

เอกสารแนบ ง  
ใบรับรองการสอบเทียบเครื่องมือ

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บริษัท ยูไนเต็ด แอนนาลิสต์ แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด

List of Instrument Certificates for Environmental Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*
1	Atomic Absorption Spectrometer	MERCURY	Agilent Technologies	AA240FS / MY13160001	Agilent Technologies (Thailand) Co.,Ltd.	Preventive Maintenance Checklist	24 Jan 24	23 Jan 25

Due Date of Calibration\* : Based on the annual calibration plan. At least 1 time per year.

## Agilent 55 240 280 Series Atomic Absorption Spectroscopy Systems

### Preventive Maintenance Checklist

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

Delivered by highly trained and certified service engineers using genuine Agilent parts and supplies, Agilent Preventive Maintenance provides everything you need to reduce unplanned downtime and keep your systems operating at their peak. This checklist will be completed at the end of the service and provided to you as a record of the installation.

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

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

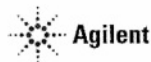
### Introduction

#### Customer Information

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

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### Important Customer Web Links

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

### Service Engineer's Responsibilities

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

This information is subject to change without notice.

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### Instrument Maintenance

#### System Information

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

Instrument System Name and ID	
Instrument System Site and Location	UNITED ANALYST AND ENGINEERING CONSULTANT / 2nd Lab

List System Component Product Numbers	List the Serial Numbers of each Component
1. G 8432 A	1713160001
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	

### Preparation, Safe operation and Initial performance checks

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### Preventive Maintenance Procedures

#### FLAME SYSTEM section

☐ Section not applicable

#### Electronic components

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

#### Mechanical components

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

#### Optics components

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

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### Sample Introduction and Atomization

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

### Gas handling components and safety interlocks

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

### Analytical performance for Flame systems

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

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### FURNACE SYSTEM section

- ☒ Section not applicable

#### Electronic components

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

#### Mechanical components

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

#### Optics components

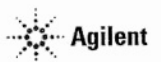
- ☐ Check that external optical surfaces are clean – Clean or replace as required.
- ☐ Use SVD and perform *Mono Wavelength Correction*.
- ☐ Use SVD and perform *Slit Calibration*.
- ☐ Use SVD and perform *Grating Squareness Diagnostic*.
- ☐ Use SVD and perform *Zero Order Offset/Mono Correction*.
-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

### Gas handling, water system and workhead component checks

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

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- ☐ Tube
- ☐ Electrodes
- ☐ Shroud

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

### Analytical performance for Furnace systems

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

### PSD autosampler accessory for Furnace systems

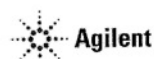
- ☒ Section NOT Applicable
- ☐ Check condition of the PSD capillary – replace if necessary
- ☐ Check condition and operation of PSD syringe – ensure it does not have air locks and bubbles.
- ☐ Change PSD rinse bottle o-ring.
- ☐ Check and clean the rinse vessel.
- ☐ Check the drain tube for good drainage.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

### Sample introduction pump system (SIPS) accessory

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

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

### Sample preparation system (SPS 4) accessory

- ☒ Section NOT Applicable

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

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

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

**NOTE: The autosampler requires no extra lubrication throughout its lifetime.**

For further details refer to the SPS 4 service manual G8410-90050.

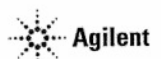
### Sample preparation system (SPS 3) accessory

- ☒ Section NOT Applicable

- ☐ Check the x-axis and z-axis timing belts – Replace if there is any cracks, splits or color deterioration and belt tension.
- ☐ Check belt tensions - adjust if required
- ☐ Check the lubrication pad for single x-axis shaft. If pad is dry or customer has observed any vibration or erratic movements of the x-axis carriage, add 1 mL of Dow Corning 200 ⑥ Fluid, 200 CS into the well.
- ☐ Check the auto-sampler ability to find tube positions - Calibrate if required.
- ☐ Clean the exterior surfaces of the accessory with soft lint free cloth. This cloth can be dampened with warm water or a mild detergent. Do not use organic solvents or abrasive cleaning agents.

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Vapor generation accessory VGA (hydride generator)

☒ Section NOT Applicable

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

UltrAA lamp accessory (external)

☒ Section NOT Applicable

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

**Restore System**

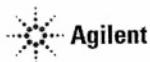
- ☒ If you have altered the customer's instrumentation during the course of PM, restore to the original status to allow the customer to conduct their normal activities (e.g., reload the customer's method.)

**Guidance**

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

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Signature Page

**Service Review**

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

**Test Results**

Test Description		
<b>Flame optics PMT Gain test</b>		
For copper at 324.8 nm, 4 mA, 0.5 nm slit width	< 55 %	44 %
<b>Flame performance test with 5 ppm copper sample</b>		
Air /acetylene, mixing paddle removed	Abs value > 0.5	0.7401 Abs
Air /acetylene, mixing paddle installed. 10 replicates	%RSD < 1.0	0.5 % RSD
<b>Deuterium furnace optics PMT Gain test</b>		
For copper at 324.8 nm, 4 mA, 0.5 nm slit width	< 55 %	N/A
<b>Deuterium furnace performance test with 25 ppb copper sample (324.8 nm)</b>		
Precision %RSD	≤ 4.0%	N/A
Abs value	≥ 0.15	N/A
<b>Zeeman furnace analytical performance: 25 ppb copper sample (327.4 nm)</b>		
Precision %RSD	≤ 4.0%	N/A
Abs value	≥ 0.10	N/A
MSR%	≥ 70 %	N/A

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**AA consumable and parts list table**

Part Description	Product/Model # where used	PM supplied or Consumable	Instrument-Type
Test Solution – Cu 5ppm solution	6610030100	50 55 140 240 280	PM supplied
Test Solution - Blank solution	5190-7001	50 55 140 240 280	PM supplied
Copper, 1000 ug/ml, 100ml	5190-8279	50 55 140 240 280	*
Kit, Mix 7 O-rings, aqueous, complete set	9910093400	50 55 140 240 280	PM supplied
Organic Kit	9910093500	50 55 140 240 280	PM supplied
Wire Nebulizer Cleaning	9910024700	50 55 140 240 280	consumable
Tubing-Capillary Std Nebs	9910024800	50 55 140 240 280	consumable
Capillary Tube Hvac Neb (3) (organics only)	9910044000	50 55 140 240 280	consumable
Glass impact beads (5/pk)	9910025700	50 55 140 240 280	consumable
Teflon impact beads (5/pk): (organics only)	9910053300	50 55 140 240 280	consumable
Burner cleaning strip (100/pk)	9910053900	50 55 140 240 280	consumable
Window UV silica – round (right side)	2010082600	50 55 140 240 280	PM supplied
Window UV silica – rectangular (left side)	2010082500	50 55 140 240 280	PM supplied
Pad adhesive window (round)	4910012700	50 55 140 240 280	PM supplied
Pad adhesive window (rectangular)	4910012800	50 55 140 240 280	PM supplied
Electrode kit (1 pr) (D2)	6310003400	GTA120	PM supplied
Shroud (D2)	6310003100	GTA120	PM supplied
Zeeman electrode kit (1 pr)	6310003500	GTA120	PM supplied
Zeeman shroud	6310003600	GTA120	PM supplied
O-ring PSD rinse bottle	6910025900	PSD120	PM supplied

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

Items classified as PM supplied in the above table are included in the standard PM

Those classified as consumable should be provided by the customer or charged to the customer if supplied by the Agilent service engineer.

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**Service Engineer Comments (optional)**

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

**Service Completion**

Service request number 6006371115 Date service completed 24 January 2024

Agilent signature

Total number of pages in this document 13

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## SVD Results Report



Report ID: Diagnostic Start Time: 1/24/2024 9:41:24 AM Diagnostic End Time: 1/24/2024 10:10:55 AM

Customer: Service Engineer: Worawit T.  
Address: Contact Details:

## Instrument Configuration

## Configuration:

Serial Number: MY13160001 Turret Type: Automatic  
Instrument Model: Varian AA140/240/280 Number Of Lamps: 4  
Flame Instrument: True Mono Type: Automatic  
Furnace Instrument: True Gasbox Type: "Y" Gas Box  
Zeeman Present: False Auto Burner Adjuster: False  
Internal Zeeman: False Mains Frequency: 50  
Internal UltraAA: False Firmware Version: 2.11  
Optics Type: Double Beam Photomultiplier Type: Normal(900nm)  
D2 BG Correction Fitted: True PWB Version: 45  
Boot Block Version: 1.09

## EEPROM Data:

Instrument Run Hours: 62609.832 D2 Run Hours: 49136.000  
Zero Wavelength Offset: 30.148 D2 Serial Number: not set !  
Mono Correction: 0.765 D2 Install Date: 1/1/1970  
Flame Hours: 29802.416 D2 Original Intensity: 1.000  
D2 Last Intensity: 475.000

## Frequency:

Averaging Period: 30.0  
Datapoint Count: 20

Upper Limit: 51.00 Highest Measured Frequency: 50.00  
Average Frequency: 50.00  
Lower Limit: 49.00 Lowest Measured Frequency: 50.00

Result: **Passed**

Report Generated At: 1/24/2024 10:11:18 AM

1

SVD Results Report

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## Power Supply:

Averaging Period: 30.0

Datapoint Count: 20

	Lower Limit (V)	Actual (V)	Upper Limit (V)	Result:
12.00 V Rail	10.80	12.19	13.20	<b>Passed</b>
-12.00 V Rail	-13.20	-11.90	-10.80	<b>Passed</b>
5.00 V Rail	4.50	5.05	5.50	<b>Passed</b>
310.00 V Rail	279.00	320.00	341.00	<b>Passed</b>

Report Generated At: 1/24/2024 10:11:18 AM

2

SVD Results Report

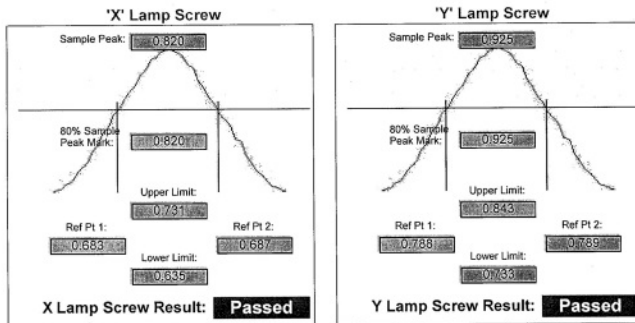
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## Optics

## Beam Balance:

Lamp Type: Copper  
Lamp Socket Used: 3

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



## Grating Squareness:

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

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

Report Generated At: 1/24/2024 10:11:18 AM

3

SVD Results Report

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## Wavelength Repeatability:

Lamp Used: Copper  
Peak Used(nm): 324.750  
Connected to Socket: 3

Lamp Current(mA): 4  
Slit Width(nm): 0.2  
Slit Height: Normal

Lamp Alignment: **Performed**

Lower Limit(nm)	324.768	324.888	Upper Limit(nm)
(Approach from Zero Order)			(Approach from end)
Sample 1:	324.828	Sample 2:	324.828
Sample 3:	324.828	Sample 4:	324.823
Sample 5:	324.823	Sample 6:	324.823
Sample 7:	324.823	Sample 8:	324.823
Sample 9:	324.823	Sample 10:	324.823

Mean: 324.825

Standard Deviation: 0.002

Result: **Passed**

Report Generated At: 1/24/2024 10:11:18 AM

4

SVD Results Report

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Mechanical

Wavelength Drive:

Passed

Slit Drive:

Passed

Turret Drive:

Passed

Auto Burner Adjuster Drive:

Untested

Miscellaneous

Signal Processing Linearity:

Calculate Mode: New Calc Mode

	Lower Limit	Actual	Upper Limit	Result:
S0	114	261	297	Passed
S1	156	165	191	Passed
S2	271	296	332	Passed
S3	474	507	579	Passed
S4	825	918	1008	Passed
S5	1435	1528	1754	Passed
S6	2498	2769	3053	Passed
S7	4347	4752	5313	Passed

Interlocks:

Burner Fitted: Working

Flame Detect: Working

N2O Burner Fitted: Untested

GCU Active: Working

Flame Shield Closed: Working

Oxidant Pressure: Working

Gas Control Fitted: Untested

Oxidant Changeover: Untested

Pressure Release Bung Fitted: Working

Ignition: Working

Liquid Trap Fitted: Working

Auto Lamp Recognition:

Lamp 1: Uncoded Lamp/Not Connected

Lamp 5: Not Supported

Lamp 2: 87 - Silver/Cadmium/Lead/Zinc(UltrAA) (Ag/C

Lamp 6: Not Supported

Lamp 3: 14 - Copper (Cu)

Lamp 7: Not Supported

Lamp 4: Uncoded Lamp/Not Connected

Lamp 8: Not Supported

Result: Passed

GTA Temperature Monitoring:

Not Performed

Notes:

PM 24 Jan 2024

Signatures:

24/1/24

24/1/24

Date

Worawit T.

Date

Sequential by time report

1/24/2024 11:46 AM

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SpectrAA

Analyst

Date Started 1/24/2024 11:39 AM GMT: 1/24/2024 4:39 AM

Worksheet Cu 5 PPM Sense check

Comment

Methods Cu

Computer name DESKTOP-R9UFRS

Serial Number: MY13160001

Method: Cu (Flame)

Sample ID	Conc. mg/L	%RSD	Mean Abs
CAL ZERO	0.000	55.0	0.0003
Readings			
	0.0002	0.0002	0.0004
			1/24/2024
STANDARD 1	5.000	1.7	0.7419
Readings			
	0.7274	0.7515	0.7468
			1/24/2024

Abs

Linear - Cal. Set 1

0.000 2.000 4.000 5.500

0.00 0.20 0.40 0.60 0.74

Cu mg/L

Curve Fit = Linear

Characteristic Conc = 0.028 mg/L

r = 1.0000

Calculated Conc = 0.000 5.000

Residuals = 0.000 0.000

Abs = 0.14833 x C + 0.00025

Sample 001	4.988	0.7	0.7401
Readings			
	0.7454	0.7399	0.7349
			1/24/2024

Sequential by time report

1/24/2024 11:50 AM

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SpectrAA

Analyst

Date Started 1/24/2024 11:47 AM GMT: 1/24/2024 4:47 AM

Worksheet Cu 5 PPM Precision

Comment

Methods Cu

Computer name DESKTOP-R9UFRS

Serial Number: MY13160001

Method: Cu (Flame)

Sample ID	Exp Abs	%RSD	Mean Abs
Cu Precision	0.723	0.5	0.7232
Readings			
	0.7221	0.7195	0.7226
	0.7201	0.7213	0.7266
			0.7283
			0.7278
			0.7260
			1/24/2024

Abs

Cu Precision

0.0 5.0 10.0 15.0 20.0

0.00 0.20 0.40 0.60 0.70 0.78

Time

บริษัท อินทิเกรตเต็ด รีเสิร์ช เซ็นเตอร์ จำกัด

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## CERTIFICATE OF CALIBRATION

Certificate No. : COF-013-67

Page 1 of 2 Pages

**MEASUREMENT ITEM** : Top Load Orifice  
**MANUFACTURER** : TISCH  
**MODEL/TYPE** : TE-5028A  
**SERIAL NUMBER** : 2926  
**ID NUMBER** : -  
**CONDITION AS-RECEIVED** : Used Item  
**CUSTOMER** : Integrated Research Center Company Limited.  
122 Moo 2, Thatoom, Srimahaphote,  
Prachinburi 25140, Thailand.

**RECEIVED DATE** : 10 May 2024  
**MEASUREMENT DATE** : 05 Jun 2024  
**ISSUE DATE** : 06 Jun 2024

### ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

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

### CALIBRATION CONDITION:

Preconditioning : 24 hours at ambient conditions.  
Measurement Condition : The average values during measurement are  $22.9$  °C and  $53.2$  %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-ep. The W-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 NIMT (National Metrology Institute of Thailand) via Certificate number: MW-0063-23.

**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'.

### 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	Ap_meter mmHg	Ap_Orifice inH <sub>2</sub> O	$\gamma$	Standard Flow [Qs] $m^3/min$
1	0.703	754.942	22.82	22.17	58.515	1.094	1.046	0.651
2	1.001	754.951	22.99	22.44	44.435	2.340	1.530	0.944
3	1.117	754.835	23.23	22.73	38.752	2.948	1.716	1.060
4	1.170	754.975	23.31	22.88	35.376	3.257	1.804	1.116
5	1.411	755.078	23.55	23.13	24.261	4.921	2.216	1.365

Slope (m): 1.63522  
Intercept (b): -0.01711  
Correlation coefficient (r): 0.99975  
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	Ap_meter mmHg	Ap_Orifice inH <sub>2</sub> O	$\gamma$	Standard Flow [Qs] $m^3/min$
1	0.703	754.942	22.82	22.17	58.515	1.094	0.655	0.650
2	1.001	754.951	22.99	22.44	44.435	2.340	0.958	0.944
3	1.117	754.835	23.23	22.73	38.752	2.948	1.076	1.061
4	1.170	754.975	23.31	22.88	35.376	3.257	1.131	1.117
5	1.411	755.078	23.55	23.13	24.261	4.921	1.391	1.367

Slope (m): 1.02416  
Intercept (b): -0.01068  
Correlation coefficient (r): 0.99975  
Uncertainty (k=2): 0.015  $m^3/min$

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

Calibrated by:  
Mr. Siraporn Thachalad  
Miss Jitragorn Lertsomphol



Approved



Calibration Department Manager



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



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Mechanical Engineering Standards Laboratory Soi 1, Bangpoo Industrial Estate, Muang, Samutprakan 10280, Thailand.

