any active service notes for this unit. If there are any applicable "Safety" or "Modification Recommended" Service notes, plan to implement the changes on this unit before doing any qualification service.
- Do not implement firmware updates, unless you get approval from the customer and are sure that they are compatible with the instrument control software.

System Information

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

Instrument System Name and ID	CN16347040
Instrument System Site and Location	Thai Environmental Technic Co., Ltd./Lab

List System Component Product Numbers	List the Serial Numbers of each Component
1. G3440B	CN16347040
2. G4517A	CN16350082
3. G4514A	CN16400014
4.	
5.	
6.	
7.	
8.	
9.	
10.	

Preparation

- ☒ Discuss any specific issues with the customer before starting.
- ☒ Review the instrument logbook for recorded problems and comments.
- ☒ Save instrument control settings before starting the procedure.
- ☒ Perform a general inspection of the system for cleanliness.
- ☒ Check for proper installation of parts, assemblies, sensors etc.
- ☒ Check system for 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.
- ☒ Before starting the following procedures, record the Detector Signal Output(s) in the results table. If the GC is turned OFF or in a service mode, comparing the detector outputs before and after the service is not possible.

Revision: 2.01, Issued: September 15, 2021

Agilent Document Number: D0013618

DE number: 44166.759722222

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Preventive Maintenance Procedure

Clean and inspect GC

- ☒ Unplug power cord from the power source.
- ☒ Open GC covers and vacuum/remove any dust/debris. Pay particular attention to cooling fans.
- ☒ Inspect internal connectors for proper contact and placement.
- ☒ Reconnect Power to the GC. Power the GC on and verify the power on self-test passed.
- ☒ Verify oven motor spins freely and turns on with the oven door closed; off when the door is opened.
- ☒ Verify operation of all other fans - the inlet and EPC cooling fans.
- ☒ Verify oven intake/outlet flap assembly is operating smoothly while heating and cooling the oven

Inlet and detector consumable replacement

- ☒ For the inlets installed, perform inlet maintenance as defined in the 7890 manual – "Maintaining Your GC" - for the inlet(s) installed.
- ☒ Replace the split vent trap cartridge filter on units with these inlets: Split/Splitless Capillary (SSL), Multi-Mode Inlet (MMI), Programmed Temperature Vaporizer (PTV), Volatiles Interface (VI).
- ☒ If the inlet system is used in Split Mode with viscous samples, inspect and clean the split vent tube on the inlet and flush or replace the tubing between the inlet and the split vent trap.
- ☒ If the GC includes a Flame Ionization Detector (FID), replace the jet. If the ignitor shows any buildup of sample or corrosion, replace the ignitor. Examine the FID collector and castle assemblies for contamination – clean as necessary.

Zero Sensors and Leak test

- ☒ Zero all pressure sensors per the procedure in the 7890 "Advanced User Guide".
- ☒ Perform inlet pressure decay test(s) as defined in the 7890 "Troubleshooting Manual".
If the PM is done in preparation for an Operational Qualification, then the pressure decay test defined within that protocol can be used for the PM.
- ☒ Record if test passed or failed in the results table.

ALS Maintenance

- ☐ **Section NOT applicable**
- ☒ Check all cabling and configuration settings between GC, tray, and injectors.
- ☒ Vacuum or remove any dust, especially around fans.
- ☒ Check operation of all fans.
- ☒ Check syringe for smooth plunger operation.
- ☒ Check for smooth operation of the needle support – clean if necessary

Restore Instrument

- ☒ Restore the normal operating conditions or customer method using the Data System.
- ☒ Purge the system with carrier flow for 15 minutes
- ☒ Bake out the system, then restore the normal operating conditions
- ☒ After equilibration, check and record the post PM detector signal output values.
Results should be similar or lower than the detector outputs recorded prior to PM.
- ☒ Perform a chemical checkout. If this is a routine PM, inject the customer's sample using the ALS if applicable. This will act as a final checkout of both the ALS and the GC.

Note: 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.

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 with the customer this service, parts replaced, and test results obtained.
- ☐ 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.
- ☐ Supply the customer with a copy of the Smart Alerts flyer.
- ☐ Describe Smart Alerts to the customer.
- ☐ Install Smart Alerts if requested.

7890 GC Test Results Table

Detector Signal Outputs	Before PM Service	After PM Service
Front detector output	N/A	17.6 (FID)
Back detector output	N/A	791.4 (ECD)
AUX detector output	N/A	4.7 (TCD)
Pressure decay test	Expected test result	Actual test result
Front inlet pressure decay test	Pass	Pass
Back inlet pressure decay test	Pass	Pass

7890 Parts List Table

The following kits are recommended for capillary and purged packed inlets. If this is a general PM and the customer has a preferred set of consumables, you may use the customer's consumables.

Part description	Part number	Product or model# where used	Quantity consumed
SSL Capillary Inlet PM kit, Splitless	5188-6497	7890A/B	2
SSL Capillary Inlet PM kit, split	5188-6496	7890A/B	N/A
SSL Capillary Ultra Inert Inlet Gold Seal with Washer	5190-6144	7890A/B	N/A
SSL Capillary Ultra Inert Inlet Splitless Liner - Single taper with Glass Wool	5190-2293	7890A/B	N/A
SSL Capillary Ultra Inert Inlet Low Pressure Drop Split Liner - with Glass Wool	5190-2295	7890A/B	N/A
PP Inlet PM kit	5188-6498	7890A/B	N/A
Split vent trap PM kit, single cartridge (for MMI, PTV & VI)	5188-6495	7890A/B	N/A
MMI Cleaning Kit	G3510-60820	7890A/B	N/A
PTV Septumless Head Rebuild Kit	5182-9747	7890A/B	N/A
PTV Septumless Head Teflon Guide	5182-9748	7890A/B	N/A
Ignitor (glow plug) assembly with O-ring	19231-60680	7890A/B	1
FID Collector Rebuild/Cleaning Kit	G1531-67000	7890A/B	N/A
Standard .011-inch FID Jet for capillary FID base	G1531-80560	7890A/B	N/A
High Temperature .018-inch FID Jet for capillary FID base	G1531-80620	7890A/B	N/A
Standard .018-inch FID Jet for packed column with packed FID base	18710-20119	7890A/B	N/A
Standard .011-inch FID Jet for capillary column with packed/adaptable FID base	19244-80560	7890A/B	1
High Temperature .018-inch FID Jet for capillary column with packed/adaptable FID base	19244-80620	7890A/B	N/A
NPD Jet, universal fit, .011-inch ID	G1534-80580	7890A/B	N/A
NPD Jet, universal fit, .011-inch ID Extended tip	G1534-80590	7890A/B	N/A
SSL Capillary Ultra Inert Inlet Gold Seal with Washer	5190-6144	7890A/B	N/A
SSL Capillary Ultra Inert Inlet Splitless Liner - Single taper with Glass Wool	5190-2293	7890A/B	N/A
**FID Collector Replacement Kit, if needed	G1531-67001	7890A/B	N/A

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DE number: 44166.7597222222

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Service Engineer Comments

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

Service Completion

Service request number 6007204229 Date service completed 25 Sep 2024
Agilent signature SNT Customer signature Saksorn
Total number of pages in this document 9 pages



SCARLET | TECH



Calibration Laboratory
3519

Certificate of Calibrator

for ST-120 Sound Calibrator

No. 20231221J143

Name of Product Sound Calibrator

Type ST-120

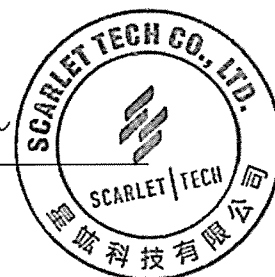
Serial Number ST120C0263E

Specification Class 1

Date 2023/12/21

Tested by

Jim Lin



1. Outside : OK
2. Sound Pressure Level : 93.97 dB ; 114.03 dB
3. Frequency : 998.30 Hz
4. Distortion : 1.15 % ; 1.35 %

Environment conditions :

Air temperature : 18 °C
Relative humidity : 62 %
Static pressure : 101.9 kPa

Scarlet Tech Co., Ltd.

4F-3, No. 347, HePing E Rd, 2nd Sec, DaAn District, Taipei City 106, Taiwan
E-mail: info@scarlet.com.tw www.scarlet-tech.com




Thai Environmental Technic Limited
บริษัท เทคนิกล้างแวล้อมไทย จำกัด

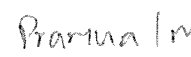
Sound Level Meter Calibration Report

Equipment Type : Sound Level Meter
Calibrator : TENMARS Sound Calibrator TM-100
Standard : IEC 60942
Accuracy : 94.0 ±0.3 dB and 114.0 ±0.5 dB
Frequency : at 1,000 Hz ±1%
Calibrator Serial NO. : ST120C0263E

Calibration Date : 1-Nov-2024
Barometric pressure (mmHg) : 759.0 mmHg
Temperature (23±3)°C : 25.00 °C
Relative Humidity(50±15 %) : 50.0 % RH
Dued Date of Calibrate : 30-Nov-2024

Item	Instrument Calibrated			Reference Acoustic dB	Before Adjust				After Adjust ± dB	Deviation ± dB	Result Calibrate
	Brand	Model	Serial NO.		ครั้งที่ 1	ครั้งที่ 2	ครั้งที่ 3	เฉลี่ย			
21	ACO	6226	070049	94.0	94.2	94.2	94.2	94.2	94.0	0.2	PASS
				114.0	114.0	114.0	114.0	114.0			
23	RION	NL-21	00487676	94.0	93.8	93.8	93.8	93.8	94.0	0.2	PASS
				114.0	113.8	113.8	113.8	113.8			
25	ACO	6226	100098	94.0	94.2	94.2	94.2	94.2	94.0	0.2	PASS
				114.0	114.1	114.1	114.1	114.1			
26	ACO	6226	100099	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.1	114.1	114.1	114.1			
28	ACO	6226	100101	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.1	114.1	114.1	114.1			
29	ACO	6226	100102	94.0	93.9	93.9	93.9	93.9	94.0	0.1	PASS
				114.0	113.9	113.9	113.9	113.9			
30	ACO	6226	100106	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.0	114.0	114.0	114.0			
31	ACO	6226	110098	94.0	93.8	93.8	93.8	93.8	94.0	0.2	PASS
				114.0	113.8	113.8	113.8	113.8			
32	ACO	6226	110105	94.0	93.9	93.9	93.9	93.9	94.0	0.1	PASS
				114.0	114.0	114.0	114.0	114.0			
34	ACO	6226	110099	94.0	94.3	94.3	94.3	94.3	94.0	0.3	PASS
				114.0	114.2	114.2	114.2	114.2			

Calibration By : 

Approve by : 




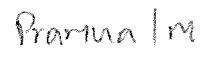
Thai Environmental Technic Limited
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Sound Level Meter Calibration Report

Equipment Type	: Sound Level Meter	Calibration Date	: 1-Nov-2024
Calibrator	: TENMARS Sound Calibrator TM-100	Barometric pressure (mmHg)	: 759.0 mmHg
Standard	: IEC 60942	Temperature (23±3)°C	: 25.00 °C
Accuracy	: 94.0 ±0.3 dB and 114.0±0.5 dB	Relative Humidity(50±15 %)	: 50.0 % RH
Frequency	: at 1,000 Hz ±1%	Dued Date of Calibrate	: 30-Nov-2024
Calibrator Serial NO.	: ST120C0263E		

Item	Instrument Calibrated			Reference Acoustic dB	Before Adjust				After Adjust ± dB	Deviation ± dB	Result Calibrate
	Brand	Model	Serial NO.		ครั้งที่ 1	ครั้งที่ 2	ครั้งที่ 3	เฉลี่ย			
35	ACO	6226	110097	94.0	94.0	94.0	94.0	94.0	94.0	0.0	PASS
				114.0	114.0	114.0	114.0	114.0			
36	ACO	6226	110102	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.1	114.1	114.1	114.1			
37	ACO	6226	110101	94.0	93.9	93.9	93.9	93.9	94.0	0.1	PASS
				114.0	114.0	114.0	114.0	114.0			
38	ACO	6226	110106	94.0	94.2	94.2	94.2	94.2	94.0	0.2	PASS
				114.0	114.2	114.2	114.2	114.2			
39	ACO	6226	110104	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.1	114.1	114.1	114.1			
40	ACO	6226	110100	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.1	114.1	114.1	114.1			
41	ACO	6226	130127	94.0	93.9	93.9	93.9	93.9	94.0	0.1	PASS
				114.0	114.0	114.0	114.0	114.0			
42	ACO	6226	130128	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.0	114.0	114.0	114.0			
44	ACO	6226	130130	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.1	114.1	114.1	114.1			
45	ACO	6226	130131	94.0	93.8	93.8	93.8	93.8	94.0	0.2	PASS
				114.0	113.8	113.8	113.8	113.8			

Calibration By : 

Approve by : 



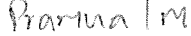
Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