Request No.23-67/0186

MTC.No.23-67/0186

Number of page(s) 2

## CALIBRATION CERTIFICATE

### Nomenclature : DRYCAL FLOWMETER

Manufacturer : Bios International Corporation, USA

Serial No.: 210155

Model : Defender 510 M

Scale range : 50 ml/min to 5000 ml/min

Subdivision : (0.00001, 0.0001, 0.001) l/min

Submitted by : INTEGRATED RESEARCH CENTER COMPANY LIMITED.

122 T.Thatoom A.Srimahaphote,

Prachinburi 25140, Thailand.

Received date : 5 January 2024

Condition of measured item : Normal

Calibration date : 16 January 2024

Standard	Certificate No.	Date due	Traceability
RTD Thermometer	PSL-T 643/65	1-Jun-24	TISTR
Molbox/Pressure Transducer/UpStream	MP-0076-23	2-Apr-25	NIMT
Primary Flow Calibrator S/N 117982	MW-0034-23	11-Jun-25	NIMT
Primary Flow Calibrator S/N 119521	MW-0033-23	6-Jun-25	NIMT

Mechanical Engineering Standards Laboratory

Ref. 2013267010500059001

Issued Date 22 January 2024

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

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FM.BLMTC.002 Rev.4

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Mechanical Engineering Standards Laboratory Soi 1, Bangpoo Industrial Estate, Muang, Samutprakan 10280, Thailand.

Request No.23-67/0186

2/2

MTC.No.23-67/0186

**Calibration point :** (0.05, 0.5, 1, 1.5, 2) l/min

**Ambient condition :** Temperature ( $23 \pm 3$ ) °C , Relative humidity ( $55 \pm 15$ ) %

Atmospheric pressure ( $1010 \pm 13$ ) hPa

**Calibration method :** The flowmeter (UUC) was calibrated by comparison method with standard flowmeter according to CP-370.01.

The reported value is the value that converted to value at reference condition within pressure and temperature of the actual gas entering the UUC

### Measurement data :

UUC Value (l/min)	Standard Value (l/min)	Temperature (°C)	Pressure (hPa)	Deviation (%)	Uncertainty (%)
0.05100	0.050841	24.840	1011.69	+0.31	1.0
0.50176	0.49450	24.862	1011.80	+1.47	0.99
1.0057	0.99132	24.865	1011.93	+1.45	0.86
1.5013	1.4814	24.805	1012.07	+1.34	0.86
2.0090	1.9856	24.755	1012.22	+1.18	0.86

The reported expanded uncertainties are based on standard uncertainties multiplied by a coverage factor  $k=2$ , which provides a level of confidence of approximately 95%.

The end of calibration certificate.

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

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FM.BLMTC.002 Rev.4



## Certificate of Calibration

Certificate No.: C01233749

Page: 2 of 2

Equipment: Balance  
Model: BSA224S-CW  
Serial No. (or ID.): 34490341  
Manufacturer: Sartorius  
Condition: In condition

Certificate No.: C01233749  
Issued Date: 03 November 2023  
Job No.: WO-0008313  
Page: 1 of 2

Customer: Integrated Research Center Co., Ltd.  
122 Moo 2, Tambol Thatoom,  
Amphur Srimahaphote, Prachinburi 25140 Thailand

Environment Condition: Temperature 23 °C ± 0.5 °C  
Humidity 61 %RH ± 4.3 %RH

Calibration Place: Double A (1991) Public Company Limited.  
(Water Laboratory IP1 (Balance Room))  
1 Moo 2, Thatoom, Srimahaphot,  
Prachinburi 25140 Thailand.

Calibration By: Mr. Piyapat Saldoung

Calibration Date: 02 November 2023

The Method used: In-house method, CAL-WI-47, based on UKAS Lab 14

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Co., Ltd. Certificate No. C02222418

## Calibration Results:

## Without Adjustment

Eccentric Error: Weight to be 1/3 or 1/2 of Maximum capacity, taken from the center of the pan as a zero reference.

Nominal Test Value		100 (g)				
		Reference Points (g)				
A	B	C	D	E		
-	-0.0001	0.0000	0.0001	-0.0001		

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

Nominal test value (g)	Standard Deviation
20	0.00004
200	0.00006

Error of indication from nominal or conventional mass value., Readability 0.0001 (g)

Nominal Value (g)	Conventional Mass (g)	Displayed Value (g)	Error of Indication (g)	Uncertainty (g)	k
0.1	0.10000	0.1000	0.0000	0.00011	2.04
0.2	0.20000	0.2000	0.0000	0.00011	2.04
0.5	0.50000	0.5000	0.0000	0.00011	2.04
1	1.00000	1.0000	0.0000	0.00011	2.04
2	2.00001	2.0000	0.0000	0.00011	2.04
5	4.99999	5.0000	0.0000	0.00011	2.04
10	10.00001	10.0000	0.0000	0.00011	2.04
20	19.99998	20.0000	0.0000	0.00012	2.03
50	49.99994	50.0000	0.0001	0.00013	2.02
100	99.99997	100.0000	0.0000	0.00017	2.01
200	199.99993	199.9999	0.0000	0.00030	2.00

The End of Certificate

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

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Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

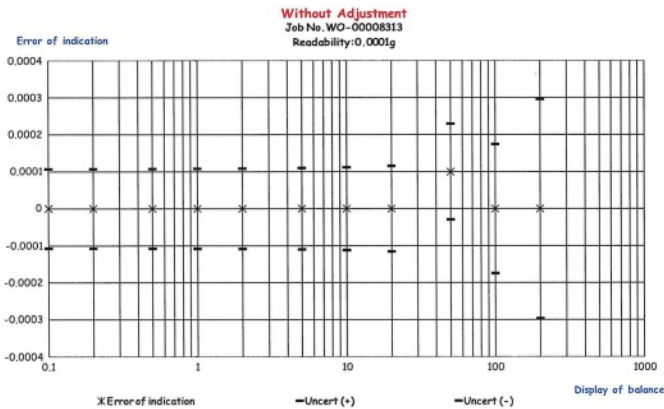
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CAL-FM-C01-14: 12 Sep 2022

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## ใบตรวจสอบสภาพเครื่องชั่ง

เลขที่ใบงาน: WO-0008313

ชนิดเครื่องมือ: Balance

รุ่น: BSA224S-CW

หมายเลขเครื่อง: 34490341

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
02 Nov 2023			02 Nov 2023		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ/Adapter, power supply 220/110V	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสมบูรณ์ชุดกระจกักนลม (Cover)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. ความสมบูรณ์ชุดของระดับน้ำ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การปรับระดับของขาตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การตรวจสอบของไม่กีด	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. ความสมบูรณ์ของ Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. การแสดงผลของ Display หลังวางน้ำหนัก	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. ชุดรองจานชั่ง (Stopper) / pan support	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. การทำงานของ Function Internal / External	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. ความสะอาดของตัวเครื่องภายนอกและแกน load cell	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	11. สภาวะแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

หมายเหตุเพิ่มเติม/ข้อแนะนำ :

Service Engineer

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# Certificate of Calibration



Certificate No.: C01233752

Page: 2 of 2

**Equipment:** Balance  
**Model:** ME36S  
**Serial No. (or ID.):** 27206085  
**Manufacturer:** Sartorius  
**Condition:** In condition

**Certificate No.:** C01233752  
**Issued Date:** 06 November 2023  
**Job No.:** WO-00008313  
**Page:** 1 of 2

**Customer:** Integrated Research Center Co.,Ltd.  
122 Moo 2, Tambol Thatoom,  
Amphur Srimahaphote, Prachinburi 25140 Thailand

**Environment Condition:** Temperature 23 °C ± 0,8 °C  
Humidity 59 %RH ± 3.3 %RH

**Calibration Place:** Double A (1991) Public Company Limited.  
(Water Laboratory IP1 (Balance Room))  
1 Moo 2, Thatoom, Srimahaphot,  
Prachinburi 25140 Thailand.

**Calibration By:** Mr. Piyapat Saidoung

**Calibration Date:** 01 November 2023




**The Method used:** In-house method, CAL-WI-47, based on UKAS Lab 14

**Traceability:** This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Co., Ltd. Certificate No. C02222418

## Calibration Results:

### Without Adjustment

**Eccentric Error:** Weight to be 1/3 or 1/2 of Maximum capacity, taken from the center of the pan as a zero reference.

			<b>Nominal Test Value</b>	10000	(mg)
<b>Reference Points (mg)</b>					
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	
-	0.001	0.001	-0.001	-0.002	

**Repeatability:** Determination of the standard deviation of weighing balance., Readability 0.001 (mg)

Nominal test value (mg)	Standard Deviation
2000	0.0011
20000	0.0011

**Error of Indication from nominal or conventional mass value.,** Readability 0,001 (mg)

Nominal Value (mg)	Conventional Mass (mg)	Displayed Value (mg)	Error of Indication (mg)	Uncertainty (mg)	k
1	1.0010	1.001	0.000	0.0034	2,01
5	5.0010	5.001	0.000	0.0034	2,01
10	9.9990	9.999	0.000	0.0041	2,00
50	50.0010	50.001	0.000	0.0063	2,00
100	100.0020	100.002	0.000	0.0082	2,00
500	499.9980	499.999	0.001	0.013	2,00
1000	1000.0000	1000.000	0.000	0.016	2,00
5000	4999.9910	4999.989	-0.002	0.027	2,00
10000	10000.0070	10000.003	-0.004	0.033	2,00
20000	19999.9810	19999.976	-0.005	0.048	2,00
30000	29999.9880	29999.982	-0.006	0.080	2,00

The End of Certificate



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

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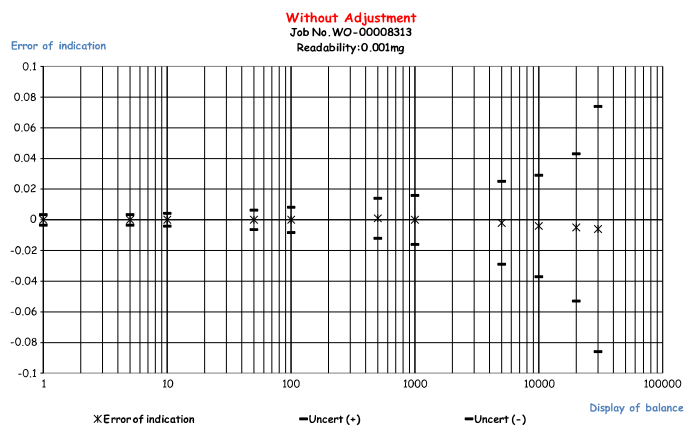
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CAL-FM-C01-14: 12 Sep 2022



## ใบตรวจสอบสภาพเครื่องชั่ง

เลขที่ใบงาน: WO-00008313

ชนิดเครื่องมือ: Balance

รุ่น: ME36S

หมายเลขเครื่อง: 27206085

ตรวจสอบ (รับ)		รายการตรวจเช็ค		ตรวจสอบ (ส่ง)		หมายเหตุ
01 Nov 2023				01 Nov 2023		
ปกติ	ไม่ปกติ			ปกติ	ไม่ปกติ	
		<b>General</b>				
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ/Adapter, power supply 220/110V		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสมบูรณ์ชุดกระจก้นลม (Cover)		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. ความสมบูรณ์ชุดของระดับน้ำ		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การปรับระดับของขาตั้งเครื่อง		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การทดสอบของไม่กด		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. ความสมบูรณ์ของ Display		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. การแสดงผลของ Display หลังวางน้ำหนัก		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. ชุดรองจานชั่ง (Stopper) / pan support		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. การทำงานของ Function Internal / External		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. ความสะอาดของตัวเครื่องภายนอกและภายใน load cell		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	11. สภาวะแวดล้อม ณ สถานที่ตั้งเครื่อง		<input checked="" type="checkbox"/>	<input type="checkbox"/>	

หมายเหตุเพิ่มเติม/ข้อแนะนำ :

Service Engineer

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## CERTIFICATE OF ANALYSIS

### Grade of Product: EPA Protocol

Part Number: E03N199E80A0020 Reference Number: 82-401285019-1  
Cylinder Number: LL193324 Cylinder Volume: 83.4 CF  
Laboratory: 124 - Riverton (SAP) - NJ Cylinder Pressure: 2215 PSIG  
PGVP Number: B52018 Valve Outlet: 660  
Gas Code: NO,NOX,SO2,BALN Certification Date: Sep 05, 2018  
Expiration Date: Sep 05, 2026

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.  
Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	50.00 PPM	50.71 PPM	G1	+/- 1.4% NIST Traceable	08/27/2018, 09/05/2018
NITRIC OXIDE	50.00 PPM	50.67 PPM	G1	+/- 1.4% NIST Traceable	08/27/2018, 09/05/2018
SULFUR DIOXIDE	50.00 PPM	50.54 PPM	G1	+/- 1.0% NIST Traceable	08/27/2018, 09/05/2018
NITROGEN	Balance				

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	16060525	CC442585	50.42 PPM NITRIC OXIDE/NITROGEN	+/- 0.8%	Jun 27, 2020
PRM	12368	5604119	29.86 PPM NITROGEN DIOXIDE/AIR	+/- 1.5%	Jun 02, 2017
GMIS	7042010014	CC503941	5.101 PPM NITROGEN DIOXIDE/NITROGEN	+/- 2.0%	Jun 01, 2020
NTRM	14010327	KAL004376	49.08 PPM SULFUR DIOXIDE/NITROGEN	+/- 1.0%	Apr 17, 2024

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 APW1100391 NO	FTIR	Aug 09, 2018
Nicolet 6700 APW1100391 NO2	FTIR	Aug 31, 2018
Nicolet 6700 APW1100391 SO2	FTIR	Aug 30, 2018

Triad Data Available Upon Request

NOTES: PO# 5218003935

Net weight: 2736 grams  
Gross weight: 17393 grams

This calibration std. has been certified in accordance with the May 2012 EPA Traceability Protocol. Document EPA-600/R-12/531. All testing processes and measurements conform to the requirements of ISO/IEC 17025 and to Airgas ISO 9001:2008 and relate only to items identified on this certificate. All values are certified to be NIST Traceable with total uncertainty as detailed under Analytical Uncertainty. This document shall not be reproduced in full without written approval of the issuer.



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Request No. 21-67/0176 MTC No. EEL. BP. 7/0167

### CALIBRATION CERTIFICATE

Submitted by : Integrated Research Center Company Limited.  
Address : 122 Moo 2, T.Thatoom, A.Srimahaphote, Prachinburi, 25140.  
Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.  
Sri IC, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :  
Description : Sound Calibrator  
Manufacturer : ACO  
Model : 2127  
Serial No. : 100012

Ambient Environment  
Temperature : (23 ± 3) °C  
Relative Humidity : (50 ± 15) %  
Ambient Pressure : (101.325 ± 1.500) 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 2889871.

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 : 3 Jan. 2024  
Date of Calibration : 5 Jan. 2024

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0176 MTC No. EEL. BP. 7/0167

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 20µPa at 1000 Hz

Acoustic Output in dB re 20µPa, 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 1
1/2 inch Bruel&Kjaer 4180	93.98	-0.02	± 0.10	±0.40 dB

#### 2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	1000.0	0.0	± 1.5	±1.0%

#### 3. Total distortion

Standard Microphone Type	Measured Total distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	1.50	± 0.50	±3.0%

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Date of Calibration : 5 Jan. 2024

Date of Issue : 5 Jan. 2024

Ref: 2011267010300007001

End of Certificate

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0177

MTC No. EEL. BP. 16/0167

### CALIBRATION CERTIFICATE

Submitted by : Integrated Research Center Company Limited.

Address : 122 Moo 2, T.Thatoom, A.Srimahaphote, Prachinburi, 25140.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.

Sri IC, Bangpoo Industrial Estate, Sukhumvit Rd., A.Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Integrating Sound Level Meter

Manufacturer : ACO

Model : 6236

Serial No. : 100144

Microphone : Type 7052 No.79844

Preamplifier : -

Standards used :

- Band Pass Filter Wavetek 752A S/N 90010494.
- Condenser Microphone Brüel&Kjaer 4180 S/N 2889871.
- Decade Attenuator Ando AL-205 S/N 00464602.
- Function/Arbitrary Waveform Generator Agilent 33220A S/N MY44042668.
- Digital Function Synthesizer NF Electronic Instruments DF-193A S/N 122037.
- Digital Multimeter Fluke 8520A S/N 4985007.
- Pistonphone Rion NC-72 S/N 00402446.
- Measuring Amplifier Brüel&Kjaer 2636 S/N 1537484.

Date of Receipt : 3 Jan. 2024

Date of Calibration : 7-8 Feb. 2024

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9. Power Amplifier Brüel&Kjær 2706 S/N 1517650.
10. Speaker Tannoy Limited, Great Britain British Patent No. 215300.
11. Digital Multimeter Agilent 34401A S/N MY44005560.
12. Programmable Attenuator Tamagawa TPA-303A S/N 2212.

#### Calibration Procedure :

This instrument was calibrated by using calibration procedures no CP-102-02 and CP-102-03, which were based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (2013). These calibration procedures were related to the electrical and acoustic signal tests. The electrical signal test was carried out with the direct measurement method. The acoustic signal test was performed in an anechoic room with the comparison measurement method.

This instrument has been calibrated against standards maintained at the 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.

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%.

Date of Calibration : 7-8 Feb. 2024

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

Frequency (Hz)	Deviation from frequency response (dB)			Acceptance limit class 2 ( $\pm$ dB)	Uncertainty ( $\pm$ dB)	Maximum-permitted uncertainty of measurement ( $\pm$ dB)
	A-weight	C-weight	Flat			
125	0.3	0.2	0.0	1.5	0.45	0.6
1 000	-0.6	-0.6	-0.6	1.0	0.45	0.6
8 000	-4.5	-4.4	-4.6	5.0	0.45	0.7

#### 4. Electrical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response (dB)			Acceptance limit class 2 ( $\pm$ dB)	Uncertainty ( $\pm$ dB)	Maximum-permitted uncertainty of measurement ( $\pm$ dB)
	A-weight	C-weight	Flat			
63	0.2	0.1	0.1	2.0	0.20	0.6
125	0.1	0.1	0.1	1.5	0.20	0.6
250	0.1	0.0	0.0	1.5	0.20	0.6
500	0.1	0.0	0.0	1.5	0.20	0.6
1 000	0.0	0.0	0.0	1.0	0.20	0.6
2 000	-0.2	0.0	0.1	2.0	0.20	0.6
4 000	-0.4	-0.2	0.0	3.0	0.20	0.6
8 000	-0.3	-0.2	-0.1	5.0	0.20	0.7

Date of Calibration : 7-8 Feb. 2024

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#### 1. Absolute Sensitivity

Reference Acoustic Signal (dB)	Measured value (dB)		Deviation value (dB)	Acceptance limit Class 2 ( $\pm$ dB)	Uncertainty ( $\pm$ dB)	Maximum-permitted uncertainty of measurement ( $\pm$ dB)
	Before adjust	After adjust				
113.96	114.4	114.0	0.0	1.0	0.30	N/A

**Note:** The external calibration adjustment was firstly performed. The internal calibration adjustment was then completed at the display of 114.8 dB.

#### 2. Self-generated noise

##### 2.1 Normal test

Measured value (dB)	Uncertainty ( $\pm$ dB)	Maximum-permitted uncertainty of measurement ( $\pm$ dB)
20.8	0.10	N/A

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

Frequency Weighting	Measured value (dB)	Uncertainty ( $\pm$ dB)	Maximum-permitted uncertainty of measurement ( $\pm$ dB)
A-Weight	15.4	0.10	N/A
C-Weight	24.7	0.10	N/A
Flat	27.4	0.10	N/A

Date of Calibration : 7-8 Feb. 2024

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#### 5. Long-term stability

Time	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 2 ( $\pm$ dB)	Uncertainty ( $\pm$ dB)	Maximum-permitted uncertainty of measurement ( $\pm$ dB)
Begin	94.0	0.0	0.3	0.10	0.1
End	94.0				

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

##### 6.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 2 ( $\pm$ dB)	Uncertainty ( $\pm$ dB)	Maximum-permitted uncertainty of measurement ( $\pm$ dB)
A-weight	94.0	0.0	0.2	0.20	0.2
C-weight	94.0	0.0	0.2	0.20	0.2
Flat	94.1	0.1	0.2	0.20	0.2

##### 6.2 Time weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 2 ( $\pm$ dB)	Uncertainty ( $\pm$ dB)	Maximum-permitted uncertainty of measurement ( $\pm$ dB)
Fast	94.0	0.0	0.1	0.20	0.2
Slow	94.0	0.0	0.1	0.20	0.2
Leq	94.0	0.0	0.1	0.20	0.2

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## 7. Level linearity on the reference level range

Anticipated value (dB)	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 2 ( $\pm$ dB)	Uncertainty ( $\pm$ dB)	Maximum-permitted uncertainty of measurement ( $\pm$ dB)
122	121.9	-0.1	1.1	0.30	0.3
121	120.9	-0.1	1.1	0.30	0.3
120	119.9	-0.1	1.1	0.30	0.3
119	118.9	-0.1	1.1	0.30	0.3
114	113.8	-0.2	1.1	0.30	0.3
109	108.8	-0.2	1.1	0.30	0.3
104	103.9	-0.1	1.1	0.30	0.3
99	99.0	0.0	1.1	0.30	0.3
94	94.0	0.0	1.1	0.30	0.3
89	88.9	-0.1	1.1	0.30	0.3
84	84.0	0.0	1.1	0.30	0.3
79	78.9	-0.1	1.1	0.30	0.3
74	74.0	0.0	1.1	0.30	0.3
69	69.0	0.0	1.1	0.30	0.3
64	63.9	-0.1	1.1	0.30	0.3
59	58.9	-0.1	1.1	0.30	0.3
54	53.9	-0.1	1.1	0.30	0.3
49	48.9	-0.1	1.1	0.30	0.3
44	43.9	-0.1	1.1	0.30	0.3
39	38.8	-0.2	1.1	0.30	0.3
34	34.0	0.0	1.1	0.30	0.3
33	33.0	0.0	1.1	0.30	0.3

Date of Calibration : 7-8 Feb. 2024

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## 8. Level linearity including the level range control

At reference level at 5 dB greater than the under-range on a level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 ( $\pm$ dB)	Uncertainty ( $\pm$ dB)	Maximum-permitted uncertainty of measurement ( $\pm$ dB)
40-130	45	45.0	0.0	1.1	0.30	0.3
30-120	35	35.0	0.0	1.1	0.30	0.3
20-110	25	25.3	0.3	1.1	0.30	0.3
20-100	25	25.2	0.2	1.1	0.30	0.3
20-90	25	25.3	0.3	1.1	0.30	0.3
20-80	25	25.1	0.1	1.1	0.30	0.3

## 9. Tone burst response

Time Weighting	Toneburst Duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 ( $\pm$ dB)	Uncertainty ( $\pm$ dB)	Maximum-permitted uncertainty of measurement ( $\pm$ dB)
Fast	200	115.8	-0.2	$\pm 1.0$	0.20	0.3
	2	98.8	-0.2	+1.0; -2.5	0.20	0.3
	0.25	89.6	-0.4	+1.5; -5.0	0.20	0.3
Slow	200	109.4	-0.2	$\pm 1.0$	0.20	0.3
	2	89.8	-0.2	+1.0; -5.0	0.20	0.3
SEL	200	109.9	-0.1	$\pm 1.0$	0.20	0.3
	2	90.0	0.0	+1.0; -2.5	0.20	0.3
	0.25	80.9	-0.1	+1.5; -5.0	0.20	0.3

Date of Calibration : 7-8 Feb. 2024

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## 7. Level linearity on the reference level range

Anticipated value (dB)	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 2 ( $\pm$ dB)	Uncertainty ( $\pm$ dB)	Maximum-permitted uncertainty of measurement ( $\pm$ dB)
32	32.0	0.0	1.1	0.30	0.3
31	31.1	0.1	1.1	0.30	0.3
30	30.1	0.1	1.1	0.30	0.3

## 8. Level linearity including the level range control

At reference sound level on the reference level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 ( $\pm$ dB)	Uncertainty ( $\pm$ dB)	Maximum-permitted uncertainty of measurement ( $\pm$ dB)
40-130	94.0	94.0	0.0	1.1	0.30	0.3
30-120	94.0	94.0	0.0	1.1	0.30	0.3
20-110	94.0	94.0	0.0	1.1	0.30	0.3
20-100	94.0	94.0	0.0	1.1	0.30	0.3

Date of Calibration : 7-8 Feb. 2024

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## 10. Peak C sound level

Number of cycles in test signal	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 ( $\pm$ dB)	Uncertainty ( $\pm$ dB)	Maximum-permitted uncertainty of measurement ( $\pm$ dB)
Complete cycle	125.4	125.8	0.4	3.0	0.20	0.35
Positive half cycle	124.4	124.2	-0.2	2.0	0.20	0.35
Negative half cycle	124.4	124.2	-0.2	2.0	0.20	0.35

## 11. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limit class 2 ( $\pm$ dB)	Uncertainty ( $\pm$ dB)	Maximum-permitted uncertainty of measurement ( $\pm$ dB)
Positive one-half cycle	Negative one-half cycle				
131.1	131.1	0.0	1.5	0.20	0.25

## 12. High-level stability

Time	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 ( $\pm$ dB)	Uncertainty ( $\pm$ dB)	Maximum-permitted uncertainty of measurement ( $\pm$ dB)
Begin	129.0	0.0	0.3	0.10	0.1
End	129.0				

End of Certificate

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No.21-67/0177

MTC No. EEL. BP. 17/0167

## CALIBRATION CERTIFICATE

Submitted by : Integrated Research Center Company Limited.

Address : 122 Moo 2, T.Thatoom, A.Srimahaphote, Prachinburi, 25140.

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

## Instrument Calibrated :

Description : Integrating Sound Level Meter

Manufacturer : ACO

Model : 6236

Serial No. : 100145

Microphone : Type 7052 No.78400

Preamplifier : -

## Ambient Environment

Temperature : (23 ± 3) °C

Relative Humidity : (50 ± 15) %

Ambient Pressure : (101.325 ± 1.5) kPa

## Standards used :

1. Band Pass Filter Wavetek 752A S/N 90010494.
2. Condenser Microphone Brüel&Kjær 4180 S/N 2889871.
3. Decade Attenuator Ando AL-205 S/N 00464602.
4. Function/Arbitrary Waveform Generator Agilent 33220A S/N MY44042668.
5. Digital Function Synthesizer NF Electronic Instruments DF-193A S/N 122037.
6. Digital Multimeter Fluke 8520A S/N 4985007.
7. Pistonphone Rion NC-72 S/N 00402446.
8. Measuring Amplifier Brüel&Kjær 2636 S/N 1537484.

Date of Receipt : 3 Jan. 2024

Date of Calibration : 7-8 Feb. 2024

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No.21-67/0177

MTC No. EEL. BP. 17/0167

## 1. Absolute Sensitivity

Reference Acoustic Signal (dB)	Measured value (dB)		Deviation value (dB)	Acceptance limit Class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	Before adjust	After adjust				
113.96	112.2	114.0	0.0	1.0	0.30	N/A

Note: The external calibration adjustment was firstly performed. The internal calibration adjustment was then completed at the display of 115.9 dB.

## 2. Self-generated noise

## 2.1 Normal test

Measured value (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
18.9	0.10	N/A

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

Frequency Weighting	Measured value (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
A-Weight	16.7	0.10	N/A
C-Weight	25.6	0.10	N/A
Flat	28.7	0.10	N/A

Date of Calibration : 7-8 Feb. 2024

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No.21-67/0177

MTC No. EEL. BP. 17/0167

9. Power Amplifier Brüel&amp;Kjær 2706 S/N 1517650.

10. Speaker Tannoy Limited, Great Britain British Patent No. 215300.

11. Digital Multimeter Agilent 34401A S/N MY44005560.

12. Programmable Attenuator Tamagawa TPA-303A S/N 2212.

## Calibration Procedure :

This instrument was calibrated by using calibration procedures no CP-102-02 and CP-102-03, which were based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (2013). These calibration procedures were related to the electrical and acoustic signal tests. The electrical signal test was carried out with the direct measurement method. The acoustic signal test was performed in an anechoic room with the comparison measurement method.

This instrument has been calibrated against standards maintained at the 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.

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%.

Date of Calibration : 7-8 Feb. 2024

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No.21-67/0177

MTC No. EEL. BP. 17/0167

## 3. Acoustical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response (dB)			Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	A-weight	C-weight	Flat			
125	0.0	0.0	0.0	1.5	0.45	0.6
1 000	-0.8	-0.8	-0.8	1.0	0.45	0.6
8 000	-4.6	-4.5	-4.7	5.0	0.45	0.7

## 4. Electrical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response (dB)			Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	A-weight	C-weight	Flat			
63	0.1	0.0	0.0	2.0	0.20	0.6
125	0.1	0.1	-0.2	1.5	0.20	0.6
250	0.0	0.1	0.1	1.5	0.20	0.6
500	0.1	0.0	0.0	1.5	0.20	0.6
1 000	0.0	0.0	0.0	1.0	0.20	0.6
2 000	-0.1	0.0	0.0	2.0	0.20	0.6
4 000	-0.3	-0.2	0.0	3.0	0.20	0.6
8 000	-0.3	-0.2	-0.2	5.0	0.20	0.7

Date of Calibration : 7-8 Feb. 2024

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### 5. Long-term stability

Time	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Begin	94.0	0.0	0.3	0.10	0.1
End	94.0				

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

#### 6.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
A-weight	94.0	0.0	0.2	0.20	0.2
C-weight	94.0	0.0	0.2	0.20	0.2
Flat	94.1	0.1	0.2	0.20	0.2

#### 6.2 Time weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Fast	94.0	0.0	0.1	0.20	0.2
Slow	94.0	0.0	0.1	0.20	0.2
Lq	94.0	0.0	0.1	0.20	0.2

Date of Calibration : 7-8 Feb. 2024

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### 7. Level linearity on the reference level range

Anticipated value (dB)	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
32	32.0	0.0	1.1	0.30	0.3
31	31.1	0.1	1.1	0.30	0.3
30	30.1	0.1	1.1	0.30	0.3

### 8. Level linearity including the level range control

At reference sound level on the reference level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
40-130	94.0	94.0	0.0	1.1	0.30	0.3
30-120	94.0	94.0	0.0	1.1	0.30	0.3
20-110	94.0	94.0	0.0	1.1	0.30	0.3
20-100	94.0	94.0	0.0	1.1	0.30	0.3

Date of Calibration : 7-8 Feb. 2024

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### 7. Level linearity on the reference level range

Anticipated value (dB)	Measured Value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
122	121.9	-0.1	1.1	0.30	0.3
121	120.9	-0.1	1.1	0.30	0.3
120	119.9	-0.1	1.1	0.30	0.3
119	118.9	-0.1	1.1	0.30	0.3
114	113.8	-0.2	1.1	0.30	0.3
109	108.8	-0.2	1.1	0.30	0.3
104	103.9	-0.1	1.1	0.30	0.3
99	99.0	0.0	1.1	0.30	0.3
94	94.0	0.0	1.1	0.30	0.3
89	88.9	-0.1	1.1	0.30	0.3
84	84.0	0.0	1.1	0.30	0.3
79	78.9	-0.1	1.1	0.30	0.3
74	74.0	0.0	1.1	0.30	0.3
69	69.0	0.0	1.1	0.30	0.3
64	63.9	-0.1	1.1	0.30	0.3
59	58.8	-0.2	1.1	0.30	0.3
54	53.9	-0.1	1.1	0.30	0.3
49	48.8	-0.2	1.1	0.30	0.3
44	43.9	-0.1	1.1	0.30	0.3
39	38.8	-0.2	1.1	0.30	0.3
34	34.0	0.0	1.1	0.30	0.3
33	33.0	0.0	1.1	0.30	0.3

Date of Calibration : 7-8 Feb. 2024

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### 8. Level linearity including the level range control

At reference level at 5 dB greater than the under-range on a level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
40-130	45	45.0	0.0	1.1	0.30	0.3
30-120	35	35.0	0.0	1.1	0.30	0.3
20-110	25	25.4	0.4	1.1	0.31	0.3
20-100	25	25.3	0.3	1.1	0.33	0.3
20-90	25	25.4	0.4	1.1	0.30	0.3
20-80	25	25.2	0.2	1.1	0.30	0.3

### 9. Tone burst response

Time Weighting	Toneburst Duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Fast	200	115.8	-0.2	±1.0	0.20	0.3
	2	98.8	-0.2	+1.0; -2.5	0.20	0.3
	0.25	89.6	-0.4	+1.5; -5.0	0.20	0.3
Slow	200	109.4	-0.2	±1.0	0.20	0.3
	2	89.8	-0.2	+1.0; -5.0	0.20	0.3
SEL	200	109.9	-0.1	±1.0	0.20	0.3
	2	90.0	0.0	+1.0; -2.5	0.20	0.3
	0.25	80.9	-0.1	+1.5; -5.0	0.20	0.3

Date of Calibration : 7-8 Feb. 2024

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## 10. Peak C sound level

Number of cycles in test signal	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Complete cycle	125.4	125.8	0.4	3.0	0.20	0.35
Positive half cycle	124.4	124.2	-0.2	2.0	0.20	0.35
Negative half cycle	124.4	124.2	-0.2	2.0	0.20	0.35

## 11. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Positive one-half cycle	Negative one-half cycle				
131.1	131.1	0.0	1.5	0.20	0.25

## 12. High-level stability

Time	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Begin	129.0	0.0	0.3	0.10	0.1
End	129.0				

End of Certificate

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This instrument has been calibrated against standards maintained at the 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.

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%.

Date of Calibration : 26 Jan. 2024

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

## CALIBRATION CERTIFICATE

Submitted by : Integrated Research Center Company Limited.

Address : 122 Moo 2, T.Thatoom, A.Srimahaphote, Prachinburi, 25140

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., A.Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Sound Level Meter

Manufacturer : ACO

Model : 6236

Serial No. : 192014

Microphone : 7052NR No.73303

Preamplifier : -

Standards used :

- Band Pass Filter Wavetek 752A S/N 90010494.
- Condenser Microphone Brüel&Kjær 4180 S/N 2889871.
- Decade Attenuator Ando AL-205 S/N 00464602.
- Function/Arbitrary Waveform Generator Agilent 33220A S/N MY44042668.
- Digital Function Synthesizer NF Electronic Instruments DF-193A S/N 122037.
- Digital Multimeter Fluke 8520A S/N 4985007.
- Pistonphone Rion NC-72 S/N 00402446.
- Measuring Amplifier Brüel&Kjær 2636 S/N 1537484.