Sound Level Meter Calibration Report

Equipment Type	: Sound Level Meter	Calibration Date	: 1-Nov-2024
Calibrator	: TENMARS Sound Calibrator TM-100	Barometric pressure (mmHg)	: 759.0 mmHg
Standard	: IEC 60942	Temperature (23±3)°C	: 25.00 °C
Accuracy	: 94.0 ±0.3 dB and 114.0±0.5 dB	Relative Humidity(50±15 %)	: 50.0 % RH
Frequency	: at 1,000 Hz ±1%	Dued Date of Calibrate	: 30-Nov-2024
Calibrator Serial NO.	: ST120C0263E		

Item	Instrument Calibrated			Reference Acoustic dB	Before Adjust				After Adjust ± dB	Deviation ± dB	Result Calibrate
	Brand	Model	Serial NO.		ครั้งที่ 1	ครั้งที่ 2	ครั้งที่ 3	เฉลี่ย			
57	ACO	6226	160099	94.0	93.9	93.9	93.9	93.9	94.0	0.1	PASS
				114.0	113.9	113.9	113.9	113.9			
58	ACO	6226	160143	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.0	114.0	114.0	114.0			
59	ACO	6226	160203	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.0	114.0	114.0	114.0			
60	ACO	6226	160204	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.1	114.1	114.1	114.1			
61	ACO	6226	160205	94.0	93.9	93.9	93.9	93.9	94.0	0.1	PASS
				114.0	113.9	113.9	113.9	113.9			
62	ACO	6226	160211	94.0	94.2	94.2	94.2	94.2	94.0	0.2	PASS
				114.0	114.1	114.1	114.1	114.1			
63	ACO	6226	160212	94.0	94.2	94.2	94.2	94.2	94.0	0.2	PASS
				114.0	114.2	114.2	114.2	114.2			
64	ACO	6226	160213	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.0	114.0	114.0	114.0			
66	ACO	6226	160215	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.1	114.1	114.1	114.1			
67	ACO	6226	160216	94.0	93.9	93.9	93.9	93.9	94.0	0.1	PASS
				114.0	113.9	113.9	113.9	113.9			

Calibration By : 

Approve by : 



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0566

MTC No. EEL. BP. 1/0867

CALIBRATION CERTIFICATE

Submitted by : THAI ENVIRONMENTAL TECHNIC LIMITED.

Address : 1/6 Soi Ramkhamhaeng 145, Khwaeng/Khet Saphansung, Bangkok, 10240, Thailand.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.
Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Sound Calibrator

Manufacturer : Tenmars

Model : TM-100

Serial No. : 180501628

Ambient Environment

Temperature : $(23 \pm 3) ^\circ\text{C}$

Relative Humidity : $(50 \pm 15) \%$

Ambient Pressure : $(101.325 \pm 1.500) \text{ kPa}$

Standards used :

1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.
3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.
4. Digital Multimeter Agilent 34401A S/N MY44005560.
5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.
6. Audio Analyzer Panasonic VP-7722A S/N 041477D122.
7. Condenser Microphone B&K 4180 S/N 2633526.

Calibration Procedure: CP-102-04 based on IEC 60942-2003. The sound pressure level of instrument was measured by standard microphone using an insert voltage technique.

This instrument has been calibrated against standards maintained at Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

Date of Receipt : 1 Aug. 2024

Date of Calibration : 13 Aug. 2024

1 / 3

The results relate only to the items tested/calibrated or value assigned.

Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FM.BL.MTC.002 Rev.5

Head Office

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Office/Laboratory

668 Mu 2 Tambon Bangpoomai, Amphoe Muang Samutprakan,
Changwat Samutprakan 10280, Thailand

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(66) 08 3219 9440

E-mail : mtc@tistr.or.th Website : www.tistr.or.th

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(66) 08 1889 6827



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0566

MTC No. EEL. BP. 1/0867

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.

Nominal Output of Unit Under Test = 94 dB re 20 μ Pa at 1000 HzAcoustic Output in dB re 20 μ Pa , Corrected to Reference Conditions : 101.325 kPa , 23.0°C and 50 %RH

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	94.58	0.58	± 0.10	± 0.75 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	990.7	-9.3	± 1.5	$\pm 2.0\%$

3. Total distortion

Standard Microphone Type	Measured Total distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	1.74	± 0.50	$\pm 4.0\%$

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Date of Calibration : 13 Aug. 2024

2/3

The results relate only to the items tested/calibrated or value assigned.

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FM.BL.MTC.002 Rev.4

Head Office

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Tel. (66) 0 2323 1672-80 ext. 115, 116
Fax. (66) 0 2323 9165
E-mail : mtc@tistr.or.th

Office

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Thailand
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Fax. (66) 0 2579 8592
E-mail : sumalee@tistr.or.th



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0566

MTC No. EEL. BP. 1/0867

Nominal Output of Unit Under Test = 114 dB re 20 μ Pa at 1000 Hz

Acoustic Output in dB re 20 μ Pa , Corrected to Reference Conditions : 101.325 kPa , 23.0 °C and 50 %RH

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Brüel&Kjaer 4180	114.61	0.61	± 0.10	± 0.75 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Brüel&Kjaer 4180	985.9	-14.1	± 1.5	$\pm 2.0\%$

3. Total Distortion

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Brüel&Kjaer 4180	3.00	± 0.70	$\pm 4.0\%$

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :

.....
(Mr. Weerachai Deechaiyae)

Approved by :

.....
(Mr. Prawate Kluaypa)
Director
Electrical and Electronic Standards Laboratory

Date of Calibration : 13 Aug. 2024

Date of Issue : 15 Aug. 2024

Industrial Metrology and Testing Service Centre

Ref : 2011267080102854001

End of Certificate

3 / 3

The results relate only to the items tested/calibrated or value assigned.

Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FM.BL.MTC.002 Rev.5

Head Office

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(66) 08 3219 9440
E-mail : mtc@tistr.or.th Website : www.tistr.or.th

Office

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Bangkok 10900, Thailand
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(66) 08 1889 6827

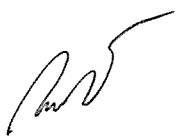


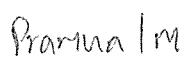
Thai Environmental Technic Limited
บริษัท เทคนิกลิ่งแวดล้อมไทย จำกัด

Sound Level Meter Calibration Report

Equipment Type	: Sound Level Meter	Calibration Date	: 1-Aug-2024
Calibrator	: TENMARS Sound Calibrator TM-100	Barometric pressure (mmHg)	: 759.0 mmHg
Standard	: IEC 60942	Temperature (23±3)°C	: 25.00 °C
Accuracy	: 94.0 ±0.3 dB and 114.0±0.5 dB	Relative Humidity(50±15 %)	: 50.0 % RH
Frequency	: at 1,000 Hz ±1%	Dued Date of Calibrate	: 31-Aug-2024
Calibrator Serial NO.	: 180501628		

Item	Instrument Calibrated			Reference Acoustic dB	Before Adjust				After Adjust ± dB	Deviation ± dB	Result Calibrate
	Brand	Model	Serial NO.		ครั้งที่ 1	ครั้งที่ 2	ครั้งที่ 3	เฉลี่ย			
21	ACO	6226	070049	94.0	94.2	94.2	94.2	94.2	94.0	0.2	PASS
				114.0	114.1	114.1	114.1	114.1			
23	RION	NL-21	00487676	94.0	93.8	93.8	93.8	93.8	94.0	0.2	PASS
				114.0	113.8	113.8	113.8	113.8			
25	ACO	6226	100098	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.1	114.1	114.1	114.1			
26	ACO	6226	100099	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.0	114.0	114.0	114.0			
28	ACO	6226	100101	94.0	93.9	93.9	93.9	93.9	94.0	0.1	PASS
				114.0	113.9	113.9	113.9	113.9			
29	ACO	6226	100102	94.0	93.9	93.9	93.9	93.9	94.0	0.1	PASS
				114.0	114.0	114.0	114.0	114.0			
30	ACO	6226	100106	94.0	94.3	94.3	94.3	94.3	94.0	0.3	PASS
				114.0	114.2	114.2	114.2	114.2			
31	ACO	6226	110098	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.0	114.0	114.0	114.0			
32	ACO	6226	110105	94.0	93.7	93.7	93.7	93.7	94.0	0.3	PASS
				114.0	113.7	113.7	113.7	113.7			
34	ACO	6226	110099	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.0	114.0	114.0	114.0			

Calibration By : 

Approve by : 



Thai Environmental Technic Limited

บริษัท เทคนิคสิ่งแวดล้อมไทย จำกัด

Sound Level Meter Calibration Report

Equipment Type : Sound Level Meter
Calibrator : TENMARS Sound Calibrator TM-100
Standard : IEC 60942
Accuracy : 94.0 ±0.3 dB and 114.0±0.5 dB
Frequency : at 1,000 Hz ±1%
Calibrator Serial NO. : 180501628

Calibration Date : 1-Aug-2024
Barometric pressure (mmHg) : 759.0 mmHg
Temperature (23±3)°C : 25.00 °C
Relative Humidity(50±15 %) : 50.0 % RH
Dued Date of Calibrate : 31-Aug-2024

Item	Instrument Calibrated			Reference Acoustic dB	Before Adjust				After Adjust ± dB	Deviation ± dB	Result Calibrate
	Brand	Model	Serial NO.		ครั้งที่ 1	ครั้งที่ 2	ครั้งที่ 3	เฉลี่ย			
46	ACO	6236	112029	94.0	94.0	94.0	94.0	94.0	94.0	0.0	PASS
				114.0	114.1	114.1	114.1	114.1			
48	ACO	6236	152074	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.0	114.0	114.0	114.0			
49	ACO	6236	152075	94.0	93.7	93.7	93.7	93.7	94.0	0.3	PASS
				114.0	113.7	113.7	113.7	113.7			
50	ACO	6236	152076	94.0	94.2	94.2	94.2	94.2	94.0	0.2	PASS
				114.0	114.1	114.1	114.1	114.1			
51	ACO	6236	152077	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.1	114.1	114.1	114.1			
52	ACO	6226	150142	94.0	93.9	93.9	93.9	93.9	94.0	0.1	PASS
				114.0	113.9	113.9	113.9	113.9			
53	ACO	6226	160095	94.0	93.9	93.9	93.9	93.9	94.0	0.1	PASS
				114.0	113.9	113.9	113.9	113.9			
54	ACO	6226	160096	94.0	93.9	93.9	93.9	93.9	94.0	0.1	PASS
				114.0	114.0	114.0	114.0	114.0			
55	ACO	6226	160097	94.0	94.2	94.2	94.2	94.2	94.0	0.2	PASS
				114.0	114.1	114.1	114.1	114.1			
56	ACO	6226	160098	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.0	114.0	114.0	114.0			

Calibration By : 

Approve by : 



Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

Sound Level Meter Calibration Report

Equipment Type : Sound Level Meter
Calibrator : TENMARS Sound Calibrator TM-100
Standard : IEC 60942
Accuracy : 94.0 ±0.3 dB and 114.0±0.5 dB
Frequency : at 1,000 Hz ±1%
Calibrator Serial NO. : 180501628

Calibration Date : 1-Aug-2024
Barometric pressure (mmHg) : 759.0 mmHg
Temperature (23±3)°C : 25.00 °C
Relative Humidity(50±15 %) : 50.0 % RH
Dued Date of Calibrate : 31-Aug-2024

Item	Instrument Calibrated			Reference Acoustic dB	Before Adjust				After Adjust ± dB	Deviation ± dB	Result Calibrate
	Brand	Model	Serial NO.		ครั้งที่ 1	ครั้งที่ 2	ครั้งที่ 3	เฉลี่ย			
68	ACO	6236	222036	94.0	94.0	94.0	94.0	94.0	94.0	0.0	PASS
				114.0	113.9	113.9	113.9	113.9			
69	ACO	6236	222037	94.0	94.0	94.0	94.0	94.0	94.0	0.0	PASS
				114.0	114.0	114.0	114.0	114.0			
70	ACO	6236	222038	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.1	114.1	114.1	114.1			
71	ACO	6236	222039	94.0	94.0	94.0	94.0	94.0	94.0	0.0	PASS
				114.0	114.0	114.0	114.0	114.0			
72	ACO	6236	222040	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.1	114.1	114.1	114.1			
74	ACO	6236	222245	94.0	94.0	94.0	94.0	94.0	94.0	0.0	PASS
				114.0	114.0	114.0	114.0	114.0			

Calibration By : 

Approve by : Praruna Im



Sound Level Meter Calibration Report

Equipment Type : Sound Level Meter
Calibrator : TENMARS Sound Calibrator TM-100
Standard : IEC 60942
Accuracy : 94.0 ±0.3 dB and 114.0±0.5 dB
Frequency : at 1,000 Hz ±1%
Calibrator Serial NO. : 180501628

Calibration Date : 1-Nov-2024
Barometric pressure (mmHg) : 759.0 mmHg
Temperature (23±3)°C : 25.00 °C
Relative Humidity(50±15 %) : 50.0 % RH
Dued Date of Calibrate : 30-Nov-2024