Date of Receipt : 3 Jan. 2024

Date of Calibration : 26 Jan. 2024

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## 1. Absolute Sensitivity

Reference Acoustic Signal (dB)	Measured value (dB)	Deviation value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
113.91	113.7	113.9	0.0	1.0	0.30
					N/A

Note: The external calibration adjustment was firstly performed. The internal calibration adjustment was then completed at the display of 114.2 dB.

## 2. Self-generated noise

## 2.1 Normal test

Measured value (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
24.0	0.10	N/A

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

Frequency	Measured value (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Weighting			
A-Weight	13.2	0.10	N/A
C-Weight	18.4	0.10	N/A
Flat	22.3	0.10	N/A

Date of Calibration : 26 Jan. 2024

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## 3. Acoustical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response curve(dB)			Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	A-weight	C-weight	Flat			
125	0.6	0.8	0.6	1.5	0.45	0.6
1 000	-0.9	-1.0	-0.8	1.0	0.45	0.6
8 000	1.1	1.3	1.4	5.0	0.45	0.7

## 4. Electrical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response curve(dB)			Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	A-weight	C-weight	Flat			
63	0.1	0.1	0.0	2.0	0.20	0.6
125	0.0	0.1	0.0	1.5	0.20	0.6
250	0.0	0.1	0.1	1.5	0.20	0.6
500	0.0	0.1	0.1	1.5	0.20	0.6
1 000	0.0	0.0	0.0	1.0	0.20	0.6
2 000	-0.2	0.0	0.0	2.0	0.20	0.6
4 000	-0.5	-0.4	-0.1	3.0	0.20	0.6
8 000	-0.7	-0.6	-0.2	5.0	0.20	0.7

Date of Calibration : 26 Jan. 2024

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## 7. Level linearity on the reference level range

Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
123	123.0	0.0	1.1	0.30	0.3
122	122.0	0.0	1.1	0.30	0.3
121	121.0	0.0	1.1	0.30	0.3
120	120.1	0.1	1.1	0.30	0.3
119	119.0	0.0	1.1	0.30	0.3
114	114.0	0.0	1.1	0.30	0.3
109	109.0	0.0	1.1	0.30	0.3
104	104.0	0.0	1.1	0.30	0.3
99	99.0	0.0	1.1	0.30	0.3
94	94.0	0.0	1.1	0.30	0.3
89	89.0	0.0	1.1	0.30	0.3
84	84.0	0.0	1.1	0.30	0.3
79	79.1	0.1	1.1	0.30	0.3
74	74.1	0.1	1.1	0.30	0.3
69	69.1	0.1	1.1	0.30	0.3
64	64.0	0.0	1.1	0.30	0.3
59	59.0	0.0	1.1	0.30	0.3
54	54.0	0.0	1.1	0.30	0.3
49	49.0	0.0	1.1	0.30	0.3
44	44.0	0.0	1.1	0.30	0.3
39	39.0	0.0	1.1	0.30	0.3

Date of Calibration : 26 Jan. 2024

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## 5. Long-term stability

Time	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Begin	94.0	0.0	0.3	0.10	0.1
End	94.0				

## 6. Frequency and time weightings at 1 kHz

## 6.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
A-weight	94.0	0.0	0.2	0.20	0.2
C-weight	94.0	0.0	0.2	0.20	0.2
Flat	94.0	0.0	0.2	0.20	0.2

## 6.2 Time weightings at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Fast	94.0	0.0	0.1	0.20	0.2
Slow	94.0	0.0	0.1	0.20	0.2
Leq	94.0	0.0	0.1	0.20	0.2

Date of Calibration : 26 Jan. 2024

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## 7. Level linearity on the reference level range (cont.)

Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
34	34.1	0.1	1.1	0.30	0.3
33	33.1	0.1	1.1	0.30	0.3
32	32.2	0.2	1.1	0.30	0.3
31	31.2	0.2	1.1	0.30	0.3
30	30.3	0.3	1.1	0.30	0.3

## 8. Level linearity including the level range control

At reference sound level on the reference level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2(±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
40-130	94.0	93.9	-0.1	1.1	0.30	0.3
30-120	94.0	94.0	0.0	1.1	0.30	0.3
20-110	94.0	94.0	0.0	1.1	0.30	0.3
20-100	94.0	93.9	-0.1	1.1	0.30	0.3

Date of Calibration : 26 Jan. 2024

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### 8. Level linearity including the level range control

At reference level at 5 dB greater than the under-range on a level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2(±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
40-130	45	45.0	0.0	1.1	0.30	0.3
30-120	35	35.0	0.0	1.1	0.30	0.3
20-110	25	25.3	0.3	1.1	0.30	0.3
20-100	25	25.2	0.2	1.1	0.30	0.3
20-90	25	25.1	0.1	1.1	0.30	0.3
20-80	25	25.0	0.0	1.1	0.30	0.3

### 9. Tone burst response

Time Weighting	Toneburst Duration, Tb(ms)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2(±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Fast	200	116.0	0.0	±1.0	0.20	0.3
	2	97.6	-1.4	+1.0; -2.5	0.20	0.3
	0.25	89.2	-0.8	+1.5; -5.0	0.20	0.3
Slow	200	109.4	-0.2	±1.0	0.20	0.3
	2	89.7	-0.3	+1.0; -5.0	0.20	0.3
SEL	200	109.9	-0.1	±1.0	0.20	0.3
	2	89.9	-0.1	+1.0; -2.5	0.20	0.3
	0.25	80.9	-0.1	+1.5; -5.0	0.20	0.3

Date of Calibration : 26 Jan. 2024

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### 10. Peak C sound level

Number of cycles in test signal	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2(±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Complete cycle	125.4	125.8	0.4	3.0	0.20	0.35
Positive half cycle	124.4	124.3	-0.1	2.0	0.20	0.35
Negative half cycle	124.4	124.3	-0.1	2.0	0.20	0.35

### 11. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limit class 2(±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Positive one-half cycle	Negative one-half cycle				
133.0	133.0	0.0	1.5	0.20	0.25

### 12. High-level stability

Time	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Begin	129.0	0.0	0.3	0.10	0.1
End	129.0				

End of Certificate

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# Certificate of Calibration

Certificate No.: C01233749

Page: 2 of 2

Equipment:	Balance	Certificate No.:	C01233749
Model:	BSA224S-CW	Issued Date:	03 November 2023
Serial No. (or ID.):	34490341	Job No.:	WO-00008313
Manufacturer:	Sartorius	Page:	1 of 2
Condition:	In condition		

Customer: Integrated Research Center Co.,Ltd.  
122 Moo 2, Tambol Thatoom,  
Amphur Srimahaphote, Prachinburi 25140 Thailand

Environment Condition:	Temperature	23 °C	± 0.5 °C
	Humidity	61 %RH	± 4.3 %RH

**Calibration Place:** Double A (1991) Public Company Limited.  
(Water Laboratory IP1 (Balance Room))  
1 Moo 2, Thatoom, Srimahaphot,  
Prachinburi 25140 Thailand.

Calibration By: Mr. Piyapat Saidouno

Calibration Date: 02 November 2023

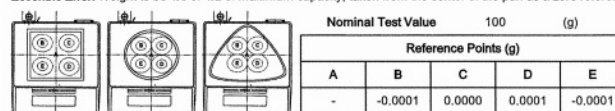
**The Method used:** In-house method, CAL-WI-47, based on UKAS Lab 14

**Traceability:** This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Co., Ltd. Certificate No. C02222418

**Calibration Results:**

Without Adjustment

**Eccentric Error:** Weight to be 1/3 or 1/2 of Maximum capacity, taken from the center of the pan as a zero reference.



**Repeatability:** Determination of the standard deviation of weighing balance., Readability 0.0001 (g)

Nominal test value (g)	Standard Deviation
20	0.00004
200	0.00006

Error of indication from nominal or conventional mass value., Readability	0.0001	(g)
---	--------	-----

Nominal Value	Conventional Mass	Displayed Value	Error of Indication	Uncertainty	k
(g)	(g)	(g)	(g)	(g)	
0.1	0.10000	0.1000	0.0000	0.00011	2.04
0.2	0.20000	0.2000	0.0000	0.00011	2.04
0.5	0.50000	0.5000	0.0000	0.00011	2.04
1	1.00000	1.0000	0.0000	0.00011	2.04
2	2.00001	2.0000	0.0000	0.00011	2.04
5	4.99999	5.0000	0.0000	0.00011	2.04
10	10.00001	10.0000	0.0000	0.00011	2.04
20	19.99998	20.0000	0.0000	0.00012	2.03
50	49.99994	50.0000	0.0001	0.00013	2.02
100	99.99997	100.0000	0.0000	0.00017	2.01
200	199.99993	199.9999	0.0000	0.00030	2.00

### The End of Certificate

The measurement uncertainty stated in the measurement according to the International System of Units (SI), previous laboratory for measurements for international or national standard or other recognized national standard laboratories.

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

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

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2533 Sukhumvit Road, Bangchak, Phra Khanong, Bangkok 10260  
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

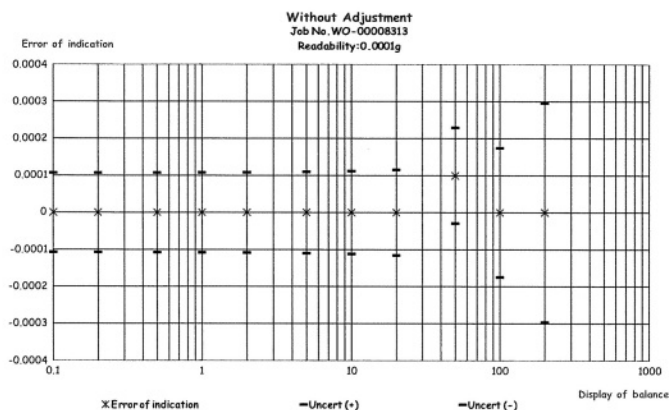
Delivering Growth – in Asia and Beyond.

CAL-FM-C01-14: 12 Sep 2022

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DKSH Technology Limited  
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## Delivering Growth – in Asia and Beyond

CAL-FM-C01-14; 12 Sep 2022



ใบตรวจสอบสภาพเครื่องจักร

เลขที่ใบงาน: WO-00008313

ชนิดเครื่องมือ: Balance

รุ่น: BSA224S-CW

หมายเลขเครื่อง: 34490341

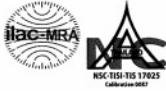
ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
02 Nov 2023			02 Nov 2023		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		<b>General</b>			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ/Adapter, power supply 220/110V	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสมบูรณ์ชุดกระดกกันลม (Cover)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. ความสมบูรณ์ชุดของระดัมน้ำ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การปรับระดับของขาตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การตบตนเองของไมกีด	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. ความสมบูรณ์ของ Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. การแสดงผลของ Display หลังวางน้ำหนัก	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. ชุดรองจานแข็ง (Stopper) / pan support	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. การทำงานของ Function Internal / External	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. ความสะอาดของตัวเครื่องภายนอกและแกน load cell	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	11. สภาวะแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

หมายเหตุเพิ่มเติม/ข้อแนะนำ :

Service Engineer

บริษัท ดีเคเอส อีที จำกัด  
DKSH Technology Limited  
2533 สุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260  
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## Certificate of Calibration

Certificate No.: C06230521

Page 2 of 3

Equipment: SPECTROPHOTOMETER  
Model: DR3900  
Serial No. (or ID.): 2008400  
Manufacturer: HACH  
Condition: In Condition

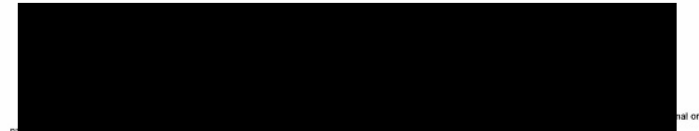
Certificate No.: C06230521  
Issued Date: 03 November 2023  
Job No.: WO-00008310  
Page: 1 of 3

Customer: Integrated Research Center Co.,Ltd.  
122 Moo 2, Tambol Thatoom,  
Amphur Srimahaphote, Prachinburi 25140 Thailand

Environment Condition: Temperature 25.9 °C ± 0.2 °C  
Humidity 65.0 %RH ± 2.7 %RH

Calibration Place: Double A (1991) Public Company Limited. (Water Laboratory IP1)  
1 Moo 2, Thatoom, Srimahaphot,  
Prachinburi 25140 Thailand.

Calibration By: Mr.Piyapat Saidoung  
Calibration Date: 31 October 2023  
The Method used: In house method, CAL-VI-24, base on ASTM E 275-08 and ASTM E 387-04  
Traceability: This certificate is traceable to the CRM maintained by National Institute of Standards and Technology (NIST) through Starna Scientific Limited.  
The standard for Wavelength Certificate No. 105931 and 111584  
The standard for Photometric Certificate No. 105940  
The standard for Stray light Certificate No. 101040



The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).  
These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

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CAL-FM-C06-15: 12 Sep 2022

Calibration Results:  
Without Adjustment

Wavelength Accuracy (nm), The spectral bandwidth of Std at 5 nm and UUC at 5 nm				
Standard Wavelength	Unit Under Calibration	Correction	Uncertainty	
418.40	418	0.40	0.59	
459.30	459	0.30	0.59	
638.00	638	0.00	0.59	
585.56	586	-0.44	0.59	
747.61	748	-0.39	0.59	
807.04	807	0.04	0.59	

Photometric Accuracy (Absorbance)				
Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
420 nm	0.0000	0.000	0.0000	0.0045
	0.5890	0.588	0.0010	0.0045
	0.7604	0.759	0.0014	0.0045
440 nm	1.0241	1.024	0.0001	0.0045
	0.0000	0.000	0.0000	0.0045
	0.5782	0.577	0.0012	0.0045
465 nm	0.7430	0.740	0.0030	0.0045
	1.0016	1.001	0.0006	0.0045
	0.0000	0.000	0.0000	0.0045
546.1 nm	0.5283	0.529	-0.0007	0.0045
	0.6854	0.685	0.0004	0.0045
	0.9509	0.951	-0.0001	0.0045
590 nm	0.0000	0.000	0.0000	0.0045
	0.5457	0.544	0.0017	0.0045
	0.6944	0.692	0.0024	0.0045
635 nm	0.9965	0.995	0.0015	0.0045
	0.0000	0.000	0.0000	0.0045
	0.5837	0.581	0.0027	0.0045
807 nm	0.7223	0.718	0.0043	0.0045
	1.0935	1.089	0.0045	0.0045
	0.0000	0.000	0.0000	0.0045
807 nm	0.5675	0.565	0.0025	0.0045
	0.6900	0.686	0.0040	0.0045
	1.0862	1.083	0.0032	0.0045

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CAL-FM-C06-15: 12 Sep 2022

Certificate No.: C06230521

Page 3 of 3

Calibration Results:  
Without Adjustment

Stray light *			
Standard: cut-off	UUC: Wavelength (nm)	UUC: Transmission (%)	Absorbance (A)
391.94 +/- 0.11 nm	392	4.2	1.377

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

The End of Certificate

## ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: WO-00008310

ชนิดเครื่องมือ: SPECTROPHOTOMETER รุ่น: DR3900

หมายเลขเครื่อง: 2008400

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
31 Oct 2023			31 Oct 2023		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. ความสมบูรณ์เครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสะอาด ( ช่องใส่ตัวอย่าง, ภายใน-นอกเครื่อง)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. สวิทช์ ปิด – เปิด เครื่อง (On-Off Switch)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. ปุ่มกด (Keypad)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. หน้าจอ (Display, Screen Contrast)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
		Spectrophotometer			
<input type="checkbox"/>	<input type="checkbox"/>	6. แรงดันไฟฟ้า (Battery Backup) >= 2.5 VDC	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	7. ตัวหมุนเลือกความยาวคลื่น (Wavelength Control)	<input type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. ความยาวคลื่น (Wavelength Check)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	807nm=807.0nm
<input type="checkbox"/>	<input type="checkbox"/>	9. แสงอัลตราไวโอเล็ต (UV < 3,000 hour)	<input type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. แสงที่มองเห็น (Visible < 5,000 hour)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	11. ข้องวัดหลายตัวอย่าง (Carousel Module)	<input type="checkbox"/>	<input type="checkbox"/>	
		pH Meter and Conductivity Meter			
<input type="checkbox"/>	<input type="checkbox"/>	12. อิเล็กโทรด ( Electrode and Connection Cable )	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	13. ระดับสารละลายใน Electrode (Level KCl)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	14. ฝาปิดกันปลาย Electrode (Dust Protection Hood)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	15. ขาจับอิเล็กโทรด (Stand)	<input type="checkbox"/>	<input type="checkbox"/>	
		Turbidimeter			
<input type="checkbox"/>	<input type="checkbox"/>	16. ค่าความขุ่นที่ต่ำสุด (No Sample)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	17. ระดับการส่องสว่างของแสง (>= 2.5 ไม่นเกิน 3.0)	<input type="checkbox"/>	<input type="checkbox"/>	
		Automatic titrator			
<input type="checkbox"/>	<input type="checkbox"/>	18. สภาพ Piston Burettes	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	19. Function Rinsing and Dosing	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	20. ระบบท่อสายยางและอุปกรณ์ประกอบ	<input type="checkbox"/>	<input type="checkbox"/>	

เพื่อแจ้ง/ขอแนะนำ:

Service Engineer

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DKSH Technology Limited  
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CAL-FM-C06-15: 12 Sep 2022

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CAL-FM-R31-03: 20 Jul 2022



## Certificate of Calibration

Certificate No.: C06230520 Page 2 of 3

Equipment: SPECTROPHOTOMETER Certificate No.: C06230520  
Model: DR3900 Issued Date: 03 November 2023  
Serial No. (or ID.): 1918120 Job No.: WO-00008310  
Manufacturer: HACH Page: 1 of 3  
Condition: In Condition

Customer: Integrated Research Center Co.,Ltd.  
122 Moo 2, Tambol Thatoom,  
Amphur Srimahaphote, Prachinburi 25140 Thailand

Environment Condition: Temperature 25.9 °C ± 0.2 °C  
Humidity 65.0 %RH ± 2.7 %RH

Calibration Place: Double A (1991) Public Company Limited, (Water Laboratory IP1)  
1 Moo 2, Thatoom, Srimahaphot,  
Prachinburi 25140 Thailand.