Item	Instrument Calibrated			Reference Acoustic dB	Before Adjust				After Adjust ± dB	Deviation ± dB	Result Calibrate
	Brand	Model	Serial NO.		ครั้งที่ 1	ครั้งที่ 2	ครั้งที่ 3	เฉลี่ย			
46	ACO	6236	112029	94.0	94.0	94.0	94.0	94.0	94.0	0.0	PASS
				114.0	114.0	114.0	114.0	114.0			
48	ACO	6236	152074	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.0	114.0	114.0	114.0			
49	ACO	6236	152075	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.1	114.1	114.1	114.1			
50	ACO	6236	152076	94.0	93.9	93.9	93.9	93.9	94.0	0.1	PASS
				114.0	114.0	114.0	114.0	114.0			
51	ACO	6236	152077	94.0	94.0	94.0	94.0	94.0	94.0	0.0	PASS
				114.0	113.9	113.9	113.9	113.9			
52	ACO	6226	150142	94.0	94.2	94.2	94.2	94.2	94.0	0.2	PASS
				114.0	114.1	114.1	114.1	114.1			
53	ACO	6226	160095	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.0	114.0	114.0	114.0			
54	ACO	6226	160096	94.0	94.0	94.0	94.0	94.0	94.0	0.0	PASS
				114.0	113.9	113.9	113.9	113.9			
55	ACO	6226	160097	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.1	114.1	114.1	114.1			
56	ACO	6226	160098	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.1	114.1	114.1	114.1			

Calibration By : 

Approve by : Barua / m



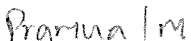
Thai Environmental Technic Limited
บริษัท เทคนิกลิ่งแวดล้อมไทย จำกัด

Sound Level Meter Calibration Report

Equipment Type	: Sound Level Meter	Calibration Date	: 1-Nov-2024
Calibrator	: TENMARS Sound Calibrator TM-100	Barometric pressure (mmHg)	: 759.0 mmHg
Standard	: IEC 60942	Temperature (23±3)°C	: 25.00 °C
Accuracy	: 94.0 ±0.3 dB and 114.0±0.5 dB	Relative Humidity(50±15 %)	: 50.0 % RH
Frequency	: at 1,000 Hz ±1%	Dued Date of Calibrate	: 30-Nov-2024
Calibrator Serial NO.	: 180501628		

Item	Instrument Calibrated			Reference Acoustic dB	Before Adjust				After Adjust ± dB	Deviation ± dB	Result Calibrate
	Brand	Model	Serial NO.		ครั้งที่ 1	ครั้งที่ 2	ครั้งที่ 3	เฉลี่ย			
68	ACO	6236	222036	94.0	94.0	94.0	94.0	94.0	94.0	0.0	PASS
				114.0	114.0	114.0	114.0	114.0			
69	ACO	6236	222037	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.0	114.0	114.0	114.0			
70	ACO	6236	222038	94.0	94.0	94.0	94.0	94.0	94.0	0.0	PASS
				114.0	114.0	114.0	114.0	114.0			
71	ACO	6236	222039	94.0	94.1	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.1	114.1	114.1	114.1			
72	ACO	6236	222040	94.0	94.0	94.0	94.0	94.0	94.0	0.0	PASS
				114.0	114.0	114.0	114.0	114.0			
74	ACO	6236	222245	94.0	94.0	94.0	94.0	94.0	94.0	0.0	PASS
				114.0	114.0	114.0	114.0	114.0			
76	ACO	6236	222247	94.0	94.0	94.0	94.0	94.0	94.0	0.0	PASS
				114.0	114.0	114.0	114.0	114.0			

Calibration By : 

Approve by : 



ID LINE : IEC17025



Certificate of Calibration

Certificate Number : SPR24020220-33

Page : 1 of 3

Customer : Thai Environmental Technic Limited.

1/6 Soi Ramkhamhaeng 145, Khwaeng Saphan Sung, Khet Saphan
Sung, Bangkok 10240, Thailand.

Equipment Name : Noise Dose Meter

Manufacturer : SOUNDTEK

Model : ST-130

Serial Number : 170400163

ID. Number : No.20

Environmental Conditions

Ambient Temperature : $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$

Received Date : 14 Feb 2024

Relative Humidity : $50\% \pm 15\%$

Calibration Date : 15 Feb 2024

Location of Calibration : In-Lab

Recommend Due Date : 15 Feb 2025

Calibration Procedure : SP-CPE-04-01

Date of Issue : 16 Feb 2024

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by : Mr.Chumpon Dokpikul

Approved by :

Calibration Officer

(Mr.Prayoon Topart)

Authorized Signatory



ID LINE : IEC17025



Calibration Report

Certificate Number : SPR24020220-33

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	ST-120	211203773	EEL.BP. 140/0167	26 Jan 2025

Traceability

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

TISTR - Thailand Institute of Scientific and Technological Research



ID LINE : IEC17025



Result of Calibration

Certificate No. : SPR24020220-33

Page : 3 of 3

Range : 94 to 114 dB

Function : @1kHz

Select A

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	114.0	114.0	0.0	0.0	0.15

Select C

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	114.0	114.0	0.0	0.0	0.15

Select Z

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	114.0	114.0	0.0	0.0	0.15

Note :

The result of calibration was found accurate as show on date and place of calibration only.
This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.

- End of Certificate -



ID LINE : IEC17025



Certificate of Calibration

Certificate Number : SPR24020220-34

Page : 1 of 3

Customer : Thai Environmental Technic Limited.

1/6 Soi Ramkhamhaeng 145, Khwaeng Saphan Sung, Khet Saphan
Sung, Bangkok 10240, Thailand.

Equipment Name : Noise Dose Meter

Manufacturer : SOUNDTEK

Model : ST-130

Serial Number : 220100050

ID. Number : No.30

Environmental Conditions

Ambient Temperature : $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$

Received Date : 14 Feb 2024

Relative Humidity : $50\% \pm 15\%$

Calibration Date : 15 Feb 2024

Location of Calibration : In-Lab

Recommend Due Date : 15 Feb 2025

Calibration Procedure : SP-CPE-04-01

Date of Issue : 16 Feb 2024

Method of Calibration


This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by : Mr.Chumpon Dokpikul

Calibration Officer

Approved by :


(Mr. Prayoon Topart)

Authorized Signatory



ID LINE : IEC17025



Calibration Report

Certificate Number : SPR24020220-34

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	ST-120	211203773	EEL.BP. 140/0167	26 Jan 2025

Traceability

This certification is traceable to the International System of Unit maintained at :
TISTR - Thailand Institute of Scientific and Technological Research



ID LINE : IEC17025



Result of Calibration

Certificate No. : SPR24020220-34

Page : 3 of 3

Range : 94 to 114 dB

Function : @1kHz

Select A

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	114.0	114.0	0.0	0.0	0.15

Select C

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	114.0	114.0	0.0	0.0	0.15

Select Z

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	114.0	114.0	0.0	0.0	0.15

Note :

The result of calibration was found accurate as show on date and place of calibration only.
This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.

- End of Certificate -



ID LINE : IEC17025



Certificate of Calibration

Certificate Number : SPR24020220-35

Page : 1 of 3

Customer : Thai Environmental Technic Limited.

1/6 Soi Ramkhamhaeng 145, Khwaeng Saphan Sung, Khet Saphan
Sung, Bangkok 10240, Thailand.

Equipment Name : Noise Dose Meter

Manufacturer : SOUNDTEK

Model : ST-130

Serial Number : 220100051

ID. Number : No.31

Environmental Conditions

Ambient Temperature : $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$

Received Date : 14 Feb 2024

Relative Humidity : $50\% \pm 15\%$

Calibration Date : 15 Feb 2024

Location of Calibration : In-Lab

Recommend Due Date : 15 Feb 2025

Calibration Procedure : SP-CPE-04-01

Date of Issue : 16 Feb 2024

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by : Mr.Chumpon Dokpikul

Calibration Officer

Approved by :

(Mr. Prayoon Topart)

Authorized Signatory



ID LINE : IEC17025



Calibration Report

Certificate Number : SPR24020220-35

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	ST-120	211203773	EEL.BP. 140/0167	26 Jan 2025

Traceability

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

TISTR - Thailand Institute of Scientific and Technological Research



ID LINE : IEC17025



Result of Calibration

Certificate No. : SPR24020220-35

Page : 3 of 3

Range : 94 to 114 dB

Function : @1kHz

Select A

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	114.0	114.0	0.0	0.0	0.15

Select C

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	114.0	114.0	0.0	0.0	0.15

Select Z

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	114.0	114.0	0.0	0.0	0.15

Note :

The result of calibration was found accurate as show on date and place of calibration only.
This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.

- End of Certificate -



ID LINE : IEC17025



Certificate of Calibration

Certificate Number : SPR24020220-36

Page : 1 of 3

Customer : Thai Environmental Technic Limited.

1/6 Soi Ramkhamhaeng 145, Khwaeng Saphan Sung, Khet Saphan
Sung, Bangkok 10240, Thailand.

Equipment Name : Noise Dose Meter

Manufacturer : SOUNDTEK

Model : ST-130

Serial Number : 220100052

ID. Number : No.32

Environmental Conditions

Ambient Temperature : $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$

Received Date : 14 Feb 2024

Relative Humidity : $50\% \pm 15\%$

Calibration Date : 15 Feb 2024

Location of Calibration : In-Lab

Recommend Due Date : 15 Feb 2025

Calibration Procedure : SP-CPE-04-01

Date of Issue : 16 Feb 2024

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by : Mr.Chumpon Dokpikul

Calibration Officer

Approved by :

(Mr. Prayoon Topart)

Authorized Signatory



ID LINE : IEC17025



Calibration Report

Certificate Number : SPR24020220-36

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	ST-120	211203773	EEL.BP. 140/0167	26 Jan 2025

Traceability

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

TISTR - Thailand Institute of Scientific and Technological Research



Result of Calibration

Certificate No. : SPR24020220-36

Page : 3 of 3

Range : 94 to 114 dB

Function : @1kHz

Select A

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	114.0	114.0	0.0	0.0	0.15

Select C

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	114.0	114.0	0.0	0.0	0.15

Select Z

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	114.0	114.0	0.0	0.0	0.15

Note :

The result of calibration was found accurate as show on date and place of calibration only.
This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.

- End of Certificate -



ID LINE : IEC17025



Calibration Report

Certificate Number : SPR24020097-6

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	ST-120	211203773	EEL.BP. 114/0166	17 Feb 2024

Traceability

This certification is traceable to the International System of Unit maintained at :
TISTR - Thailand Institute of Scientific and Technological Research



ID LINE : IEC17025



Result of Calibration

Certificate No. : SPR24020097-6

Page : 3 of 3

Range : 94 to 114 dB

Function : @1kHz

Select A

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.7	113.7	-0.3	-0.3	0.15

Select C

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	114.0	114.0	0.0	0.0	0.15

Select Z

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.9	113.9	-0.1	-0.1	0.15

Note :

The result of calibration was found accurate as show on date and place of calibration only.
This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.

- End of Certificate -



ID LINE : IEC17025



Certificate of Calibration

Certificate Number : SPR24020097-7

Page : 1 of 3

Customer : Thai Environmental Technic Limited.

1/6 Soi Ramkhamhaeng 145, Khwaeng Saphan Sung, Khet Saphan
Sung, Bangkok 10240, Thailand.

Equipment Name : Noise Dose Meter

Manufacturer : SOUNDTEK

Model : ST-130

Serial Number : 170800193

ID. Number : No.24

Environmental Conditions

Ambient Temperature : $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$

Received Date : 07 Feb 2024

Relative Humidity : $50\% \pm 15\%$

Calibration Date : 08 Feb 2024

Location of Calibration : In-Lab

Recommend Due Date : 08 Feb 2025

Calibration Procedure : SP-CPE-04-01

Date of Issue : 09 Feb 2024

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by : Mr.Karoon Pengsalung

Approved by :

Calibration Officer

(Mr.Yodyaim Chansang)

Authorized Signatory



ID LINE : IEC17025



Calibration Report

Certificate Number : SPR24020097-7

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	ST-120	211203773	EEL.BP. 114/0166	17 Feb 2024

Traceability

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

TISTR - Thailand Institute of Scientific and Technological Research



Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.9	113.9	-0.1	-0.1	0.15

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.7	113.7	-0.3	-0.3	0.15

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.9	113.9	-0.1	-0.1	0.15



ID LINE : IEC17025



Certificate of Calibration

Certificate Number : SPR24030114-1

Page : 1 of 3

Customer : Thai Environmental Technic Limited.

1/6 Soi Ramkhamhaeng 145, Khwaeng Saphan Sung, Khet Saphan
Sung, Bangkok 10240, Thailand.

Equipment Name : Noise Dose Meter

Manufacturer : SOUNDTEK

Model : ST-130

Serial Number : 220100055

ID. Number : No.35

Environmental Conditions

Ambient Temperature : $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$

Received Date : 08 Mar 2024

Relative Humidity : $50\% \pm 15\%$

Calibration Date : 11 Mar 2024

Location of Calibration : In-Lab

Recommend Due Date : 11 Mar 2025

Calibration Procedure : SP-CPE-04-01

Date of Issue : 12 Mar 2024

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by : Mr.Karoon Pengsalung

Calibration Officer

Approved by :

(Mr.Prayoon Topart)

Authorized Signatory



ID LINE : IEC17025



Calibration Report

Certificate Number : SPR24030114-1

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	ST-120	211203773	EEL.BP. 140/0167	26 Jan 2025

Traceability

This certification is traceable to the International System of Unit maintained at :
TISTR - Thailand Institute of Scientific and Technological Research



ID LINE : IEC17025



Result of Calibration

Certificate Number : SPR24030114-1

Page : 3 of 3

Range : 94 to 114 dB

Function : @1kHz

Select A

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	114.0	114.0	0.0	0.0	0.15

Select C

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	114.0	114.0	0.0	0.0	0.15

Select Z

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	114.0	114.0	0.0	0.0	0.15

Note :

The result of calibration was found accurate as show on date and place of calibration only.
This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.

- End of Certificate -



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



Certificate of Calibration

Certificate No. : 24H560

Page : 1 of 2

Equipment : Thermal Environment Monitor

Manufacturer: JANTYTECH

Model : JT2011-E2A

Serial No.: 3522210143

ID No.: HD 5

Condition As-Received: Used Item

Received Date: 12 March 2024

Calibration Date: 18 March 2024

Reference: 2403-0381DSC

Submitted by: Thai Environmental Technic Limited

Ambient Temperature: (25 ± 3) °C

Relative Humidity: (50 ± 20) %

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.

1/6 Soi Ramkhamhaeng 145, Khwaeng/Khet Saphan Sung,
Bangkok 10240

Procedure used: Calibration were conducted using in-house calibration procedure CP-H03 according to comparison with
standard temperature probe for temperature measurement function into humidity / temperature chamber.

Condition of this result of calibration

1.Reference standards instruments :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
1) Handheld Thermometer With Sensor	1521	A5A339	2311238	16 Oct 2024


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 through:-

-Technology Promotion Association (Thailand-Japan), NSC-ONSC Accredited No. Calibration 0008

Calibrated by : Somchai Dumwor

Issue Date : 25 March 2024

Approved Signatory : 

☒ Chakrit Waewwanjua

☐ Pornthippa Tameyakul

☐ Unnopphol Harachai

B 0336873



Cert. No.: 24H560

Page.: 2 of 2

Result of Calibration:- Without Adjustment
Function: Temperature Measurement for T_n

<u>Standard</u> <u>Temperature</u> (°C)	<u>UUC*</u> <u>Reading</u> (°C)	<u>Error</u> (°C)	<u>Uncertainty</u> <u>of Measurement</u> (±°C)
20.019	19.8	-0.219	0.42
30.028	29.9	-0.128	0.42
39.998	40.0	0.002	0.42

Result of Calibration:- Without Adjustment
Function: Temperature Measurement for T_{nw}

<u>Standard</u> <u>Temperature</u> (°C)	<u>UUC*</u> <u>Reading</u> (°C)	<u>Error</u> (°C)	<u>Uncertainty</u> <u>of Measurement</u> (±°C)
20.019	19.9	-0.119	0.42
30.028	29.9	-0.128	0.42
39.998	39.8	-0.198	0.42

Result of Calibration:- Without Adjustment
Function: Temperature Measurement for T_g

<u>Standard</u> <u>Temperature</u> (°C)	<u>UUC*</u> <u>Reading</u> (°C)	<u>Error</u> (°C)	<u>Uncertainty</u> <u>of Measurement</u> (±°C)
20.019	19.9	-0.119	0.42
30.028	30.0	-0.028	0.42
39.998	39.9	-0.098	0.42

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



Certificate of Calibration

Certificate No. : 24H561

Page : 1 of 2

Equipment : Thermal Environment Monitor

Manufacturer: JANTYTECH

Model : JT2011-E2A

Serial No.: 3522210144

ID No.: HD 6

Condition As-Received: Used Item

Received Date: 12 March 2024

Calibration Date: 19 March 2024

Reference: 2403-0381DSC

Submitted by: Thai Environmental Technic Limited

Ambient Temperature: (25 ± 3) °C

Relative Humidity: (50 ± 20) %

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.

1/6 Soi Ramkhamhaeng 145, Khwaeng/Khet Saphan Sung,
Bangkok 10240

Procedure used: Calibration were conducted using in-house calibration procedure CP-H03 according to comparison with
standard temperature probe for temperature measurement function into humidity / temperature chamber.

Condition of this result of calibration

1.Reference standards instruments :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
1) Handheld Thermometer With Sensor	1521	A5A339	2311238	16 Oct 2024

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 through:-

-Technology Promotion Association (Thailand-Japan), NSC-ONSC Accredited No. Calibration 0008

Calibrated by : Somchai Dumwor
Issue Date : 25 March 2024

Approved Signatory :

[✓] Chakrit Waewwanjua
[] Pornthippa Tameyakul
[] Unnopphol Harachai

B 0336874



Cert. No.: 24H561

Page.: 2 of 2

Result of Calibration:- Without Adjustment

Function: Temperature Measurement for Tn

<u>Standard</u> <u>Temperature</u> (°C)	<u>UUC*</u> <u>Reading</u> (°C)	<u>Error</u> (°C)	<u>Uncertainty</u> <u>of Measurement</u> (±°C)
19.970	19.8	-0.170	0.42
29.975	29.6	-0.375	0.42
40.004	39.5	-0.504	0.42

Result of Calibration:- Without Adjustment

Function: Temperature Measurement for Tnw

<u>Standard</u> <u>Temperature</u> (°C)	<u>UUC*</u> <u>Reading</u> (°C)	<u>Error</u> (°C)	<u>Uncertainty</u> <u>of Measurement</u> (±°C)
19.970	19.7	-0.270	0.42
29.975	29.7	-0.275	0.42
40.004	39.6	-0.404	0.42

Result of Calibration:- Without Adjustment

Function: Temperature Measurement for Tg

<u>Standard</u> <u>Temperature</u> (°C)	<u>UUC*</u> <u>Reading</u> (°C)	<u>Error</u> (°C)	<u>Uncertainty</u> <u>of Measurement</u> (±°C)
19.970	19.8	-0.170	0.42
29.975	29.7	-0.275	0.42
40.004	39.7	-0.304	0.42

UUC* : Unit Under Calibration

The reported uncertainty of measurement was base on standard uncertainty multiplied by coverage factor $k = 2.00$, providing confidence level approximately 95%.

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a 1208148

Request No. : 22-67 / 0063

MTC No. : PSL-P 0015 / 67

CERTIFICATE OF CALIBRATION

Nomenclature : Digital Lux Meter
Maker : DIGICON

Serial No. : AD.60206
Model : LX-50

Customer : **THAI ENVIRONMENTAL TECHNIC LIMITED**

Address : 1/6 Soi Ramkhamhaeng 145, Khwaeng/Khet Saphan Sung, Bangkok 10240

Date of receipt : 26 October 2023

Date of calibration : 9 November 2023

Place of calibration : Photometry and Temperature Standards Laboratory, MTC. (Bangpoo)

Basis of calibration : calibration at 0 ~ 2000 lux.

Condition of calibration : - Ambient temperature : $(25 \pm 2) ^\circ\text{C}$

- Relative humidity : $(60 \pm 20) \%$

Reference Standard : Working Standard Luminous Intensity Lamp, Serial No.: FEL003 and 3501,
can be traceable to international system of units (SI), through calibration certificate
MTC No. PSL-P 131/66 and PSL-P 132/66, date of calibration 12 May 2023.

Traceability : This certificate is traceable to SI units through the National Institute of Metrology (Thailand).
calibration certificate No. TP-1010-23, TP-1011-23 and TP-1012-23

Support Equipment : 1. Photometric bench , 3.0 meter long
2. DC power supply, Serial No.: BC - 341006035007/2
3. Digital Multimeter , Model : R 6551 , S/N : 92041186 and 92041192

Calibration Procedure : The measurement was done in accordance with WI.CP.10.
The reported uncertainty is based on a standard uncertainty multiplied by a coverage
factor $k = 2$, providing a level of confidence of approximately 95 %.

page 1 of 2

R.P.

The results relate only to the items tested/calibrated or value assigned.

Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FM.BL.MTC.002 Rev.4

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Tel. (66) 0 2323 1672-80 ext. 115, 116
Fax. (66) 0 2323 9165
E-mail : mtc@tistr.or.th

Office
196 Phahonyothin Road, Chatuchak, Bangkok 10900,
Thailand
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217
Fax. (66) 0 2579 8592
E-mail : sumalee@tistr.or.th



Request No. : 22-67 / 0063

MTC No. : PSL-P 0015 / 67

Serial No. : AD.60206

Results :

UUC Range (lux)	Standard (lux)	*UUC Reading (lux)	Uncertainty of Measurement \pm (lux)
2000	100	104	2.0
	500	503	10
	1000	1000	20
	1500	1494	30
	2000	1988	40

Note : *UUC = Unit Under Calibration.

...end of certificate...

Calibrated by :

(Ms. Rattanawadee Pholprom)

Approved by :

(Mr. Kamchai Singhapiwat)

Director

Photometry and Temperature Standards Laboratory

Ref. : 2012266102604262002

Issued date : 16 November 2023

page 2 of 2

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FM.BL.MTC.002 Rev.4

Head Office

35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,
Changwat Pathumthani 12120, Thailand
Tel. (66) 0 2577 9000
Fax. (66) 0 2577 9009
E-mail : rumpai@tistr.or.th Website:www.tistr.or.th

Office/Laboratory

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,
Amphoe Muang, Changwat Samutprakan 10280, Thailand
Tel. (66) 0 2323 1672-80 ext. 115, 116
Fax. (66) 0 2323 9165
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Thailand
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Fax. (66) 0 2579 8592
E-mail : sumalee@tistr.or.th

Request No. : 22-67 / 0690

MTC No. : PSL-P 0197 / 67

CERTIFICATE OF CALIBRATION

Nomenclature : Digital Lux Meter

Serial No. : AC.76003

Maker : DIGICON

Model : LX-50

Customer : **THAI ENVIRONMENTAL TECHNIC LIMITED.**

Address : 1/6 Soi Ramkhamhaeng 145, Khwaeng/Khet Saphan Sung, Bangkok 10240

Date of receipt : 1 August 2024

Date of calibration : 14 August 2024

Place of calibration : Photometry and Temperature Standards Laboratory, MTC. (Bangpoo)

Basis of calibration : calibration at 0 ~ 5000 lux.

Condition of calibration : - Ambient temperature : $(25 \pm 2) ^\circ\text{C}$

- Relative humidity : $(60 \pm 20) \%$

Reference Standard : Working Standard Luminous Intensity Lamp, Serial No.: FEL003 and 3501,
can be traceable to international system of units (SI), through calibration certificate
MTC No. PSL-P 0151/67 and PSL-P 0152/67, date of calibration 10 May 2024.

Traceability : This certificate is traceable to SI units through the National Institute of Metrology (Thailand).
calibration certificate No. TP-1010-23, TP-1011-23 and TP-1012-23

Support Equipment : 1. Photometric bench , 3.0 meter long
2. DC power supply, Serial No.: BC - 341006035007/2
3. Digital Multimeter , Model : R 6551 , S/N : 92041186 and 92041192

Calibration Procedure : The measurement was done in accordance with WI.CP.10.
The reported uncertainty is based on a standard uncertainty multiplied by a coverage
factor $k = 2$, providing a level of confidence of approximately 95 %.

page 1 of 2

R.P.

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FM.BL.MTC.002 Rev.5

Head Office

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Changwat Pathumthani 12120, Thailand
Tel. (66) 0 2577 9036
Fax. (66) 0 2577 9009

Office/Laboratory

668 Mu 2 Tambon Bangpoomai, Amphoe Muang Samutprakan,
Changwat Samutprakan 10280, Thailand
Tel. (66) 0 2323 1672-80 ext. 115, 116
(66) 08 3219 9440
E-mail : mtc@tistr.or.th Website : www.tistr.or.th

Office

196 Phahonyothin Road, Ladyao, Chatuchak,
Bangkok 10900, Thailand
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217
(66) 08 1889 6827

Request No. : 22-67 / 0690

MTC No. : PSL-P 0197 / 67

Serial No. : AC.76003

Results :

UUC Range (lux)	Standard (lux)	*UUC Reading (lux)	Uncertainty of Measurement \pm (lux)
2000	100	95	2.0
	500	462	10
	1000	919	20
	1500	1372	30
	2000	1828	40
20000 ($\times 10$)	2000	190	40
	3000	284	60
	4000	379	80
	5000	471	100

Note : *UUC = Unit Under Calibration.

...end of certificate...

Calibrated by :



(Ms. Rattanawadee Pholprom)

Approved by :



(Mr. Kamchai Singhapiwat)
Director

Photometry and Temperature Standards Laboratory

Ref. : 2012267080102851001

Issued date : 15 August 2024

page 2 of 2

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FM.BL.MTC.002 Rev.5

Head Office

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Bangkok 10900, Thailand
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217
(66) 08 1889 6827



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL.0-2717-3000-29 FAX.0-2719-9484



Certificate of Calibration

Cert.No.: 24MM273

Page.: 1 of 3

Equipment : Electronic Balance

Manufacturer : Mettler Toledo

Model : XP205DR

Serial No. : 1129273885

ID No. : Ins-LAB-035

Submitted by : Thai Environmental Technic Limited
1/6 Soi Ramkhamhaeng 145,
Khwaeng/Khet Saphan Sung,
Bangkok 10240

Location : Balance Room

Received order : 09 April 2024
Calibration Date : 10 April 2024
Ambient Temperature : 15 °C to 40 °C
Relative Humidity : 30 % to 90 %

Calibrated by : Khit Ruttanaprapachai

Approved by :

Kunchit

Approved Signatory

- () Ponpan Paipim
() Suwit Imjai
(✓) Kunchit Promprat

Issue Date :

12 April 2024

The Uncertainties are for a confidence probability of approximately 95%

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



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2404-0113OC-15

Cert.No.: 24MM273
Page: 2 of 3

Procedure used :-

Calibration were conducted using in-house calibration procedure CP-OB01 based on UKAS LAB 14 according to direct measurement method against standard weight.