Calibration By: Mr.Piyapat Saidoung  
Calibration Date: 31 October 2023  
The Method used: In house method, CAL-WI-24, base on ASTM E 275-08 and ASTM E 387-04  
Traceability: This certificate is traceable to the CRM maintained by National Institute of Standards and Technology (NIST) through Starna Scientific Limited.  
The standard for Wavelength Certificate No. 105931 and 111584  
The standard for Photometric Certificate No. 105940  
The standard for Stray light Certificate No. 101040

Calibration Results:  
Without Adjustment

Wavelength Accuracy (nm), The spectral bandwidth of Std at 5 nm and UUC at 5 nm				
Standard Wavelength	Unit Under Calibration	Correction	Uncertainty	
418.40	418	0.40	0.59	
459.30	459	0.30	0.59	
638.00	638	0.00	0.59	
585.56	586	-0.44	0.59	
747.61	748	-0.39	0.59	
807.04	807	0.04	0.59	

Photometric Accuracy (Absorbance)				
Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
420 nm	0.0000	0.000	0.0000	0.0045
	0.5890	0.588	0.0010	0.0045
	0.7604	0.758	0.0024	0.0045
440 nm	1.0241	1.024	0.0001	0.0045
	0.0000	0.000	0.0000	0.0045
	0.5782	0.577	0.0012	0.0045
465 nm	0.7430	0.740	0.0030	0.0045
	1.0016	1.001	0.0006	0.0045
	0.0000	0.000	0.0000	0.0045
546.1 nm	0.5283	0.529	-0.0007	0.0045
	0.6854	0.685	0.0004	0.0045
	0.9509	0.952	-0.0011	0.0045
590 nm	0.0000	0.000	0.0000	0.0045
	0.5457	0.544	0.0017	0.0045
	0.6944	0.692	0.0024	0.0045
635 nm	0.9965	0.995	0.0015	0.0045
	0.0000	0.000	0.0000	0.0045
	0.5837	0.581	0.0027	0.0045
807 nm	0.7223	0.719	0.0033	0.0045
	1.0935	1.090	0.0035	0.0045
	0.0000	0.000	0.0000	0.0045
807 nm	0.5675	0.565	0.0025	0.0045
	0.6900	0.687	0.0030	0.0045
	1.0862	1.084	0.0022	0.0045

This certificate is issued for the test or measurement according to the international system of units (SI) to provide traceability to measurement of international or national standard or other recognized national standard laboratories.  
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).  
These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.  
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CAL-FM-C06-15: 12 Sep 2022

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CAL-FM-C06-15: 12 Sep 2022

Certificate No.: C06230520 Page 3 of 3

Calibration Results:  
Without Adjustment

Stray light *			
Standard: cut-off	UUC: Wavelength (nm)	UUC: Transmission (%T)	Absorbance (A)
391.94 +/- 0.11 nm	392	3.5	1.456

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

The End of Certificate

## ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: WO-00008310

ชนิดเครื่องมือ: SPECTROPHOTOMETER รุ่น: DR3900

หมายเลขเครื่อง: 1918120

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
31 Oct 2023			31 Oct 2023		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		<i>General</i>			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. ความสมบูรณ์เครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสะอาด ( ช่องใส่ตัวอย่าง, ภายใน-นอกเครื่อง)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. สวิทช์ ปิด – เปิด เครื่อง (On-Off Switch)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. ปุ่มกด (Keypad)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. หน้าจอ (Display, Screen Contrast)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
		<i>Spectrophotometer</i>			
<input type="checkbox"/>	<input type="checkbox"/>	6. แบตเตอรี่ไฟฟ้า (Battery Backup) >= 2.5 VDC	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	7. ตัวหมุนเลือกความยาวคลื่น (Wavelength Control)	<input type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. ความยาวคลื่น (Wavelength Check)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	807nm=807.2nm
<input type="checkbox"/>	<input type="checkbox"/>	9. แหล่งกำเนิดแสง (UV < 3,000 hour)	<input type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. แหล่งกำเนิดแสง (Visible < 5,000 hour)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	11. ช่องวัดหลายตัวอย่าง (Carousel Module)	<input type="checkbox"/>	<input type="checkbox"/>	
		<i>pH Meter and Conductivity Meter</i>			
<input type="checkbox"/>	<input type="checkbox"/>	12. อิเล็กโทรด ( Electrode and Connection Cable )	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	13. ระดับสารละลายใน Electrode (Level KCl)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	14. ฝาปิดกันปลาย Electrode (Dust Protection Hood)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	15. ขาตั้งอิเล็กโทรด (Stand)	<input type="checkbox"/>	<input type="checkbox"/>	
		<i>Turbidimeter</i>			
<input type="checkbox"/>	<input type="checkbox"/>	16. ค่าความขุ่นที่ต่ำสุด (No Sample)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	17. ระดับการส่องสว่างของแสง (>= 2.5 ไม่นเกิน 3.0)	<input type="checkbox"/>	<input type="checkbox"/>	
		<i>Automatic titrator</i>			
<input type="checkbox"/>	<input type="checkbox"/>	18. สภาพ Piston Burettes	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	19. Function Rinsing and Dosing	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	20. ระบบท่อสายยางและอุปกรณ์ประกอบ	<input type="checkbox"/>	<input type="checkbox"/>	

เพิ่มเติมนัดหมาย :

Service Engineer

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CAL-FM-C06-15: 12 Sep 2022

Delivering Growth - in Asia and Beyond.

CAL-FM-R31-03: 20 Jul 2022



## Certificate of Calibration

Certificate No.: C07230542 Page 2 of 3

Equipment: pH METER  
Model: SevenEasy  
Serial No. (or ID.): 1232025225  
Manufacturer: Mettler Toledo  
Electrode Serial No.: 1220653  
Condition: In Condition

Certificate No.: C07230542  
Issued Date: 3 November 2023  
Job No.: WO-00008310  
Page: 1 of 3  
Model: 405-60-T-PA-S8/120 pH Brand: Mettler Toledo

Customer: Integrated Research Center Co.,Ltd.  
122 Moo 2, Tambol Thatoom,  
Amphur Srimahaphote, Prachinburi 25140 Thailand

Environment Condition: Temperature 26.5 °C ± 0.2 °C  
Humidity 66.5 %RH ± 2.2 %RH

Calibration Place: Double A (1991) Public Company Limited. (Water Laboratory IP1)  
1 Moo 2, Thatoom, Srimahaphot,  
Prachinburi 25140 Thailand.

Calibration By: Mr.Piyapat Saidoung  
Calibration Date: 1 November 2023

The Method used: In house method, CAL-WI-58, base on ASTM E 70-07

Traceability: This certificate is traceable to SI Units, Sample Test is assured through primary measurement method Harned cell, through CPAchem Ltd. (ISO/IEC 17034) Certificate No. 873613, 873615, 931984 And pH Scale traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through Industrial Foundation Electrical and Electronics Institute Certificate No. CA20230350EA

### Calibration Results:

#### pH Scale

Input	pH Meter Reading			Uncertainty of Measurement (mV)	Coverage Factor (k)
	(mV)	Error (mV)	(pH)		
414.12	414	-0.12	0.00	0.58	2.00
354.96	355	0.04	1.00	0.58	2.00
295.8	296	0.20	2.00	0.58	2.00
236.64	236	-0.64	3.00	0.58	2.00
177.48	177	-0.48	4.00	0.58	2.00
118.32	118	-0.32	5.00	0.58	2.00
59.16	59	-0.16	6.00	0.58	2.00
0	0	0.00	7.00	0.58	2.00
-59.16	-59	0.16	8.00	0.58	2.00
-118.32	-119	-0.68	9.00	0.58	2.00
-177.48	-178	-0.52	10.00	0.58	2.00
-236.64	-237	-0.36	11.00	0.58	2.00
-295.8	-296	-0.20	12.00	0.58	2.00
-354.96	-355	-0.04	13.00	0.58	2.00
-414.12	-414	0.12	13.99	0.58	2.00



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

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

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CAL-FM-C07-13: 12 Sep 2022

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Certificate No.: C07230542 Page 3 of 3



### Electrode Test Results\*

The three-point calibration using three standard buffer solutions; pH 4.008, pH 6.986 and pH 9.997

-During calibration, display of pH meter reading: pH 4.00, pH 7.00 and pH 10.01

The practical slope of the pH electrode; 57.91 (mV/pH), 97.88%

The zero point of the pH electrode; 7.10 (pH)

### Sample Test Results

Standard Buffer Solution (pH)	Unit Under Calibration (pH)	Difference (pH)	Uncertainty of Measurement (pH)	Coverage Factor (k)
4.008	4.00	-0.008	0.0072	2.00
6.986	7.00	0.014	0.010	2.00
9.997	10.01	0.013	0.014	2.00

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

The End of Certificate

### ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: WO-00008310

ชนิดเครื่องมือ: pH METER

รุ่น: SevenEasy

หมายเลขเครื่อง: 1232025225

ตรวจสอบ (วัน)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
01 Nov 2023			01 Nov 2023		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		<b>General</b>			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. ความสมบูรณ์เครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสะอาด (ช่องใส่ตัวอย่าง, ภายใน-นอกเครื่อง)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. สวิตซ์ ปิด - เปิด เครื่อง (On-Off Swich)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. ปุ่มกด (Keypad)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. หน้าจอ (Display, Screen Contrast)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
		<b>Spectrophotometer</b>			
<input type="checkbox"/>	<input type="checkbox"/>	6. แรงดันไฟฟ้า (Battery Backup) >= 2.5 VDC	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	7. ตัวหมุนเลือกความยาวคลื่น (Wavelength Control)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	8. ความยาวคลื่น (Wavelength Check)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	9. แหล่งกำเนิดแสง (UV < 3,000 hour)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	10. แหล่งกำเนิดแสง (Visible < 5,000 hour)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	11. ช่องวัดหลายตัวอย่าง (Carousel Module)	<input type="checkbox"/>	<input type="checkbox"/>	
		<b>pH Meter and Conductivity Meter</b>			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	12. อิเล็กโทรด ( Electrode and Connection Cable )	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	13. ระดับสารละลายใน Electrode (Level KCl )	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	14. ฝาปิดกันปลาย Electrode (Dust Protection Hood)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	15. ขาจับอิเล็กโทรด (Stand)	<input type="checkbox"/>	<input type="checkbox"/>	
		<b>Turbidimeter</b>			
<input type="checkbox"/>	<input type="checkbox"/>	16. ค่าความขุ่นที่ต่ำสุด (No Sample)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	17. ระดับการส่องสว่างของแสง (>= 2.5 ไม่น้อย 3.0)	<input type="checkbox"/>	<input type="checkbox"/>	
		<b>Automatic titrator</b>			
<input type="checkbox"/>	<input type="checkbox"/>	18. สภาพ Piston Burettes	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	19. Function Rinsing and Dosing	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	20. ระบบท่อสายยางและอุปกรณ์ประกอบ			

เพิ่มเติมข้อแนะนำ :

Service Engineer

บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด  
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CAL-FM-R31-03: 20 Jul 2022



## Certificate of Calibration

Certificate No.: C15231038

Page: 2 of 2

Equipment: Digital Thermometer with Probe  
 Model: SevenEasy  
 Serial No.: 1232025225  
 Manufacturer: Mettler Toledo  
 Condition: In Condition

Certificate No.: C15231038  
 Issued Date: 03 November 2023  
 Job No.: WO-00008310  
 ID No.: -  
 Page: 1 of 2

Customer: Integrated Research Center Co.,Ltd.  
 122 Moo 2, Tambol Thatoom,  
 Amphur Srimahaphote, Prachinburi 25140 Thailand

Environment Condition: Temperature: 30 °C ± 10 °C  
 Humidity: 55 %RH ± 25 %RH  
 Voltage: 220 VAC ± 10 %

Calibration Place: Double A (1991) Public Company Limited. (Water Laboratory IP1)  
 1 Moo 2, Thatoom, Srimahaphot,  
 Prachinburi 25140 Thailand.

Calibration By: Mr. Piyapat Saldoung  
 Calibration Date: 31 October 2023  
 The Method used: In house method, CAL-WI-69, by comparison with standard thermometer  
 Traceability: This certificate is traceable to the International System of Unit maintained by Quality Reborn Co.,Ltd. (QR) Certificate No. QR22-2916

## Calibration Results:

## Without Adjustment

Sensor Type: RTD		Channel: Correction		
Diameter (mm) 15		Length (mm): 120		Immersion (mm): 110
Calibrate Point (°C)	STD. Reading (°C)	UUC. Reading (°C)	Correction of UUC (°C)	Uncertainty (± °C)
25.0	24.994	25.0	-0.006	0.20

The End of Certificate



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

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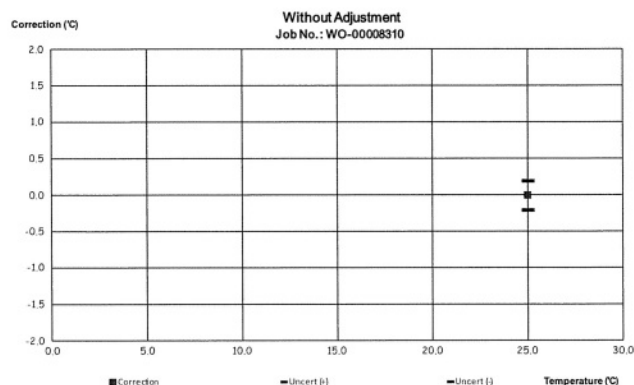
CAL-FM-C15-14: 06 Dec 2022

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CAL-FM-C15-14: 06 Dec 2022

## ใบตรวจสอบสภาพเครื่องมือวัดอุณหภูมิ



เลขที่ใบงาน: WO-00008310

ชนิดเครื่องมือ: Digital Thermometer with Probe

รุ่น: SevenEasy

หมายเลขเครื่อง: 1232025225

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
31-Oct-2023			31-Oct-2023		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. Adapter / Power supply 220 / 110 VAC	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Main Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การทำงาน Selector Key	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การแสดงผล Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	6. Battery	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สภาพตัวเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. สภาพ Sensor ( In / Ex )	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ข้อเสนอแนะ:

Service Engineer

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## Certificate of Calibration

Equipment: pH METER  
Model: Seven2Go S2  
Serial No. (or ID.): B633886757  
Manufacturer: Mettler Toledo  
Electrode Serial No.: 2351365  
Condition: In Condition

Certificate No.: C07230543  
Issued Date: 3 November 2023  
Job No.: WO-00008310  
Page: 1 of 3  
Model: InLabExpertGo-ISM Brand: Mettler Toledo

Customer: Integrated Research Center Co.,Ltd.  
122 Moo 2, Tambol Thatoom,  
Amphur Srimahaphote, Prachinburi 25140 Thailand

Environment Condition: Temperature 26.5 °C ± 0.2 °C  
Humidity 66.5 %RH ± 2.2 %RH

Calibration Place: Double A (1991) Public Company Limited. (Water Laboratory IP1)  
1 Moo 2, Thatoom, Srimahaphot,  
Prachinburi 25140 Thailand.