Condition of this result of calibration

1. Reference standard instruments:-

<u>Instruments</u>	<u>Model</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Test report No.</u>	<u>Due date</u>
1) Standard Weight Set (E2)	15884	-	70RC138	MM-0020-23	30 Jan 2025

2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This result of calibration was made on requested at the point specified by customer.
4. This certificate is not certified for any commercial transaction.
5. This certification is traceable to the International System of Unit.

Result of calibration () Without Adjustment (*) After Adjustment by Internal Calibration

Range capacity :	0 g to 81 g	Resolution	0.00001 g
	81 g to 220 g	Resolution	0.0001 g

Before Adjustment :

<u>Applied Weight</u> (g)	<u>Balance Reading</u> (g)	<u>Correction</u> (g)	<u>Measurement Uncertainty</u> (± mg)	<u>Coverage Factor</u> (k)
80	79.99997	+0.00003	0.15	2
200	199.9998	+0.0002	0.29	2

After Adjustment :

1. **Determination of the standard deviation of weighing machine** (n = 10)

<u>Applied Weight</u> (g)	<u>Standard Deviation of Reading (g)</u>
80	0.000016
200	0.00005



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2404-0113OC-15

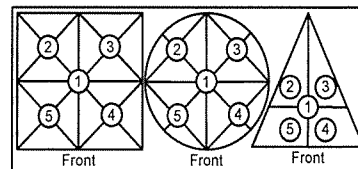
Cert.No.: 24MM273

Page: 3 of 3

Result of calibration

2. Effect of off center loading

A mass of 100 g was placed to various position on the pan.
The weighing machine reading error obtained is given in the table



Maximum difference between
off-center and central loading
(g)
0.0001

Position 1	Position 2	Position 3	Position 4	Position 5
(g)	(g)	(g)	(g)	(g)
+0.0001	+0.0001	0.0000	0.0000	+0.0002

3. Departure from nominal value

Applied Weight	Balance Reading	Correction	Measurement Uncertainty	Coverage Factor
(g)	(g)	(g)	(\pm mg)	(k)
Unload	0.00000	0.00000	0.028	2.28
0.01	0.00999	+0.00001	0.029	2.28
0.05	0.04999	+0.00001	0.029	2.23
1	0.99999	+0.00001	0.030	2.17
2	1.99999	+0.00001	0.030	2.15
5	4.99999	+0.00001	0.034	2.09
10	10.00000	0.00000	0.036	2.06
20	19.99999	+0.00001	0.045	2
50	49.99999	+0.00001	0.080	2
80	79.99999	+0.00001	0.15	2
200	199.9998	+0.0002	0.29	2

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

-o0o-

ภาคผนวก ฉ

หนังสือขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
เลขทะเบียน ว-236



ที่ อก ๐๓๑๐(๑)/ ๕ ๘ ๗ ๖

กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๒๒ มิถุนายน ๒๕๖๖

เรื่อง ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท เทคนิคลิ่งแวดล้อมไทย จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๓ มีนาคม ๒๕๖๖

สิ่งที่ส่งมาด้วย เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท เทคนิคลิ่งแวดล้อมไทย จำกัด จำนวน ๒๘ แผ่น

ตามหนังสือที่อ้างถึง บริษัท เทคนิคลิ่งแวดล้อมไทย จำกัด ขอต่ออายุหนังสือรับขึ้นทะเบียน
ห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ว-๒๓๖ สถานที่ตั้งเลขที่ ๑/๖ ซอยรามคำแหง ๑๔๕ แขวงสะพานสูง
เขตสะพานสูง กรุงเทพมหานคร ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท เทคนิคลิ่งแวดล้อมไทย จำกัด ต่ออายุหนังสือรับขึ้น
ทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน โดยมีองค์ประกอบดังนี้

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์

- | | |
|------------------------------|----------------------------|
| ๑) นายณัฐพงศ์ โคตะมา | ทะเบียนเลขที่ ว-๒๓๖-ค-๐๐๐๑ |
| ๒) นางสาววารีรัตน์ ประชุมแดง | ทะเบียนเลขที่ ว-๒๓๖-ค-๐๐๐๒ |
| ๓) นางพรทิพย์ เพชรชี | ทะเบียนเลขที่ ว-๒๓๖-ค-๐๐๐๓ |
| ๔) นายสมชาย ปิยะวรสกุล | ทะเบียนเลขที่ ว-๒๓๖-ค-๐๐๐๔ |
| ๕) นายประมวล มูลสาร | ทะเบียนเลขที่ ว-๒๓๖-ค-๐๐๐๕ |
| ๖) นายรัฐพล สุขดี | ทะเบียนเลขที่ ว-๒๓๖-ค-๐๐๐๖ |

ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์

- | | |
|-----------------------------------|----------------------------|
| ๑) นางสาวทอฝัน อัสวชัยสุวิกรม | ทะเบียนเลขที่ ว-๒๓๖-จ-๐๐๐๑ |
| ๒) นางสาวกมลลักษณ์ ตีมมงคล | ทะเบียนเลขที่ ว-๒๓๖-จ-๐๐๐๒ |
| ๓) นางสาวกนกวรรณ เริ่มประชาธิปไตย | ทะเบียนเลขที่ ว-๒๓๖-จ-๐๐๐๓ |
| ๔) นางสาวจิตติพรรณ ศรีสุวรรณ | ทะเบียนเลขที่ ว-๒๓๖-จ-๐๐๐๔ |
| ๕) นางสาวธนิดา กุมหาชาติ | ทะเบียนเลขที่ ว-๒๓๖-จ-๐๐๐๕ |
| ๖) นางสาวมาลินี มณีรัตน์ | ทะเบียนเลขที่ ว-๒๓๖-จ-๐๐๐๖ |
| ๗) นางสาวพัชราพรรณ สว่างภาพ | ทะเบียนเลขที่ ว-๒๓๖-จ-๐๐๐๗ |
| ๘) นายสุริยพงษ์ ยงยุทธ | ทะเบียนเลขที่ ว-๒๓๖-จ-๐๐๐๘ |
| ๙) นางสาวดอกกรักร์ สีแท้ | ทะเบียนเลขที่ ว-๒๓๖-จ-๐๐๐๙ |
| ๑๐) นางสาวศิริพร กาจิต | ทะเบียนเลขที่ ว-๒๓๖-จ-๐๐๑๐ |
| ๑๑) นายสุชาติ ศรีบุญ | ทะเบียนเลขที่ ว-๒๓๖-จ-๐๐๑๑ |
| ๑๒) นายเกียรติศักดิ์ วันดี | ทะเบียนเลขที่ ว-๒๓๖-จ-๐๐๑๒ |

๑๓) นายจิรวุฒน์...

๑๓) นายจิรวุฒิ อินทเสย์	ทะเบียนเลขที่ ว-๒๓๖-จ-๐๐๑๓
๑๔) นางสาวนิตยา เย็นวัฒนา	ทะเบียนเลขที่ ว-๒๓๖-จ-๐๐๑๔
๑๕) นางสาวณัฐธัญ สารแสง	ทะเบียนเลขที่ ว-๒๓๖-จ-๐๐๑๕
๑๖) นายกิตติศักดิ์ เมืองงาม	ทะเบียนเลขที่ ว-๒๓๖-จ-๐๐๑๖
๑๗) นายเทพพงศ์ เขยวัดเกาะ	ทะเบียนเลขที่ ว-๒๓๖-จ-๐๐๑๗
๑๘) นายเฉลิมวุฒิ พูลสงวน	ทะเบียนเลขที่ ว-๒๓๖-จ-๐๐๑๘
๑๙) นางสาวนุชศิริ อรชร	ทะเบียนเลขที่ ว-๒๓๖-จ-๐๐๑๙
๒๐) นางสาววรรณศิริ สุริยวงศ์	ทะเบียนเลขที่ ว-๒๓๖-จ-๐๐๒๐
๒๑) นายวิฑูรน์ วลัยรัตน์	ทะเบียนเลขที่ ว-๒๓๖-จ-๐๐๒๑
๒๒) นางสาวกังสดา จอกสูงเนิน	ทะเบียนเลขที่ ว-๒๓๖-จ-๐๐๒๒
๒๓) นางสาวสุภัทญา อยู่นิม	ทะเบียนเลขที่ ว-๒๓๖-จ-๐๐๒๓
๒๔) นางสาวลลิตา ตรีโยดม	ทะเบียนเลขที่ ว-๒๓๖-จ-๐๐๒๔
๒๕) นายเจอ แซ่หว่า	ทะเบียนเลขที่ ว-๒๓๖-จ-๐๐๒๕
๒๖) นายอรรถพล วงศ์สวัสดิ์	ทะเบียนเลขที่ ว-๒๓๖-จ-๐๐๒๖
๒๗) นายประหยัด จิวเดช	ทะเบียนเลขที่ ว-๒๓๖-จ-๐๐๒๗
๒๘) นายเบญจพล กรังคคา	ทะเบียนเลขที่ ว-๒๓๖-จ-๐๐๒๘
๒๙) นายวีรพล บุตสา	ทะเบียนเลขที่ ว-๒๓๖-จ-๐๐๒๙
๓๐) นายพิเชฐ อยู่ติรัมย์	ทะเบียนเลขที่ ว-๒๓๖-จ-๐๐๓๐
๓๑) นายณัฐดนัย ศรีรัตนชัยวาลย์	ทะเบียนเลขที่ ว-๒๓๖-จ-๐๐๓๑

ค. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย น้ำใต้ดิน อากาศเสีย สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว และดิน ตามสิ่งที่ส่งมาด้วย

หนังสือฉบับนี้จะหมดอายุในวันที่ ๑๓ มีนาคม ๒๕๖๙ หากประสงค์จะต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอต่อกรมโรงงานอุตสาหกรรม ภายใน ๓๐ วัน ก่อนวันสิ้นอายุของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ทั้งนี้ สามารถยื่นคำขอผ่านระบบอิเล็กทรอนิกส์ได้ที่หน้าเว็บไซต์กรมโรงงานอุตสาหกรรม

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

จรูญ งาม

(นายประสม ดำรงพงษ์)
ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน
ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

กองวิจัยและเตือนภัยมลพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕

โทรสาร ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๙๙

ไปรษณีย์อิเล็กทรอนิกส์ saraban@diw.mail.go.th



เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท เทคนิคสิ่งแวดล้อมไทย จำกัด

เลขทะเบียน ว-๒๓๖

ที่ อก ๐๓๑๐(๑)/ ๙ ๘ ๗ ๖

ลงวันที่ ๒๒ มิถุนายน ๒๕๖๖

ขอขยายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๓๓๗ รายการ

น้ำเสีย จำนวน 40 รายการ


ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Aldrin	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
2	Arsenic	Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[4]
3	Barium	1) Digestion, Direct Nitrous Oxide-Acetylene Flame Method ^[4] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^[4] 3) Digestion, Inductively Coupled Plasma Method ^[4]
4	α -BHC	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
5	γ -BHC	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
6	Biochemical Oxygen Demand	5-Day BOD Test, Azide Modification Method ^[4]
7	Cadmium	1) Digestion, Direct Air-Acetylene Flame Method ^[4] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^[4] 3) Digestion, Inductively Coupled Plasma Method ^[4]
8	Chemical Oxygen Demand	Closed Reflux, Titrimetric Method ^[4]
9	Chlordane	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
10	Chromium	1) Digestion, Direct Air-Acetylene Flame Method ^[4] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^[4] 3) Digestion, Inductively Coupled Plasma Method ^[4]
11	Color	ADMI Weighted-Ordinate Spectrophotometric Method ^[4]
12	Copper	1) Digestion, Direct Air-Acetylene Flame Method ^[4] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^[4] 3) Digestion, Inductively Coupled Plasma Method ^[4]
13	Cyanide	Distillation, Colorimetric Method ^[4]
14	4,4'-DDE	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
15	4,4'-DDT	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
16	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
17	Endosulfan I	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
18	Endosulfan II	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
19	Endosulfan Sulfate	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
20	Endrin	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
21	Formaldehyde	Distillation, Colorimetric Method ^[3]
22	Free Chlorine	DPD Ferrous Titrimetric Method ^[4]
23	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
24	Heptachlor Epoxide	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
25	Hexavalent Chromium	Colorimetric Method ^[4]
26	Lead	1) Digestion, Direct Air-Acetylene Flame Method ^[4] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^[4] 3) Digestion, Inductively Coupled Plasma Method ^[4]
27	Manganese	1) Digestion, Direct Air-Acetylene Flame Method ^[4] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^[4] 3) Digestion, Inductively Coupled Plasma Method ^[4]
28	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[4]
29	Nickel	1) Digestion, Direct Air-Acetylene Flame Method ^[4] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^[4] 3) Digestion, Inductively Coupled Plasma Method ^[4]
30	Oil & Grease	1) Liquid-Liquid, Partition-Gravimetric Method ^[4] 2) Soxhlet Extraction Method ^[4]
31	pH	Electrometric Method ^[4]
32	Phenols	Distillation, Direct Photometric Method ^[4]
33	Selenium	Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[4]
34	Sulfide	1) Iodometric Method ^[4] 2) Methylene Blue Method ^[4]
35	Temperature	Laboratory and Field Methods ^[4]
36	Total Dissolved Solids	Dried at 180 °C ^[4]
37	Total Kjeldahl Nitrogen	Macro-Kjeldahl Method ^[4]
38	Total Suspended Solids	Dried at 103-105 °C ^[4]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
39	Trivalent Chromium	Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation ^[4]
40	Zinc	1) Digestion, Direct Air-Acetylene Flame Method ^[4] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^[4] 3) Digestion, Inductively Coupled Plasma Method ^[4]

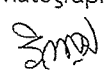
น้ำใต้ดิน จำนวน 122 รายการ

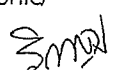
ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
2	Acetone	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[4]
3	Aldrin	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
4	Anthracene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
5	Antimony	1) Digestion, Direct Air-Acetylene Flame Method ^[4] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^[4] 3) Digestion, Inductively Coupled Plasma Method ^[4]
6	Arsenic	Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[4]
7	Atrazine	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
8	Barium	1) Digestion, Direct Nitrous Oxide-Acetylene Flame Method ^[4] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^[4] 3) Digestion, Inductively Coupled Plasma 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]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
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, Electrothermal Atomic Absorption Spectrometric Method ^[4] 2) 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, Electrothermal Atomic Absorption Spectrometric Method ^[4] 2) Digestion, Inductively Coupled Plasma Method ^[4]
24	Carbazole	Liquid-Liquid Extraction, Gas Chromatographic 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 Method ^[4]
28	p-Chloroaniline	Liquid-Liquid Extraction, Gas Chromatographic 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] 

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
32	Chromium	1) Digestion, Direct Air-Acetylene Flame Method ^[4] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^[4] 3) Digestion, Inductively Coupled Plasma Method ^[4]
33	Chromium (III)	1) Digestion, Direct Air-Acetylene Flame Method; Colorimetric Method; Calculation ^[4] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method; Colorimetric Method; Calculation ^[4] 3) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation ^[4]
34	Chromium (VI)	Colorimetric Method ^[4]
35	Chrysene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
36	Cyanide	Distillation, Colorimetric Method ^[4]
37	2,4-D	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
38	DDD	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
39	DDE	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
40	DDT	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
41	Dibenz(a,h)anthracene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
42	Di-n-butyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
43	1,2-Dichlorobenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[4]
44	1,3-Dichlorobenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[4]
45	1,4-Dichlorobenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[4]
46	1,1-Dichloroethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[4]
47	1,2-Dichloroethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[4]
48	1,1-Dichloroethylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[4]
49	cis-1,2-Dichloroethylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[4]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
50	trans-1,2-Dichloroethylene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[4]
51	1,2-Dichloropropane	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[4]
52	1,3-Dichloropropane	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[4]
53	1,3-Dichloropropene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[4]
54	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
55	Diethyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
56	2,4-Dimethylphenol	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
57	2,4-Dinitrophenol	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
58	2,4-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
59	2,6-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
60	Di-n-Octyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
61	Endosulfan	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
62	Endrin	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
63	Ethylbenzene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[4]
64	Fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
65	Fluorene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
66	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
67	Heptachlor epoxide	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
68	Hexachloro-1,3-butadiene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[4]
69	n-Hexane	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[4]
70	α -HCH	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
71	β -HCH	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
72	γ -HCH	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
73	Hexachlorocyclopentadiene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
74	Hexachloroethane	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
75	Indeno(1,2,3-cd)pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
76	Isophorone	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
77	Lead	1) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^[4] 2) Digestion, Inductively Coupled Plasma Method ^[4]
78	Manganese	1) Digestion, Direct Air-Acetylene Flame Method ^[4] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^[4] 3) Digestion, Inductively Coupled Plasma Method ^[4]
79	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[4]
80	Methanol	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[4]
81	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
82	Methyl bromide	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[4]
83	Methylene chloride	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[4]
84	2-Methylphenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
85	2-Methylnaphthalene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
86	Methyl tert-butyl ether	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[4]
87	Naphthalene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[4]
88	Nickel	1) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^[4] 2) Digestion, Inductively Coupled Plasma Method ^[4]
89	Nitrobenzene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
90	N-Nitrosodiphenylamine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4] 

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
91	N-Nitrosodi-n-propylamine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
92	Polychlorinated Biphenyls PCB-1016 PCB-1221 PCB-1232 PCB-1242 PCB-1248 PCB-1254 PCB-1260	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
93	Pentachlorophenol	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
94	pH	Electrometric Method ^[4]
95	Phenanthrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
96	Phenol	1) Distillation, Direct Photometric Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
97	Pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4]
98	Selenium	Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[4]
99	Silver	1) Digestion, Direct Air-Acetylene Flame Method ^[4] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^[4] 3) Digestion, Inductively Coupled Plasma Method ^[4]
100	Styrene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[4]
101	1,1,2,2-Tetrachloroethane	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[4]
102	Tetrachloroethylene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[4]
103	Toluene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[4]
104	Toxaphene	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
105	TPH (C ₅ -C ₈)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[12,22] 

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
106	TPH (C ₈ -C ₁₆)	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^[9,22]
107	TPH (C ₁₆ -C ₃₅)	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^[9,22]
108	1,2,4-Trichlorobenzene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[4]
109	1,1,1-Trichloroethane	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[4]
110	1,1,2-Trichloroethane	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[4]
111	Trichloroethylene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[4]
112	2,4,5-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
113	2,4,6-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic Method ^[4]
114	1,3,5-Trimethylbenzene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[4]
115	Vanadium	1) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^[4] 2) Digestion, Inductively Coupled Plasma Method ^[4]
116	Vinyl acetate	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[4]
117	Vinyl chloride	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[4]
118	m-Xylene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[4]
119	o-Xylene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[4]
120	p-Xylene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[4]
121	Xylene (Total)	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[4]
122	Zinc	1) Digestion, Direct Air-Acetylene Flame Method ^[4] 2) Digestion, Inductively Coupled Plasma Method ^[4]

จก

อากาศเสีย (ปล่อยระบาย) จำนวน 18 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Antimony	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5] 2) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ^[5] 3) Isokinetic Sampling, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^[5]
2	Arsenic	Isokinetic Sampling, Digestion, Hydride Generation/ Atomic Absorption Spectrometric Method ^[5]
3	Carbon monoxide	Instrumental Analyzer Method ^[5]
4	Chlorine	Absorption Sampling, Ion Chromatographic Method ^[5]
5	Copper	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5] 2) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ^[5]
6	Cresol	Adsorption Sampling, Gas Chromatographic Method ^[5]
7	Dioxins/Furans	Isokinetic Sampling, Analysis by ISO/IEC 17025 Accredited Laboratory or Analysis by Department of Industrial Works Registered Laboratory (Dioxins/Furans Analysis Approved) ^[5]
8	Hydrogen Chloride	Absorption Sampling, Ion Chromatographic Method ^[5]
9	Hydrogen Fluoride	Absorption Sampling, Ion Chromatographic Method ^[5]
10	Hydrogen Sulfide	Absorption Sampling, Iodometric Method ^[5]
11	Lead	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5] 2) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ^[5] 3) Isokinetic Sampling, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^[5]
12	Mercury	Isokinetic Sampling, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[5]
13	Opacity	Ringelmann's Method ^[2]
14	Oxides of Nitrogen	1) Absorption Sampling, Phenoldisulfonic acid Method ^[5] 2) Instrumental Analyzer Method ^[5]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
15	Sulfur dioxide	1) Absorption Sampling, Barium-Thorin Titrimetric Method ^[5] 2) Instrumental Analyzer Method ^[5]
16	Sulfuric acid	Isokinetic Sampling, Barium-Thorin Titrimetric Method ^[5]
17	Total Suspended Particulate	Isokinetic Sampling, Gravimetric Method ^[5]
18	Xylene	Adsorption Sampling, Gas Chromatographic Method ^[5]

สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน 36 รายการ

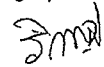
ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Aldrin	1) Waste Extraction, Solid-Phase Extraction, Gas Chromatographic Method ^[1,10,24] 2) Solid-Phase Extraction, Gas Chromatographic Method ^[10,24] 3) Soxhlet Extraction, Gas Chromatographic Method ^[11,24]
2	Antimony	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^[1,6,15] 2) Waste Extraction, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^[1,6,16] 3) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,14] 4) Digestion, Flame Atomic Absorption Spectrometric Method ^[7,15] 5) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^[7,16] 6) Digestion, Inductively Coupled Plasma Method ^[7,14]
3	Arsenic	1) Waste Extraction, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[1,6,17] 2) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[7,17]
4	Barium	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^[1,6,15] 2) Waste Extraction, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^[1,6,16] 3) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,14]

4) Digestion...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
5	Beryllium	4) Digestion, Flame Atomic Absorption Spectrometric Method ^[7,15] 5) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^[7,16] 6) Digestion, Inductively Coupled Plasma Method ^[7,14] 1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^[1,6,15] 2) Waste Extraction, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^[1,6,16] 3) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,14] 4) Digestion, Flame Atomic Absorption Spectrometric Method ^[7,15] 5) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^[7,16] 6) Digestion, Inductively Coupled Plasma Method ^[7,14]
6	Cadmium	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^[1,6,15] 2) Waste Extraction, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^[1,6,16] 3) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,14] 4) Digestion, Flame Atomic Absorption Spectrometric Method ^[7,15] 5) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^[7,16] 6) Digestion, Inductively Coupled Plasma Method ^[7,14]
7	Chlordane	1) Waste Extraction, Solid-Phase Extraction, Gas Chromatographic Method ^[1,10,24] 2) Solid-Phase Extraction, Gas Chromatographic Method ^[10,24] 3) Soxhlet Extraction, Gas Chromatographic Method ^[11,24]
8	Chromium	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^[1,6,15] 2) Waste Extraction, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^[1,6,16]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
9	Chromium (III)	3) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,14] 4) Digestion, Flame Atomic Absorption Spectrometric Method ^[7,15] 5) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^[7,16] 6) Digestion, Inductively Coupled Plasma Method ^[7,14] 1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method; Waste Extraction, Colorimetric Method; Calculation ^[1,6,15,18] 2) Waste Extraction, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method; Waste Extraction, Colorimetric Method; Calculation ^[1,6,16,18] 3) Waste Extraction, Digestion, Inductively Coupled Plasma Method; Waste Extraction, Colorimetric Method; Calculation ^[1,6,14,18] 4) Digestion, Flame Atomic Absorption Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation ^[7,8,15,18] 5) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation ^[7,8,16,18] 6) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation ^[7,8,14,18]
10	Chromium (VI)	1) Waste Extraction, Colorimetric Method ^[1,18] 2) Alkaline Digestion, Colorimetric Method ^[8,18]
11	Cobalt	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^[1,6,15] 2) Waste Extraction, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^[1,6,16] 3) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,14] 4) Digestion, Flame Atomic Absorption Spectrometric Method ^[7,15] 5) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^[7,16] 6) Digestion, Inductively Coupled Plasma Method ^[7,14]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
12	Copper	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^[1,6,15] 2) Waste Extraction, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^[1,6,16] 3) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,14] 4) Digestion, Flame Atomic Absorption Spectrometric Method ^[7,15] 5) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^[7,16] 6) Digestion, Inductively Coupled Plasma Method ^[7,14]
13	2,4-D	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^[1,9,24] 2) Soxhlet Extraction, Gas Chromatographic Method ^[11,24]
14	DDD	1) Waste Extraction, Solid-Phase Extraction, Gas Chromatographic Method ^[1,10,24] 2) Solid-Phase Extraction, Gas Chromatographic Method ^[10,24] 3) Soxhlet Extraction, Gas Chromatographic Method ^[11,24]
15	DDE	1) Waste Extraction, Solid-Phase Extraction, Gas Chromatographic Method ^[1,10,24] 2) Solid-Phase Extraction, Gas Chromatographic Method ^[10,24] 3) Soxhlet Extraction, Gas Chromatographic Method ^[11,24]
16	DDT	1) Waste Extraction, Solid-Phase Extraction, Gas Chromatographic Method ^[1,10,24] 2) Solid-Phase Extraction, Gas Chromatographic Method ^[10,24] 3) Soxhlet Extraction, Gas Chromatographic Method ^[11,24]
17	Dieldrin	1) Waste Extraction, Solid-Phase Extraction, Gas Chromatographic Method ^[1,10,24] 2) Solid-Phase Extraction, Gas Chromatographic Method ^[10,24] 3) Soxhlet Extraction, Gas Chromatographic Method ^[11,24]



ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
18	Endrin	1) Waste Extraction, Solid-Phase Extraction, Gas Chromatographic Method ^[1,10,24] 2) Solid-Phase Extraction, Gas Chromatographic Method ^[10,24] 3) Soxhlet Extraction, Gas Chromatographic Method ^[11,24]
19	Heptachlor	1) Waste Extraction, Solid-Phase Extraction, Gas Chromatographic Method ^[1,10,24] 2) Solid-Phase Extraction, Gas Chromatographic Method ^[10,24] 3) Soxhlet Extraction, Gas Chromatographic Method ^[11,24]
20	Lead	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^[1,6,15] 2) Waste Extraction, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^[1,6,16] 3) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,14] 4) Digestion, Flame Atomic Absorption Spectrometric Method ^[7,15] 5) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^[7,16] 6) Digestion, Inductively Coupled Plasma Method ^[7,14]
21	Lindane	1) Waste Extraction, Solid-Phase Extraction, Gas Chromatographic Method ^[1,10,24] 2) Solid-Phase Extraction, Gas Chromatographic Method ^[10,24] 3) Soxhlet Extraction, Gas Chromatographic Method ^[11,24]
22	Mercury	1) Waste Extraction, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[1,6,19] 2) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[20]
23	Methoxychlor	1) Waste Extraction, Solid-Phase Extraction, Gas Chromatographic Method ^[1,10,24] 2) Solid-Phase Extraction, Gas Chromatographic Method ^[10,24]

3) Soxhlet...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
24	Mirex	3) Soxhlet Extraction, Gas Chromatographic Method ^[11,24] 1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^[1,9,24] 2) Soxhlet Extraction, Gas Chromatographic Method ^[11,24]
25	Molybdenum	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^[1,6,15] 2) Waste Extraction, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^[1,6,16] 3) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,14] 4) Digestion, Flame Atomic Absorption Spectrometric Method ^[7,15] 5) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^[7,16] 6) Digestion, Inductively Coupled Plasma Method ^[7,14]
26	Nickel	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^[1,6,15] 2) Waste Extraction, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^[1,6,16] 3) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,14] 4) Digestion, Flame Atomic Absorption Spectrometric Method ^[7,15] 5) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^[7,16] 6) Digestion, Inductively Coupled Plasma Method ^[7,14]
27	Polychlorinated Biphenyls Aroclor 1016 Aroclor 1221 Aroclor 1232 Aroclor 1242 Aroclor 1248 Aroclor 1254 Aroclor 1260 2,4,4'-Trichlorobiphenyl 2,2',5,5'-Tetrachlorobiphenyl	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^[1,9,25] 2) Waste Extraction, Solid-Phase Extraction, Gas Chromatographic Method ^[1,10,25] 3) Soxhlet Extraction, Gas Chromatographic Method ^[11,25]

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ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
28	2,2',4,5,5'-Pentachlorobiphenyl 2,2',3,4,4',5'- Hexachlorobiphenyl 2,2',4,4',5,5'- Hexachlorobiphenyl 2,2',3,4,4',5,5'- Heptachlorobiphenyl Pentachlorophenol	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^[1,9,24] 2) Soxhlet Extraction, Gas Chromatographic Method ^[11,24]
29	Selenium	1) Waste Extraction, Digestion, Hydride Generation/ Atomic Absorption Spectrometric Method ^[1,6,21] 2) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[7,21]
30	Silver	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^[1,6,15] 2) Waste Extraction, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^[1,6,16] 3) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,14] 4) Digestion, Flame Atomic Absorption Spectrometric Method ^[7,15] 5) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^[7,16] 6) Digestion, Inductively Coupled Plasma Method ^[7,14]
31	Thallium	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^[1,6,15] 2) Waste Extraction, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^[1,6,16] 3) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,14] 4) Digestion, Flame Atomic Absorption Spectrometric Method ^[7,15] 5) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^[7,16] 6) Digestion, Inductively Coupled Plasma Method ^[7,14]

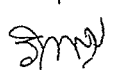
ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
32	Toxaphene	1) Waste Extraction, Solid-Phase Extraction, Gas Chromatographic Method ^[1,10,24] 2) Solid-Phase Extraction, Gas Chromatographic Method ^[10,24] 3) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[11,27]
33	Trichloroethylene	1) Waste Extraction, Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[1,12,26] 2) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[13,26]
34	Vanadium	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^[1,6,15] 2) Waste Extraction, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^[1,6,16] 3) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,14] 4) Digestion, Flame Atomic Absorption Spectrometric Method ^[7,15] 5) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^[7,16] 6) Digestion, Inductively Coupled Plasma Method ^[7,14]
35	Vinyl chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[13,26]
36	Zinc	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^[1,6,15] 2) Waste Extraction, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^[1,6,16] 3) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,14] 4) Digestion, Flame Atomic Absorption Spectrometric Method ^[7,15] 5) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^[7,16] 6) Digestion, Inductively Coupled Plasma Method ^[7,14]

Signature

ดิน จำนวน 121 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[11,27]
2	Acetone	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26]
3	Aldrin	Soxhlet Extraction, Gas Chromatographic Method ^[11,24]
4	Anthracene	Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[11,27]
5	Antimony	1) Digestion, Flame Atomic Absorption Spectrometric Method ^[7,15] 2) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^[7,16] 3) Digestion, Inductively Coupled Plasma Method ^[7,14]
6	Arsenic	Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[7,17]
7	Atrazine	Soxhlet Extraction, Gas Chromatographic Method ^[11,24]
8	Barium	1) Digestion, Flame Atomic Absorption Spectrometric Method ^[7,15] 2) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^[7,16] 3) Digestion, Inductively Coupled Plasma Method ^[7,14]
9	Benz(a)anthracene	Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[11,27]
10	Benzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26]
11	Benzo(b)fluoranthene	Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[11,27]
12	Benzo(k)fluoranthene	Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[11,27]
13	Benzoic acid	Soxhlet Extraction, Gas Chromatographic Method ^[11,23]
14	Benzo(a)pyrene	Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[11,27]
15	Benzo(g,h,i)perylene	Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[11,27]
16	Beryllium	1) Digestion, Flame Atomic Absorption Spectrometric Method ^[7,15]

2) Digestion...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
17	Bis(2-chloroethyl)ether	2) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^[7,16] 3) Digestion, Inductively Coupled Plasma Method ^[7,14] Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[11,27]
18	Bis(2-ethylhexyl)phthalate	Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[11,27]
19	Bromodichloromethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26]
20	Bromoform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26]
21	Butanol	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26]
22	Butyl benzyl phthalate	Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[11,27]
23	Cadmium	1) Digestion, Flame Atomic Absorption Spectrometric Method ^[7,15] 2) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^[7,16] 3) Digestion, Inductively Coupled Plasma Method ^[7,14]
24	Carbazole	Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[11,27]
25	Carbon disulfide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26]
26	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26]
27	Chlordane	Soxhlet Extraction, Gas Chromatographic Method ^[11,24]
28	p-Chloroaniline	Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[11,27]
29	Chlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26]
30	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26]
31	Chloroform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26]
32	Chromium	1) Digestion, Flame Atomic Absorption Spectrometric Method ^[7,15] 

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
33	Chromium (III)	2) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^[7,16] 3) Digestion, Inductively Coupled Plasma Method ^[7,14] 1) Digestion, Flame Atomic Absorption Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation ^[7,8,15,18] 2) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation ^[7,8,16,18] 3) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation ^[7,8,14,18]
34	Chromium (VI)	Alkaline Digestion, Colorimetric Method ^[8,18]
35	Chrysene	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[11,27]
36	Cyanide	1) Extraction, Distillation, Titrimetric Method ^[28,29,30] 2) Extraction, Distillation, Colorimetric Method ^[28,29,30]
37	2,4-D	Soxhlet Extraction, Gas Chromatographic Method ^[11,24]
38	DDD	Soxhlet Extraction, Gas Chromatographic Method ^[11,24]
39	DDE	Soxhlet Extraction, Gas Chromatographic Method ^[11,24]
40	DDT	Soxhlet Extraction, Gas Chromatographic Method ^[11,24]
41	Dibenz(a,h)anthracene	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[11,27]
42	Di-n-butyl phthalate	Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[11,27]
43	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[13,26]
44	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[13,26]
45	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[13,26]
46	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[13,26]
47	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[13,26]
48	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[13,26]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
49	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26]
50	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26]
51	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26]
52	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26]
53	1,3-Dichloropropene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26]
54	Dieldrin	Soxhlet Extraction, Gas Chromatographic Method ^[11,24]
55	Diethyl phthalate	Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[11,27]
56	2,4-Dimethylphenol	Soxhlet Extraction, Gas Chromatographic Method ^[11,23]
57	2,4-Dinitrophenol	Soxhlet Extraction, Gas Chromatographic Method ^[11,23]
58	2,4-Dinitrotoluene	Soxhlet Extraction, Gas Chromatographic Method ^[11,23]
59	2,6-Dinitrotoluene	Soxhlet Extraction, Gas Chromatographic Method ^[11,23]
60	Di-n-Octyl phthalate	Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[11,27]
61	Endosulfan	Soxhlet Extraction, Gas Chromatographic Method ^[11,24]
62	Endrin	Soxhlet Extraction, Gas Chromatographic Method ^[11,24]
63	Ethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26]
64	Fluoranthene	Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[11,27]
65	Fluorene	Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[11,27]
66	Heptachlor	Soxhlet Extraction, Gas Chromatographic Method ^[11,24]
67	Heptachlor epoxide	Soxhlet Extraction, Gas Chromatographic Method ^[11,24]
68	Hexachloro-1,3-butadiene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26]
69	n-Hexane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26]
70	α -HCH	Soxhlet Extraction, Gas Chromatographic Method ^[11,24]
71	β -HCH	Soxhlet Extraction, Gas Chromatographic Method ^[11,24]
72	γ -HCH	Soxhlet Extraction, Gas Chromatographic Method ^[11,24]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
73	Hexachlorocyclopentadiene	Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[11,27]
74	Hexachloroethane	Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[11,27]
75	Indeno(1,2,3-cd)pyrene	Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[11,27]
76	Isophorone	Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[11,27]
77	Lead	1) Digestion, Flame Atomic Absorption Spectrometric Method ^[7,15] 2) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^[7,16] 3) Digestion, Inductively Coupled Plasma Method ^[7,14]
78	Manganese	1) Digestion, Flame Atomic Absorption Spectrometric Method ^[7,15] 2) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^[7,16] 3) Digestion, Inductively Coupled Plasma Method ^[7,14]
79	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[20]
80	Methanol	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26]
81	Methoxychlor	Soxhlet Extraction, Gas Chromatographic Method ^[11,24]
82	Methyl bromide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26]
83	Methylene chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26]
84	2-Methylphenol	Soxhlet Extraction, Gas Chromatographic Method ^[11,23]
85	2-Methylnaphthalene	Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[11,27]
86	Methyl tert-butyl ether	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26]
87	Naphthalene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26]
88	Nickel	1) Digestion, Flame Atomic Absorption Spectrometric Method ^[7,15] 2) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^[7,16] 3) Digestion, Inductively Coupled Plasma Method ^[7,14]


ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
89	Nitrobenzene	Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[11,27]
90	N-Nitrosodiphenylamine	Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[11,27]
91	N-Nitrosodi-n-propylamine	Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[11,27]
92	Polychlorinated Biphenyls Aroclor 1016 Aroclor 1221 Aroclor 1232 Aroclor 1242 Aroclor 1248 Aroclor 1254 Aroclor 1260 2,2',5,5'-Tetrachlorobiphenyl 2,2',4,5,5'-Pentachlorobiphenyl 2,2',3,4,4',5'- Hexachlorobiphenyl 2,2',4,4',5,5'- Hexachlorobiphenyl 2,2',3,4,4',5,5'- Heptachlorobiphenyl	Soxhlet Extraction, Gas Chromatographic Method ^[11,25]
93	Pentachlorophenol	Soxhlet Extraction, Gas Chromatographic Method ^[11,24]
94	Phenanthrene	Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[11,27]
95	Phenol	Soxhlet Extraction, Gas Chromatographic Method ^[11,23]
96	Pyrene	Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[11,27]
97	Selenium	Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[7,21]
98	Silver	1) Digestion, Flame Atomic Absorption Spectrometric Method ^[7,15] 2) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^[7,16] 3) Digestion, Inductively Coupled Plasma Method ^[7,14]
99	Styrene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26]

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ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
100	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26]
101	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26]
102	Toluene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26]
103	Toxaphene	Soxhlet Extraction, Gas Chromatographic Method ^[11,24]
104	TPH (C ₅ -C ₈)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26]
105	TPH (C ₈ -C ₁₆)	Soxhlet Extraction, Gas Chromatographic Method ^[11,22]
106	TPH (C ₁₆ -C ₃₅)	Soxhlet Extraction, Gas Chromatographic Method ^[11,22]
107	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26]
108	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26]
109	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26]
110	Trichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26]
111	2,4,5-Trichlorophenol	Soxhlet Extraction, Gas Chromatographic Method ^[11,23]
112	2,4,6-Trichlorophenol	Soxhlet Extraction, Gas Chromatographic Method ^[11,23]
113	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26]
114	Vanadium	1) Digestion, Flame Atomic Absorption Spectrometric Method ^[7,15] 2) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^[7,16] 3) Digestion, Inductively Coupled Plasma Method ^[7,14]
115	Vinyl acetate	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26]
116	Vinyl chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26]
117	m-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26]
118	o-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26]
119	p-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
120	Xylene (Total)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26]
121	Zinc	1) Digestion, Flame Atomic Absorption Spectrometric Method ^[7,15] 2) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method ^[7,16] 3) Digestion, Inductively Coupled Plasma Method ^[7,14]