Calibration By: Mr.Piyapat Saidoung  
Calibration Date: 31 October 2023

The Method used: In house method, CAL-WI-58, base on ASTM E 70-07

Traceability: This certificate is traceable to SI Units, Sample Test is assured through primary measurement method Harned cell, through CPAchem Ltd. (ISO/IEC 17034) Certificate No. 873613, 873615, 931984 And pH Scale traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through Industrial Foundation Electrical and Electronics Institute Certificate No. CA20230350EA

## Calibration Results:

## pH Scale

Input	pH Meter Reading			Uncertainty of Measurement (mV)	Coverage Factor (k)
	(mV)	Error (mV)	(pH)		
414.12	414	-0.12	0.02	0.58	2.00
354.96	355	0.04	1.02	0.58	2.00
295.8	295	-0.80	2.02	0.58	2.00
236.64	236	-0.64	3.02	0.58	2.00
177.48	177	-0.48	4.01	0.58	2.00
118.32	118	-0.32	5.01	0.58	2.00
59.16	59	-0.16	6.00	0.58	2.00
0	0	0.00	7.00	0.58	2.00
-59.16	-59	0.16	8.00	0.58	2.00
-118.32	-118	0.32	8.99	0.58	2.00
-177.48	-177	0.48	9.99	0.58	2.00
-236.64	-236	0.64	10.98	0.58	2.00
-295.8	-295	0.80	11.98	0.58	2.00
-354.96	-355	-0.04	12.98	0.58	2.00
-414.12	-414	0.12	13.98	0.58	2.00

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

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## Electrode Test Results\*

The three-point calibration using three standard buffer solutions; pH 4.008, pH 6.986 and pH 9.997  
-During calibration, display of pH meter reading; pH 4.01, pH 7.00 and pH 10.01  
The practical slope of the pH electrode; 57.84 (mV/pH), 97.77%  
The zero point of the pH electrode; 7.08 (pH)

## Sample Test Results

Standard Buffer Solution (pH)	Unit Under Calibration (pH)	Difference (pH)	Uncertainty of Measurement (pH)	Coverage Factor (k)
4.008	4.01	0.002	0.0072	2.00
6.986	7.00	0.014	0.011	2.00
9.997	10.01	0.013	0.014	2.00

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

The End of Certificate

## ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: WO-00008310

ชนิดเครื่องมือ: pH METER

รุ่น: Seven2Go S2

หมายเลขเครื่อง: B633886757

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
31 Oct 2023	ปกติ	ไม่ปกติ	31 Oct 2023	ปกติ	ไม่ปกติ
<input checked="" type="checkbox"/>	<input type="checkbox"/>		<b>General</b>		
<input checked="" type="checkbox"/>	<input type="checkbox"/>		1. ความสมบูรณ์เครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>		2. ความสะอาด (ช่องใส่ตัวอย่าง, ภายใน-นอกเครื่อง)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>		3. สวิตช์ ปิด - เปิด เครื่อง (On-Off Switch)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>		4. ปุ่มกด (Keypad)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>		5. หน้าจอ (Display, Screen Contrast)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>		<b>Spectrophotometer</b>		
<input type="checkbox"/>	<input type="checkbox"/>		6. แรงดันไฟฟ้า (Battery Backup) >= 2.5 VDC	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>		7. ตัวหมุนเลือกความยาวคลื่น (Wavelength Control)	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>		8. ความยาวคลื่น (Wavelength Check)	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>		9. แหล่งกำเนิดแสง (UV < 3,000 hour)	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>		10. แหล่งกำเนิดแสง (Visible < 5,000 hour)	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>		11. ช่องวัดหลายตัวอย่าง (Carousel Module)	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>		<b>pH Meter and Conductivity Meter</b>		
<input checked="" type="checkbox"/>	<input type="checkbox"/>		12. อิเล็กโทรด (Electrode and Connection Cable)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>		13. ระดับสารละลายใน Electrode (Level KCl)	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>		14. ฝาปิดกันปลาย Electrode (Dust Protection Hood)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>		15. ขาตั้งอิเล็กโทรด (Stand)	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>		<b>Turbidimeter</b>		
<input type="checkbox"/>	<input type="checkbox"/>		16. ค่าความขุ่นที่ต่ำสุด (No Sample)	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>		17. ระดับการส่องสว่างของแสง (>= 2.5 ไม่น้อย 3.0)	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>		<b>Automatic titrator</b>		
<input type="checkbox"/>	<input type="checkbox"/>		18. สภาพ Piston Burettes	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>		19. Function Rinsing and Dosing	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>		20. ระบบท่อสายยางและอุปกรณ์ประกอบ	<input type="checkbox"/>	<input type="checkbox"/>

เพิ่มเติมข้อแนะนำ :

Service Engineer

บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด  
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CAL-FM-C07-13: 12 Sep 2022

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2533 ซอยสุขุมวิท 102/6 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260  
2533 Sukhumvit Road, Bangkok, Phra Khanong, Bangkok 10260  
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CAL-FM-R31-03: 20 Jul 2022



## Certificate of Calibration

Certificate No.: C15231039

Page: 2 of 2

Equipment: Digital Thermometer with Probe  
Model: Seven2Go S2  
Serial No.: B633886757  
Manufacturer: Mettler Toledo  
Condition: In Condition

Certificate No.: C15231039  
Issued Date: 03 November 2023  
Job No.: WO-00008310  
ID No.: -  
Page: 1 of 2

Customer: Integrated Research Center Co.,Ltd.  
122 Moo 2, Tambol Thatoom,  
Amphur Srimahaphote, Prachinburi 25140 Thailand

Environment Condition: Temperature: 30 °C ± 10 °C  
Humidity: 55 %RH ± 25 %RH  
Voltage: 220 VAC ± 10 %

Calibration Place: Double A (1991) Public Company Limited. (Water Laboratory IP1)  
1 Moo 2, Thatoom, Srimahaphot,  
Prachinburi 25140 Thailand.

Calibration By: Mr. Piyapat Saidoung  
Calibration Date: 31 October 2023  
The Method used: In house method, CAL-WI-69, by comparison with standard thermometer  
Traceability: This certificate is traceable to the International System of Unit maintained by Quality Reborn Co.,Ltd. (QR) Certificate No. QR22-2916

## Calibration Results:

## Without Adjustment

Sensor Type: RTD		Channel: Correction		
Diameter (mm) 15		Length (mm): 120		Immersion (mm): 110
Calibrate Point.(°C)	STD. Reading (°C)	UUC. Reading (°C)	Correction of UUC (°C)	Uncertainty (± °C)
25.0	24.996	25.1	-0.104	0.20

The End of Certificate

Person in charge

Authorized signatory

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

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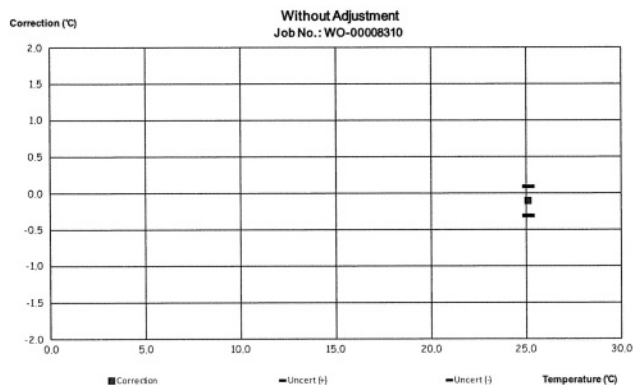
CAL-FM-C15-14: 06 Dec 2022

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CAL-FM-C15-14: 06 Dec 2022

## ใบตรวจสอบสภาพเครื่องมือวัดอุณหภูมิ



เลขที่ใบงาน: WO-00008310

ชนิดเครื่องมือ: Digital Thermometer with Probe

รุ่น: Seven2Go S2

หมายเลขเครื่อง: B633886757

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
31-Oct-2023			31-Oct-2023		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	2. Adapter / Power supply 220 / 110 VAC	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Main Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การทำงาน Selector Key	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การแสดงผล Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. Battery	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สภาพตัวเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. สภาพ Sensor ( In / Ex )	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ขอแนะนำ :

Service Engineer

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# Certificate of Calibration

Certificate No.: C31232274

Page: 2 of 4

Equipment: Hot Air Oven  
Model: UF110  
Serial No.(or ID): B417.1014  
Manufacturer: Memmert  
Condition: In Condition  
Shelves(pc.): 2

Certificate No.: C31232274  
Issued Date: 09 November 2023  
Job No.: WO-00008310  
Page: 1 of 4  
Ventilation Valve: Closed

Customer: Integrated Research Center Co.,Ltd.  
122 Moo 2, Tambol Thatoom,  
Amphur Srimahaphote, Prachinburi 25140 Thailand

Environment Condition: Temperature: 24 °C ± 1.0 °C  
Humidity: 54 %RH ± 5.1 %RH  
Voltage: 230 VAC ± 3.2 VAC

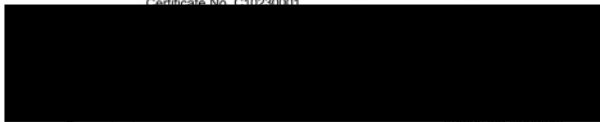
Calibration Place: Double A (1991) Public Company Limited, ( Water Laboratory IP1 )  
1 Moo 2, Thatoom, Srimahaphot,  
Prachinburi 25140 Thailand.

Calibration By: Mr. Suphanimit Khamnonphoom

Calibration Date: 01 November 2023

The Method used: In house method, CAL-WI-16, base on TLAS-G20

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Limited.  
Certificate No. C10230001

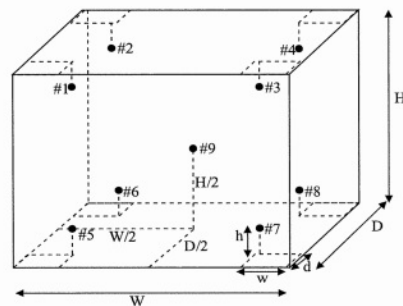


This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.  
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).  
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## Standard Installation Locations

Volume (Calibration Zone)= 50 (Liters)

Inside chamber: W = 56 (cm) D = 40 (cm) H = 48 (cm)

Standard Locations (#1, #2, #3, #4): w = 6 (cm) d = 5 (cm) h = 5 (cm)

Standard Locations (#5, #6, #7, #8): w = 6 (cm) d = 5 (cm) h = 5 (cm)

#9: Geometric center of the chamber

Position of Std	#1	#2	#3	#4	#5	#6	#7	#8	#9
Channel of Logger	301	302	303	304	305	306	307	308	309

## Definitions

**Indicating Temperature:** The average reading of indicating device which forms the integral part of the enclosure.

**Measured Temperature:** The average reading of standards at any positions or location.

**Measured Uniformity:** The maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time or at close observation time as possible to determine the temperature pattern or homogeneity with the chamber at steady-state. The reference probe is preferably located in the geometric center of the chamber.

**Measured Stability:** The one-half of greatest maximum difference of measured temperatures at any one probe.

**Overall Variation:** The difference of maximum and minimum measured temperatures throughout observation time.

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Certificate No.: C31232274

Page: 3 of 4

## Calibration Results:

### Before adjustment

Setting: Indicating: #1: #2: #3: #4: #5: #6: #7: #8: #9:  
180.0 180.0 181.69 180.65 181.55 180.91 179.79 179.96 179.14 179.90 180.11

### After adjustment

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 104.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	104.57	0.57	0.39
#2	104.23	0.23	0.39
#3	104.52	0.52	0.39
#4	104.30	0.30	0.39
#5	103.71	-0.29	0.39
#6	103.85	-0.15	0.39
#7	103.47	-0.53	0.39
#8	103.85	-0.15	0.39
#9	103.90	-0.10	0.39

### Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
104.0	104.0	104.0	104.57	104.23	104.52	104.30	103.71	103.85	103.47	103.85	103.90	0.39

### Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
104.0	0.70	0.07	1.20

Note: \* Maximum uncertainty of the each position



Certificate No.: C31232274

Page: 4 of 4

## After adjustment (Cont.)

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 180.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	181.34	1.34	0.51
#2	180.32	0.32	0.50
#3	181.19	1.19	0.50
#4	180.56	0.56	0.50
#5	179.41	-0.59	0.50
#6	179.63	-0.37	0.50
#7	178.79	-1.21	0.50
#8	179.57	-0.43	0.50
#9	179.77	-0.23	0.50

### Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
180.0	180.0	180.0	181.34	180.32	181.19	180.56	179.41	179.63	178.79	179.57	179.77	0.51

### Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
180.0	1.66	0.12	2.75

Note: \* Maximum uncertainty of the each position

The End of Certificate

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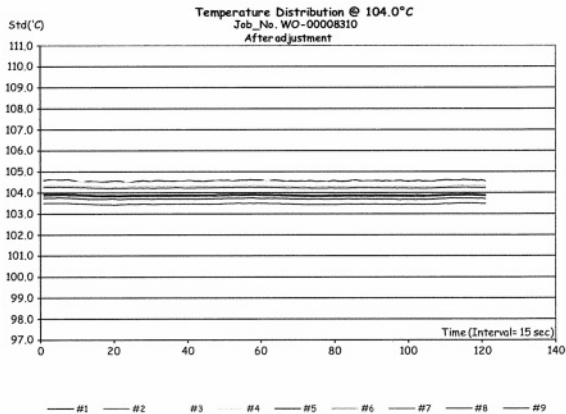
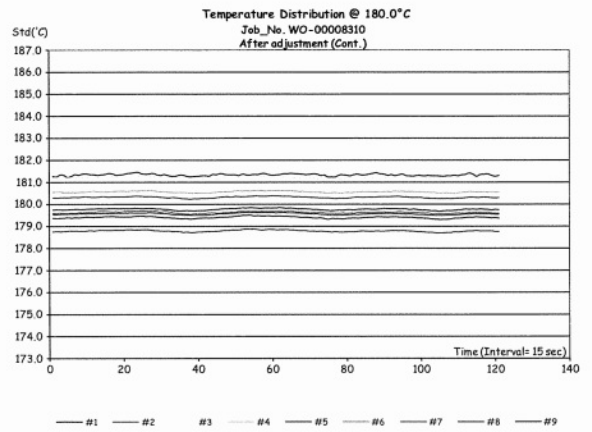
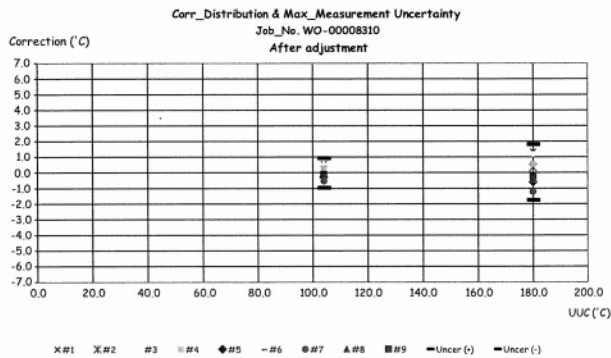
CAL-FM-C31-10: 12 Sep 2022

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## ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: WO-00008310

ชนิดเครื่องมือ: Hot Air Oven

รุ่น: UF110

หมายเลขเครื่อง: B417.1014

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
01 Nov 2023			01 Nov 2023		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การแสดงผล Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การทำงาน พัดลม	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. สภาพ Lever of Ventilation valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สภาพ Lever door open / close	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. สภาพ Door seal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. การทำงานของระบบ Safety	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	10. การทำงานของระบบทำความเย็น	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input type="checkbox"/>	<input type="checkbox"/>	11. การทำงานของระบบทำความร้อน	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	12. สภาพตัวเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	13. สภาพแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ข้อแนะนำ : \_\_\_\_\_

Mr. Suphanimit Khamnonphoem  
Service Engineer



## Certificate of Calibration

Equipment:	Oven	Certificate No.:	C31232273
Model:	ED 115	Issued Date:	09 November 2023
Serial No.(or ID):	20190000012946	Job No.:	WO-00008310
Manufacturer:	Binder	Page:	1 of 4
Condition:	In Condition	Ventilation Valve:	Closed
Shelves(pc.):	2		

Customer: Integrated Research Center Co.,Ltd.  
122 Moo 2, Tambol Thatoom,  
Amphur Srimahaphote, Prachinburi 25140 Thailand

Environment Condition: Temperature: 24 °C ± 0.9 °C  
Humidity: 54 %RH ± 5.1 %RH  
Voltage: 230 VAC ± 3.2 VAC

Calibration Place: Double A (1991) Public Company Limited. ( Water Laboratory IP1 )  
1 Moo 2, Thatoom, Srimahaphot,  
Prachinburi 25140 Thailand.

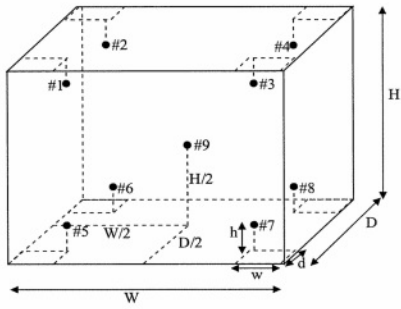
Calibration By: Mr. Suphanimit Khamnonphoem

Calibration Date: 01 November 2023

The Method used: In house method, CAL-WI-16, base on TLAS-G20

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Limited.  
Certificate No. C10230001

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**Standard Installation Locations**

Volume (Calibration Zone)= 62 (Liters)

Inside chamber: W = 60 (cm) D = 40 (cm) H = 53 (cm)

Standard Locations (#1, #2, #3, #4): w = 6 (cm) d = 5 (cm) h = 5 (cm)

Standard Locations (#5, #6, #7, #8): w = 6 (cm) d = 5 (cm) h = 5 (cm)

#9: Geometric center of the chamber

Position of Std	#1	#2	#3	#4	#5	#6	#7	#8	#9
Channel of Logger	101	102	103	104	105	106	107	108	109

**Definitions****Indicating Temperature:** The average reading of indicating device which forms the integral part of the enclosure.**Measured Temperature:** The average reading of standards at any positions or location.**Measured Uniformity:** The maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time or at close observation time as possible to determine the temperature pattern or homogeneity with the chamber at steady-state. The reference probe is preferably located in the geometric center of the chamber.**Measured Stability:** The one-half of greatest maximum difference of measured temperatures at any one probe.**Overall Variation:** The difference of maximum and minimum measured temperatures throughout observation time.

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**Calibration Results:****Before adjustment**

Setting:	Indicating:	#1:	#2:	#3:	#4:	#5:	#6:	#7:	#8:	#9:
104	104	103.37	103.16	103.45	103.03	101.07	100.53	100.78	100.26	100.33

**After adjustment**

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 104 °C

Locations	Measured Temperature (°C)	Correction of UUC (°C)	Uncertainty (± °C)
#1	105.80	1.80	0.79
#2	105.65	1.65	0.80
#3	105.85	1.85	0.79
#4	105.45	1.45	0.80
#5	104.19	0.19	0.80
#6	103.85	-0.15	0.80
#7	104.09	0.09	0.81
#8	103.91	-0.09	0.82
#9	104.03	0.03	0.82

**Temperature Distribution**

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
104	104	104	105.80	105.65	105.85	105.45	104.19	103.85	104.09	103.91	104.03	0.82

**Chamber Characterization**

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
104	1.94	0.17	2.19

Note: \* Maximum uncertainty of the each position

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**After adjustment (Cont.)**

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 177 °C

Locations	Measured Temperature (°C)	Correction of UUC (°C)	Uncertainty (± °C)
#1	180.97	3.97	0.83
#2	180.96	3.96	0.84
#3	180.99	3.99	0.84
#4	180.63	3.63	0.84
#5	180.12	3.12	0.85
#6	179.31	2.31	0.85
#7	179.84	2.84	0.87
#8	179.41	2.41	0.86
#9	178.94	1.94	0.86

**Temperature Distribution**

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
180	177	177	180.97	180.96	180.99	180.63	180.12	179.31	179.84	179.41	178.94	0.87

**Chamber Characterization**

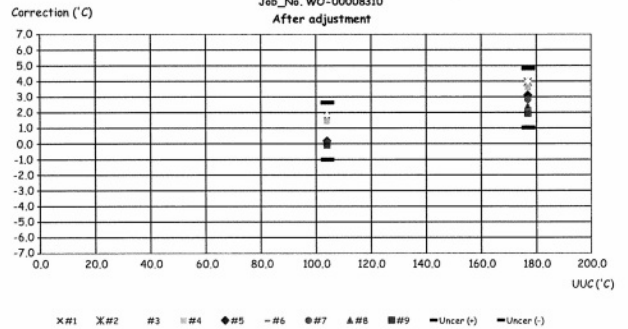
Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
177	2.20	0.25	2.34

Note: \* Maximum uncertainty of the each position

**The End of Certificate****Corr\_Distribution & Max\_Measurement Uncertainty**

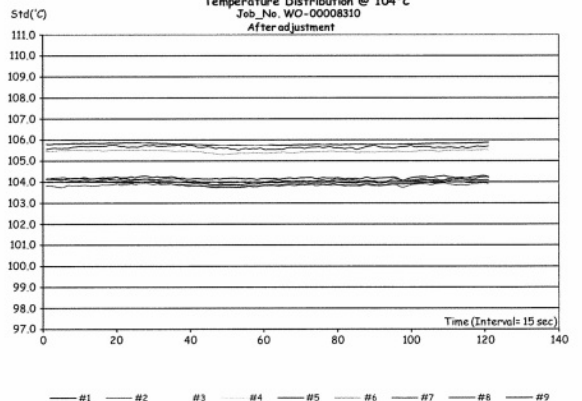
Job\_No. WO-00008310

After adjustment

**Temperature Distribution @ 104°C**

Job\_No. WO-00008310

After adjustment



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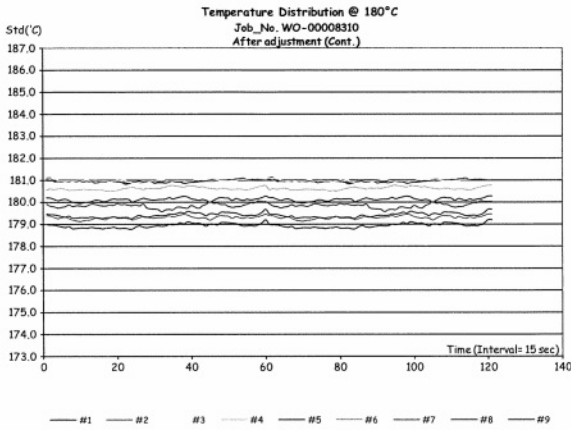
## ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: WO-00008310

ชนิดเครื่องมือ: Oven

รุ่น: ED 115

หมายเลขเครื่อง: 2019000012946



ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
01 Nov 2023			01 Nov 2023		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
			General		
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การแสดงผล Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	5. การทำงาน พัดลม	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. สภาพ Lever of Ventilation valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สภาพ Lever door open / close	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. สภาพ Door seal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. การทำงานของระบบ Safety	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	10. การทำงานของระบบทำความเย็น	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input type="checkbox"/>	<input type="checkbox"/>	11. การทำงานของระบบทำความร้อน	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	12. สภาพตัวเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	13. สภาพแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ข้อแนะนำ :

Service Engineer

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## Certificate of Calibration

Certificate No.: C31232272

Page: 2 of 4

Equipment: Oven  
Model: ED 115  
Serial No.(or ID): 950360  
Manufacturer: Binder  
Condition: In Condition  
Shelves(pc.): 2

Certificate No.: C31232272  
Issued Date: 09 November 2023  
Job No.: WO-00008310  
Page: 1 of 4  
Ventilation Valve: Closed

Customer: Integrated Research Center Co.,Ltd.  
122 Moo 2, Tambol Thatoom,  
Amphur Srimahaphote, Prachinburi 25140 Thailand

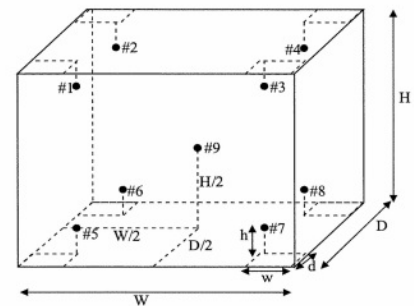
Environment Condition: Temperature: 24 °C ± 1.0 °C  
Humidity: 54 %RH ± 5.1 %RH  
Voltage: 230 VAC ± 3.2 VAC

Calibration Place: Double A (1991) Public Company Limited. ( Water Laboratory IP1 )  
1 Moo 2, Thatoom, Srimahaphot,  
Prachinburi 25140 Thailand.

Calibration By: Mr. Suphanimit Khamnonphoem  
Calibration Date: 01 November 2023

The Method used: In house method, CAL-WI-16, base on TLAS-G20

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Limited.  
Certificate No. C10230001



## Standard Installation Locations

Volume (Calibration Zone)= 22 (Liters)

Inside chamber: W = 60 (cm) D = 40 (cm) H = 48 (cm)

Standard Locations (#1, #2, #3, #4): w = 10 (cm) d = 10 (cm) h = 10 (cm)

Standard Locations (#5, #6, #7, #8): w = 10 (cm) d = 10 (cm) h = 10 (cm)

#9: Geometric center of the chamber

Position of Std	#1	#2	#3	#4	#5	#6	#7	#8	#9
Channel of Logger	201	202	203	204	205	206	207	208	209

## Definitions

**Indicating Temperature:** The average reading of indicating device which forms the integral part of the enclosure.

**Measured Temperature:** The average reading of standards at any positions or location.

**Measured Uniformity:** The maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time or at close observation time as possible to determine the temperature pattern or homogeneity with the chamber at steady-state. The reference probe is preferably located in the geometric center of the chamber.

**Measured Stability:** The one-half of greatest maximum difference of measured temperatures at any one probe.

**Overall Variation:** The difference of maximum and minimum measured temperatures throughout observation time.

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## Calibration Results:

## Before adjustment

Setting: 104 Indicating: #1: 105.17 #2: 105.35 #3: 105.61 #4: 105.33 #5: 104.22 #6: 104.75 #7: 104.49 #8: 105.10 #9: 104.66

## After adjustment

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 104 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	103.97	-0.03	0.70
#2	104.11	0.11	0.71
#3	104.29	0.29	0.71
#4	104.06	0.06	0.71
#5	103.01	-0.99	0.71
#6	103.43	-0.57	0.77
#7	103.22	-0.78	0.72
#8	103.48	-0.52	0.77
#9	103.88	-0.12	0.73

## Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
104	104	104	103.97	104.11	104.29	104.06	103.01	103.43	103.22	103.48	103.88	0.77

## Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
104	1.04	0.30	1.53

Note: \* Maximum uncertainty of the each position

## After adjustment (Cont.)

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 181 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	179.71	-1.29	0.72
#2	180.55	-0.45	0.72
#3	180.27	-0.73	0.71
#4	180.36	-0.64	0.71
#5	179.16	-1.84	0.71
#6	179.74	-1.26	0.77
#7	179.26	-1.74	0.72
#8	180.47	-0.53	0.76
#9	180.05	-0.95	0.74

## Temperature Distribution

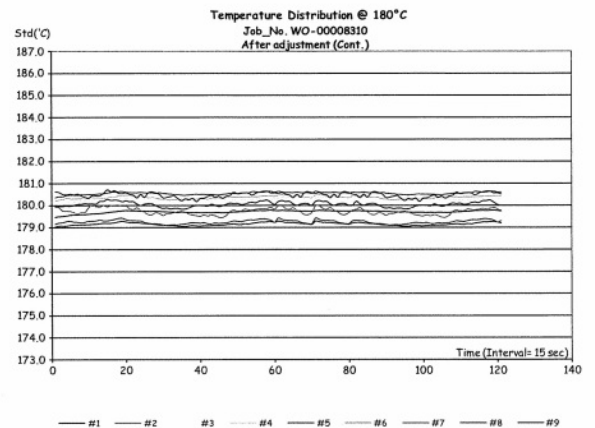
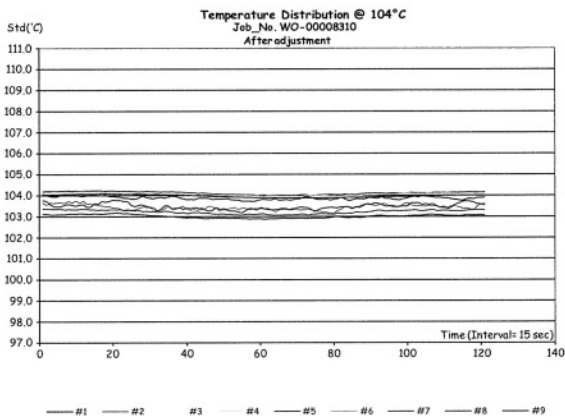
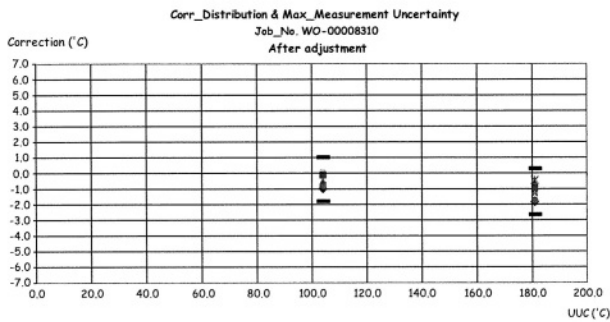
Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
180	181	181	179.71	180.55	180.27	180.36	179.16	179.74	179.26	180.47	180.05	0.77

## Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
181	1.09	0.28	1.68

Note: \* Maximum uncertainty of the each position

The End of Certificate



## ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: WO-00008310

ชนิดเครื่องมือ: Oven  
หมายเลขเครื่อง: 950360

รุ่น: ED 115

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
01 Nov 2023			01 Nov 2023		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
<b>General</b>					
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การแสดงผล Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	5. การทำงาน พัดลม	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. สภาพ Lever of Ventilation valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สภาพ Lever door open / close	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. สภาพ Door seal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. การทำงานของระบบ Safety	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	10. การทำงานของระบบทำความเย็น	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input type="checkbox"/>	<input type="checkbox"/>	11. การทำงานของระบบทำความร้อน	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	12. สภาพตัวเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	13. สภาพแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ขอแนะนำ: \_\_\_\_\_

Service Engineer

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## Certificate of Calibration

**Equipment:** Liquid Bath  
**Model:** WNB22/MAC5A  
**Serial No. (or ID.):** L518.0690  
**Manufacturer:** Memmert/SHIMAX  
**Condition:** In Condition  
**Forced Circulation:** None

**Certificate No.:** C13230363  
**Issued Date:** 09 November 2023  
**Job No.:** WO-00008310  
**Page:** 1 of 3

**Customer:** Integrated Research Center Co.,Ltd.  
122 Moo 2, Tambol Thatoom,  
Amphur Srimahaphote, Prachinburi 25140 Thailand

**Environment Condition:** Temperature: 25 °C ± 0.5 °C  
Humidity: 54 %RH ± 4.8 %RH  
Voltage: 230 VAC ± 3.4 VAC

**Calibration Place:** Double A (1991) Public Company Limited. ( Water Laboratory IP1 )  
1 Moo 2, Thatoom, Srimahaphot,  
Prachinburi 25140 Thailand.

**Calibration By:** Mr. Suphanimit Khamnonphom  
**Calibration Date:** 02 November 2023  
**The Method used:** In house method, CAL-WI-17, base on ASTM E715-80  
**Traceability:** This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Limited. Certificate No. C10230001



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

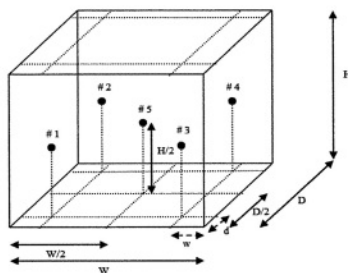
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DKSH Technology Limited  
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CAL-FM-C13-13: 12 Sep 2022

Certificate No.: C13230363

Page: 2 of 3



## Standard Installation Locations

Midway between the diffuser plate and the water surface

Inside bath: W = 36 (cm) D = 32 (cm) H = 24 (cm) Volume = 28 (Liters)

Standard Locations #1: w = 5 (cm) d = 5 (cm)

Standard Locations #2: w = 5 (cm) d = 5 (cm)

Standard Locations #3: w = 5 (cm) d = 5 (cm)

Standard Locations #4: w = 5 (cm) d = 5 (cm)

Standard Locations #5: Center of any probes. (#1 - #4)

Position of Std	#1	#2	#3	#4	#5
Channel of Logger	301	302	303	304	305

## Definitions

**Indicating Temperature:** The average reading of indicating device which forms the integral part of the bath.**Measured Temperature:** The average reading of standards at any positions or location.**Measured Uniformity:** The maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time or at close observation time as possible to determine the temperature pattern or homogeneity with the bath at steady-state. The reference probe is preferably located in the geometric center of the bath.**Measured Stability:** The one-half of greatest maximum difference of measured temperatures at any one probe.**Overall Variation:** The difference of maximum and minimum measured temperatures throughout observation time.

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CAL-FM-C13-13: 12 Sep 2022

Certificate No.: C13230363

Page: 3 of 3

## Calibration Results:

## Without adjustment

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 85.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	84.99	-0.01	0.33
#2	85.09	0.09	0.38
#3	84.91	-0.09	0.37
#4	84.84	-0.16	0.37
#5	84.88	-0.12	0.37

## Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)					Uncertainty (± °C)*
			#1	#2	#3	#4	#5	
85.0	85.0	85.0	84.99	85.09	84.91	84.84	84.88	0.38

## Bath Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
85.0	0.35	0.17	0.54

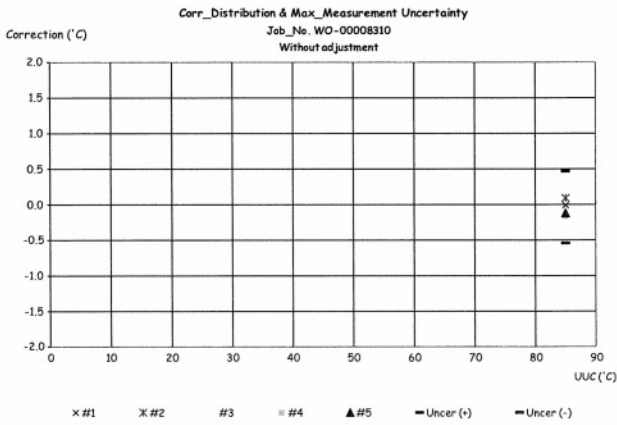
Note: \* Maximum uncertainty of the each position

The End of Certificate

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CAL-FM-C13-13: 12 Sep 2022



## ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: WO-0008310

ชนิดเครื่องมือ: Liquid Bath

รุ่น: WNB22/MAC5A

หมายเลขเครื่อง: L518.0690

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
02 Nov 2023			02 Nov 2023		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
<b>General</b>					
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การแสดงผล Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	5. การทำงาน Circulator	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input type="checkbox"/>	<input type="checkbox"/>	6. สภาพ Lever door open / close	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. ท่อระบายน้ำทิ้ง (DRAIN)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	8. การทำงานของระบบทำความเย็น	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. สภาพตัวเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. สภาพแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ข้อแนะนำ :

Service Engineer

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## Certificate of Calibration

**Equipment:** Liquid Bath  
Model: WNB22/TCN4L  
Serial No. (or ID.): L508.0973  
Manufacturer: Memmert/Autronics  
Condition: In Condition  
Forced Circulation: None

**Certificate No.:** C13230362  
**Issued Date:** 09 November 2023  
**Job No.:** WO-0008310  
**Page:** 1 of 3

**Customer:** Integrated Research Center Co.,Ltd.  
122 Moo 2, Tambol Thatoom,  
Amphur Srimahaphote, Prachinburi 25140 Thailand

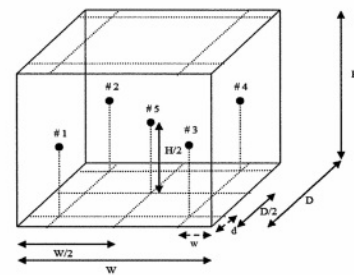
**Environment Condition:** Temperature: 25 °C ± 1.1 °C  
Humidity: 55 %RH ± 5.2 %RH  
Voltage: 230 VAC ± 3.3 VAC

**Calibration Place:** Double A (1991) Public Company Limited, ( Water Laboratory IP1 )  
1 Moo 2, Thatoom, Srimahaphot,  
Prachinburi 25140 Thailand.