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ภาคผนวก ข

ใบอนุญาตเป็นผู้ตรวจวัดและวิเคราะห์สภาวะการทำงานเกี่ยวกับ
ความร้อน แสงสว่าง เสียง และสารเคมีอันตรายในบรรยากาศ




ควมส่วร้ดการและคุ้มครองรงงาน
 ใบนฤพา
 เน้นผู้ให้บริการตรงตัวระดับความเข้ม้นของส่าษเคมีอัยคราย
 ใบนรกายคองสตาที่ทำงาน และสลาที่เก้รภษาส่าษเคมีอัยคราย

ใบอมุญาดเถาที่ ๑๒๑๑-๑๓๒๖-๑๑๑๓

[illegible]

๑๔/ พฤษภาคม พ.ศ. ๒๕๖๔ ถึงวันที่ ๑๓/ ธันวาคม พ.ศ. ๒๕๖๗

ให้ไว้ ณ วันที่ ๑๔ ธันวาคม พ.ศ. ๒๕๖๔



ผู้ตรวจราชการกรม ปฏิบัติราชการแทน
(นายสมพงษ์ กวาทแก้ว)

รายสื่อบุคลากรแบบท้ายใบอนุญาต
เป็นนิติบุคคลผู้ให้บริการควรจัดเตรียมรายชื่อสารที่มีตราในบรรณภาพของสถานที่ทำงาน
และสถานที่เก็บรักษาหนังสือตรา
ของบริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด
ใบอนุญาตเลขที่ ๐๖๐๑-๐๓-๒๕๖๔-๙๐๐๓

- | | |
|----------------------|-----------------|
| ๑. นายปิยะชัย | บุญฤทธิ์เกียรติ |
| ๒. นายประมวล | บุรสาร |
| ๓. นายวิบูล | วสันต์รัมย์ |
| ๔. นายประมัตต์ | จิราเดช |
| ๕. นายรัฐพล | สุขดี |
| ๖. นายเกียรติศักดิ์ | วันดี |
| ๗. นายสุริยพงษ์ | ธงพุทธ |
| ๘. นายจิรวัฒน์ | อิมระเหย |
| ๙. นายเฉลิมวุฒิ | บุรสาวัน |
| ๑๐. นายธนปิติ | มะลิ |
| ๑๑. นายทิเชฐ | ยโสธรรัมย์ |
| ๑๒. นายสุชาติ | ศรีบุญ |
| ๑๓. นางสาววรรณศิริ | สุยวงศ์ |
| ๑๔. นายอนันท์ชัย | เสียมโหม |
| ๑๕. นางสาวนิตยา | ไธยะเสน |
| ๑๖. นายสุรภักดิ์ | มะลิงาน |
| ๑๗. นางสาวอาภาวดี | มะลิ |
| ๑๘. ว่าที่ ร.ต. ไกศล | อุตรภาค |
| ๑๙. นางสาวปณิดา | ธีรรมย์ |
| ๒๐. นางสาวปณิดา | สังวาลย์ |
| ๒๑. นางสาวรัชชานา | สุภิกังช |

ทั้งนี้ ตั้งแต่วันที่ ๑๔ ธันวาคม พ.ศ. ๒๕๖๔ ถึงวันที่ ๑๓ ธันวาคม พ.ศ. ๒๕๖๕

เพื่อให้ ณ วันที่ ๑๔ ธันวาคม พ.ศ. ๒๕๖๔


(นายสมพงษ์ กวางแก้ว)
ผู้อำนวยการกรม ปฏิบัติราชการแทน
อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน



แบบ กค.บญ
มี.กคก

กรมสวัสดิการและคุ้มครองแรงงาน

ใบอนุญาต

เป็นผู้ให้บริการวิเคราะห์ระดับความเข้มข้นของสารเคมีอันตราย
ในบรรยากาศของสถานที่ทำงาน และสถานที่เก็บรักษาสารเคมีอันตราย

ใบอนุญาตเลขที่ ๑๒๑๒-๐๓๒๕๖๔-๐๐๐๓

อนุญาตให้.....บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด.....
เลขทะเบียนนิติบุคคล.....๑๒๑๒-๐๓๒๕๖๔-๐๐๐๓.....
ตั้งอยู่เลขที่ ๑๔/๑ ซอยสวนหัวแหล ๑๔๕ แขวงสะพานสูง เขตสะพานสูง กรุงเทพมหานคร ตามกฎกระทรวง
เป็นนิติบุคคลผู้ให้บริการด้านความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน ตามกฎกระทรวง
กำหนดมาตรฐานในการบริหาร จัดการ และดำเนินการด้านความปลอดภัย อาชีวอนามัย และสภาพแวดล้อม
ในการทำงาน เรื่อง มาตรฐานความปลอดภัยในการปฏิบัติงาน และสถานที่เก็บรักษาสารเคมีอันตราย
ฉบับที่ ๒ ของกรมสวัสดิการและคุ้มครองแรงงาน พ.ศ. ๒๕๕๔ โดยเป็นหน่วยงานที่มีความรู้ ความสามารถ
ประกอบกับกฎกระทรวงการขึ้นทะเบียนและกรอกข้อมูลให้บริการเพื่อส่งเสริมความปลอดภัย อาชีวอนามัย
และสภาพแวดล้อมในการทำงาน พ.ศ. ๒๕๖๔ แห่งพระราชบัญญัติความปลอดภัย อาชีวอนามัย
และสภาพแวดล้อมในการทำงาน พ.ศ. ๒๕๕๔ โดยมีบุคลากรหรือวิทยากร จำนวน ๘ ราย

ตั้งแต่วันที่ ๑๔ ธันวาคม พ.ศ. ๒๕๖๔ ถึงวันที่ ๑๓ ธันวาคม พ.ศ. ๒๕๖๗

ให้ไว้ ณ วันที่ ๑๔ ธันวาคม พ.ศ. ๒๕๖๔

(นายสมพงษ์ กวางแก้ว)
ผู้ตรวจราชการกรม ปฏิบัติราชการแทน
อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน

รายชื่อบุคลากรแบบบัญชีใบอนุญาต
รายชื่อบุคคลผู้ให้บริการวิเคราะห์ระดับความเข้มข้นของสารเคมีอันตรายในบรรยากาศของสถานที่ทำงาน
และสถานที่เก็บรักษาสารเคมีอันตราย
ของบริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด
ใบอนุญาตเลขที่ ๑๒๑๒-๐๓๒๕๖๔-๐๐๐๓

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| ๑. นายณัฐพงศ์ | โตตะมา |
| ๒. นายเทพพงศ์ | เขตวัฒนา |
| ๓. นางสาวศุภกวี | สีหล้า |
| ๔. นางสาวกนกวรรณ | เริ่มประจักษ์ปัด |
| ๕. นายกิตติศักดิ์ | เมืองงาม |
| ๖. นางสาวณัฐญา | สารแสง |
| ๗. นายเจ | แจ้งวัฒ |
| ๘. นางสาวนลลิกานต์ | ติ่งตล |

ตั้งแต่วันที่ ๑๔ ธันวาคม พ.ศ. ๒๕๖๔ ถึงวันที่ ๑๓ ธันวาคม พ.ศ. ๒๕๖๗

ให้ไว้ ณ วันที่ ๑๔ ธันวาคม พ.ศ. ๒๕๖๔

(นายสมพงษ์ กวางแก้ว)
ผู้ตรวจราชการกรม ปฏิบัติราชการแทน
อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน




ใบอนุญาตนเลขที่ ๑๙๑๑-๑๓๖๕๖๔-๑๑๑๓

[illegible]


ทั้งนี้ ตั้งแต่บัดที่ ๑๔ ธันวาคม พ.ศ. ๒๕๖๗ ถึง ๑๓ ธันวาคม พ.ศ. ๒๕๖๗

ให้ไว้ ณ วันที่ ๑๔ ธันวาคม พ.ศ. ๒๕๖๔


(นายสมพงษ์ กวงแก้ว)
ผู้ตรวจราชการกรม ปฏิบัติราชการแทน
อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน

๑. นายปิยะชัย
๒. นางสาวนันทาส
๓. นางสาวสุกัญญา
๔. นายภพล
๕. นางสาวอรรณี

ผู้พิมพ์และผู้จัดพิมพ์ ๑๔ ธันวาคม ๒๕๖๕ วันที่ ๑๓ ธันวาคม ๒๕๖๕


(นายสมพงษ์ กวางแก้ว)
ผู้ตรวจการกรม ปฏิบัติราชการแทน
อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน



សាលាអន្តរជាតិ

ใบอนุญาตเลขที่ ๑๙๑๓-๐๓-๒๕๖๔-๑๑๑๓

เลขทะเบียนนิติบุคคล.....๐๑๕๔๕๓๗๙๐๐๘๕๖๗๙๐

ข้อ ๕๖. เลขที่ ๑๒/ร. ร้อยเอกถ้ำแพ่ง ๓๓๕๔ แคว้นสะเทนะหุ้ง, เขตสะเทนะหุ้ง, กรุงสะเทนะหุ้ง.....
 เป็นมีปฏิญสตุให้บริกราด้านความปลอดภัย อาชีวนายัน และสภาพแวดล้อมในการทำงาน ความผูกพันระหว่าง
 กลุ่มชนของชาวชนในภูมิภาควิหกร, จัดการ และจัดเป็นความห่วงใยปลอดภัยนี้ อาชีวนายัน และสภาพแวดล้อม
 ในภาระหน้าที่เกี่ยวกับความห่วงใย, เสถียร, และเสี่ยง พ.ศ. ๒๕๔๕ ในทางตรงกันข้ามสิทธิประโยชน์และการเข้าถึงงาน
 ใญ่แล้วกับกลุ่มเสี่ยง ประกอบกับกฎกระทรวงการจ้างงานและระเบียบและการอนุญาตให้บริกร เพื่อส่งเสริมความ
 ปลอดภัย อาชีวนายัน และสภาพแวดล้อมในการทำงาน พ.ศ. ๒๕๔๕ โดยให้บริกร จำนวน ๕ ราย
 อาชีวนายัน และสภาพแวดล้อมในการทำงาน พ.ศ. ๒๕๔๕ โดยให้บริกร จำนวน ๕ ราย

ให้ไว้ ณ วันที่ ๓๔ ธันวาคม พ.ศ. ๒๕๖๔

✓

(นายสมพงษ์ กวางแก้ว)
ผู้ตรวจราชการกรม ปฏิบัติราชการแทน
อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน

เป็นนิติบุคคลให้บริการตรวจวัดและวิเคราะห์สภาวะการทำงานเกี่ยวกับเสียง

ของบริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

ใบมอบหมายหน้าที่ ๐๔๐๓-๐๓-๒๕๖๔-๐๐๐๓

- | | |
|------------------|----------------|
| ๑. นายปีย์ชัย | บุญรุ่งเกียรติ |
| ๒. นางสาวกมลดา | จอกุญจิน |
| ๓. นางสาวสุกัญญา | อู่ภูมิ |
| ๔. นายภพล | นawangค์ |
| ๕. นางสาวมรวิทย์ | โสมภย์ |

ตั้งแต่วันที่ ๑๔ ธันวาคม พ.ศ. ๒๕๖๔ ถึงวันที่ ๑๓ ธันวาคม พ.ศ. ๒๕๖๕

ให้ไว้ ณ วันที่ ๒๔ ธันวาคม พ.ศ. ๒๕๖๔


Handwritten signature: *Handwritten signature*

(นายสมพจน์ กวางแก้ว)
ผู้ตรวจราชการกรม ปฏิบัติราชการแทน
อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน

[illegible]

๖๖-๖๗
๖๘-๖๙
๖๙-๗๐
๗๐-๗๑
๗๑-๗๒
๗๒-๗๓
๗๓-๗๔
๗๔-๗๕
๗๕-๗๖
๗๖-๗๗
๗๗-๗๘
๗๘-๗๙
๗๙-๘๐
๘๐-๘๑
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๙๙-๑๐๐

ให้ไว้ ณ วันที่ ๑๔ ธันวาคม พ.ศ. ๒๕๖๔


(นายสมพงษ์ กวางแก้ว)
ผู้อำนวยการกรม ปฏิบัติราชการแทน
อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน

๑. นายปิยะชัย บุญรุ่งเกียรติ
๒. นางสาวกัญชาส จอสูงเนิน
๓. นางสาวอุบลทิศา อธิม
๔. นายกมล มหารักษ์
๕. นางสาวอมรรัตน์ โสภมาย์

ตั้งแต่ วันที่ ๑๔ ธันวาคม ถึงวันที่ ๑๓ ธันวาคม พ.ศ. ๒๕๖๗

ให้ไว้ ณ วันที่ ๑๔ ธันวาคม พ.ศ. ๒๕๖๔

ผู้ตรวจราชการกรม ปฏิบัติราชการแทน
(นายสมพงษ์ กวาทแก้ว)