**Calibration By:** Mr. Suphanimit Khamnonphom  
**Calibration Date:** 31 October 2023  
**The Method used:** In house method, CAL-WI-17, base on ASTM E715-80  
**Traceability:** This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Limited. Certificate No. C10230001

Certificate No.: C13230362

Page: 2 of 3



### Standard Installation Locations

Midway between the diffuser plate and the water surface

Inside bath: W = 36 (cm) D = 32 (cm) H = 24 (cm) Volume = 28 (Liters)

Standard Locations #1: w = 5 (cm) d = 5 (cm)

Standard Locations #2: w = 5 (cm) d = 5 (cm)

Standard Locations #3: w = 5 (cm) d = 5 (cm)

Standard Locations #4: w = 5 (cm) d = 5 (cm)

Standard Locations #5: Center of any probes. (#1 - #4)

Position of Std	#1	#2	#3	#4	#5
Channel of Logger	301	302	303	304	305

### Definitions

**Indicating Temperature:** The average reading of indicating device which forms the integral part of the bath.

**Measured Temperature:** The average reading of standards at any positions or location.

**Measured Uniformity:** The maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time or at close observation time as possible to determine the temperature pattern or homogeneity with the bath at steady-state. The reference probe is preferably located in the geometric center of the bath.

**Measured Stability:** The one-half of greatest maximum difference of measured temperatures at any one probe.

**Overall Variation:** The difference of maximum and minimum measured temperatures throughout observation time.

### Calibration Results:

#### Before adjustment

Setting: Indicating: #1: #2: #3: #4: #5:  
85 85 85.55 85.69 85.53 85.55 85.49

#### After adjustment

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 85 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	84.62	-0.38	1.4
#2	84.76	-0.24	1.3
#3	84.60	-0.40	1.3
#4	84.62	-0.38	1.4
#5	84.56	-0.44	1.3

#### Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)					Uncertainty (± °C)*
			#1	#2	#3	#4	#5	
85	85	85	84.62	84.76	84.60	84.62	84.56	1.4

#### Bath Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
85	0.32	0.63	1.39

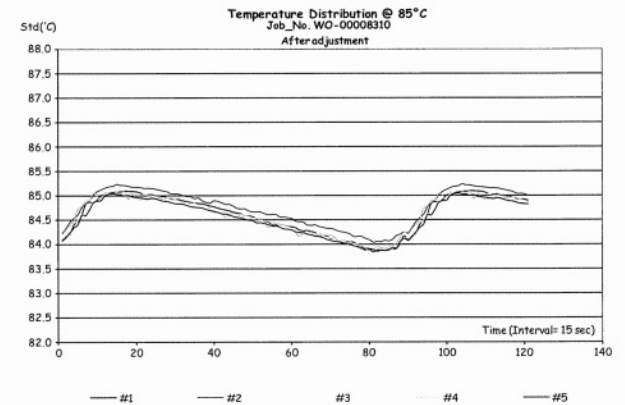
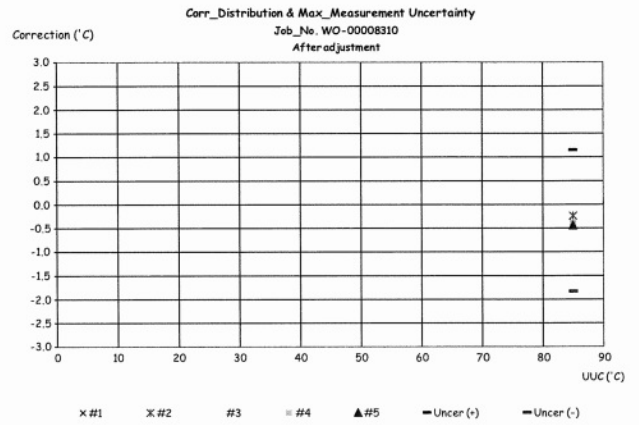
Note: \* Maximum uncertainty of the each position

The End of Certificate

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DKSH Technology Limited  
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CAL-FM-C13-13: 12 Sep 2022



### ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: WO-00008310

ชนิดเครื่องมือ: Liquid Bath

รุ่น: WNB22/TCN4L

หมายเลขเครื่อง: L508.0973

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		<b>General</b>			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การแสดงผล Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	5. การทำงาน Circulator	<input type="checkbox"/>	<input checked="" type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. สภาพ Lever door open / close	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. ท่อระบายน้ำทิ้ง (DRAIN)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	8. การทำงานของระบบทำความเย็น	<input type="checkbox"/>	<input checked="" type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. สภาพตัวเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. สภาวะแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ชื่อและนามสกุล: \_\_\_\_\_

Service Engineer

บริษัท ดีเคเอส อีเซีย จำกัด  
DKSH Technology Limited  
2533 สุขุมวิท ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260  
2533 Sukhumvit Road, Bangkok, Prachinburi, Bangkok 10260  
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### Certificate of Calibration

**Equipment:** Cooled Incubator  
**Model:** E5CC  
**Serial No.(or ID):** 03021  
**Manufacturer:** OmiRon  
**Condition:** In Condition  
**Shelves(pc.):** 9  
**Certificate No.:** C31232275  
**Issued Date:** 09 November 2023  
**Job No.:** WO-00008310  
**Page:** 1 of 3  
**Ventilation Valve:** None

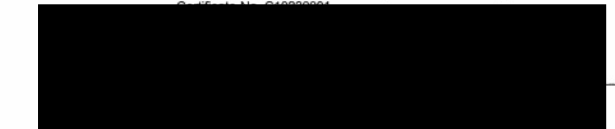
**Customer:** Integrated Research Center Co.,Ltd.  
122 Moo 2, Tambol Thatoom,  
Amphur Srimahaphote, Prachinburi 25140 Thailand

**Environment Condition:** Temperature: 24 °C ± 0.4 °C  
Humidity: 52 %RH ± 5.3 %RH  
Voltage: 231 VAC ± 3.6 VAC

**Calibration Place:** Double A (1991) Public Company Limited. ( Water Laboratory IP1 )  
1 Moo 2, Thatoom, Srimahaphot,  
Prachinburi 25140 Thailand.

**Calibration By:** Mr. Suphanimit Khamnonphoom  
**Calibration Date:** 30 October 2023  
**The Method used:** In house method, CAL-WI-16, base on TLAS-G20

**Traceability:** This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Limited.



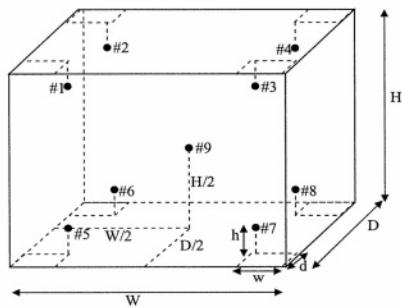
This certificate is issued the units of measurement according to the international System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.  
The measurement uncertainty stated is the expanded uncertainty which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

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CAL-FM-C31-10: 12 Sep 2022





## Standard Installation Locations

Volume (Calibration Zone)= 422 (Liters)

Inside chamber: W = 110 (cm) D = 60 (cm) H = 160 (cm)

Standard Locations (#1, #2, #3, #4): w = 11 (cm) d = 6 (cm) h = 30 (cm)

Standard Locations (#5, #6, #7, #8): w = 11 (cm) d = 6 (cm) h = 30 (cm)

#9: Geometric center of the chamber

Position of Std	#1	#2	#3	#4	#5	#6	#7	#8	#9
Channel of Logger	201	202	203	204	205	206	207	208	209

## Definitions

**Indicating Temperature:** The average reading of indicating device which forms the integral part of the enclosure.**Measured Temperature:** The average reading of standards at any positions or location.**Measured Uniformity:** The maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time or at close observation time as possible to determine the temperature pattern or homogeneity with the chamber at steady-state. The reference probe is preferably located in the geometric center of the chamber.**Measured Stability:** The one-half of greatest maximum difference of measured temperatures at any one probe.**Overall Variation:** The difference of maximum and minimum measured temperatures throughout observation time.

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CAL-FM-C31-10: 12 Sep 2022

## Calibration Results:

## Without adjustment

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 21 °C

Locations	Measured Temperature (°C)	Correction of UUC (°C)	Uncertainty (± °C)
#1	20.39	-0.61	0.63
#2	20.32	-0.68	0.64
#3	20.39	-0.61	0.65
#4	20.34	-0.66	0.64
#5	20.00	-1.00	0.73
#6	20.05	-0.95	0.68
#7	20.08	-0.92	0.67
#8	20.10	-0.90	0.66
#9	20.07	-0.93	0.71

## Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
20	20	21	20.39	20.32	20.39	20.34	20.00	20.05	20.08	20.10	20.07	0.73

## Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
21	0.51	0.34	0.86

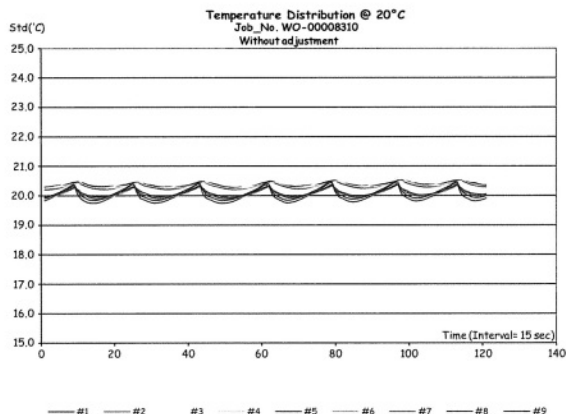
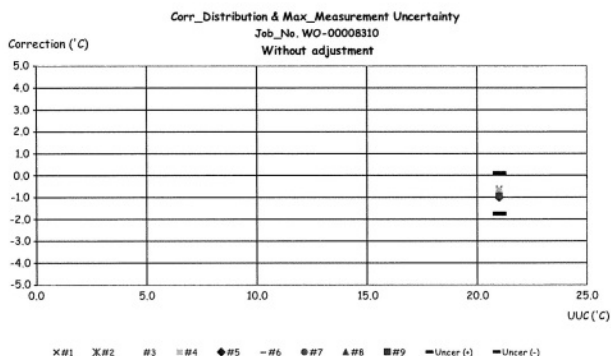
Note: \* Maximum uncertainty of the each position

The End of Certificate

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DKSH Technology Limited  
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CAL-FM-C31-10: 12 Sep 2022



## ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: WO-00008310

ชนิดเครื่องมือ: Cooled Incubator

รุ่น: E5CC

หมายเลขเครื่อง: 03021

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
30 Oct 2023			30 Oct 2023		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การแสดงผล Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การทำงาน พัดลม	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	6. สภาพ Lever of Ventilation valve	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สภาพ Lever door open / close	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. สภาพ Door seal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. การทำงานของระบบ Safety	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. การทำงานของระบบทำความเย็น	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	11. การทำงานของระบบทำความร้อน	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	12. สภาพตู้เครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	13. สภาพแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ข้อเสนอแนะ:

Service Engineer

บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด  
DKSH Technology Limited  
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## Certificate of Calibration

Certificate No.: C31232276

Page: 2 of 4

**Equipment:** Cooled Incubator  
**Model:** i250  
**Serial No.(or ID):** 0213-0004  
**Manufacturer:** Accuplus  
**Condition:** In Condition  
**Shelves(pc.):** 4

**Certificate No.:** C31232276  
**Issued Date:** 09 November 2023  
**Job No.:** WO-00008310  
**Page:** 1 of 4  
**Ventilation Valve:** None

**Customer:** Integrated Research Center Co.,Ltd.  
122 Moo 2, Tambol Thatoom,  
Amphur Srimahaphote, Prachinburi 25140 Thailand

**Environment Condition:** Temperature: 24 °C ± 0.5 °C  
Humidity: 52 %RH ± 5.3 %RH  
Voltage: 231 VAC ± 3.6 VAC

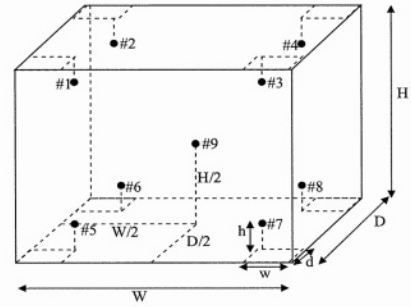
**Calibration Place:** Double A (1991) Public Company Limited. ( Water Laboratory IP1 )  
1 Moo 2, Thatoom, Srimahaphot,  
Prachinburi 25140 Thailand.

**Calibration By:** Mr. Suphanimit Khamnonphoom

**Calibration Date:** 31 October 2023

**The Method used:** In house method, CAL-WI-16, base on TLAS-G20

**Traceability:** This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Limited.  
Certificate No. C10230001



## Standard Installation Locations

Volume (Calibration Zone)= 114 (Liters)

Inside chamber: W = 50 (cm) D = 48 (cm) H = 106 (cm)

Standard Locations (#1, #2, #3, #4): w = 5 (cm) d = 5 (cm) h = 20 (cm)

Standard Locations (#5, #6, #7, #8): w = 5 (cm) d = 5 (cm) h = 11 (cm)

#9: Geometric center of the chamber

Position of Std	#1	#2	#3	#4	#5	#6	#7	#8	#9
Channel of Logger	201	202	203	204	205	206	207	208	209

## Definitions

**Indicating Temperature:** The average reading of indicating device which forms the integral part of the enclosure.**Measured Temperature:** The average reading of standards at any positions or location.**Measured Uniformity:** The maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time or at close observation time as possible to determine the temperature pattern or homogeneity with the chamber at steady-state. The reference probe is preferably located in the geometric center of the chamber.**Measured Stability:** The one-half of greatest maximum difference of measured temperatures at any one probe.**Overall Variation:** The difference of maximum and minimum measured temperatures throughout observation time.

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CAL-FM-C31-10: 12 Sep 2022

Certificate No.: C31232276

Page: 3 of 4

## Calibration Results:

## Without adjustment

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 20.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	20.07	0.07	0.31
#2	20.09	0.09	0.37
#3	20.11	0.11	0.33
#4	19.91	-0.09	0.47
#5	19.99	-0.01	0.29
#6	19.97	-0.03	0.29
#7	20.02	0.02	0.34
#8	19.84	-0.16	0.30
#9	19.90	-0.10	0.35

## Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
20.0	20.0	20.0	#1	#2	#3	#4	#5	#6	#7	#8	#9	
			20.07	20.09	20.11	19.91	19.99	19.97	20.02	19.84	19.90	0.47

## Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
20.0	0.25	0.37	0.84

Note: \* Maximum uncertainty of the each position

Certificate No.: C31232276

Page: 4 of 4

## Without adjustment (Cont.)

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 29.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	28.75	-0.25	0.30
#2	28.77	-0.23	0.33
#3	28.60	-0.40	0.29
#4	28.64	-0.36	0.38
#5	28.71	-0.29	0.28
#6	28.71	-0.29	0.28
#7	28.81	-0.19	0.31
#8	28.62	-0.38	0.30
#9	28.64	-0.36	0.34

## Temperature Distribution

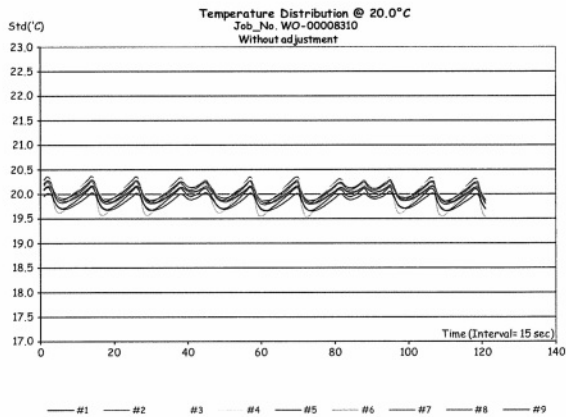
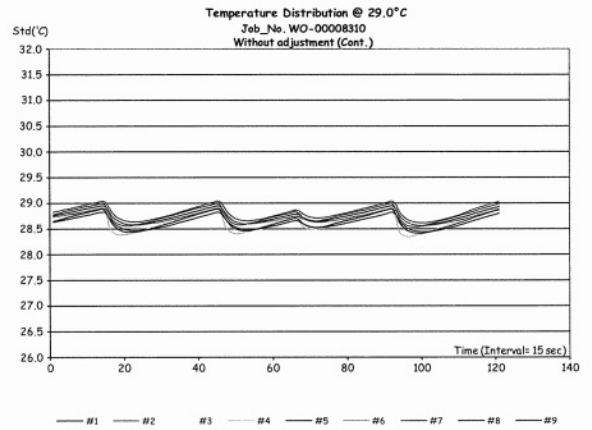
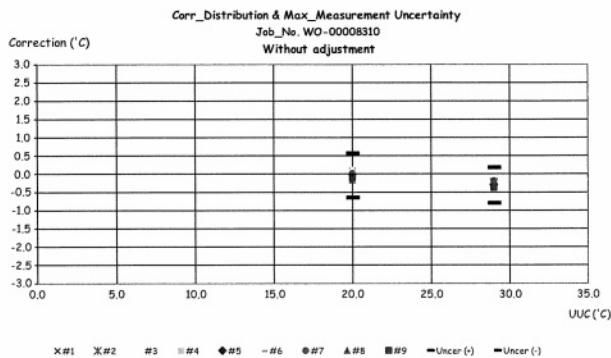
Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
29.0	29.0	29.0	#1	#2	#3	#4	#5	#6	#7	#8	#9	
			28.75	28.77	28.60	28.64	28.71	28.71	28.81	28.62	28.64	0.38

## Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
29.0	0.22	0.28	0.70

Note: \* Maximum uncertainty of the each position

The End of Certificate



## ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

## Certificate of Calibration

ชนิดเครื่องมือ: Cooled Incubator      รุ่น: i250      เลขที่ใบงาน: WO-00008310

หมายเลขเครื่อง: 0213-0004

Equipment: COD Reactor      Certificate No.: C17230188  
Model: DRB200      Issued Date: 09 November 2023  
Serial No. (or ID.): 19070C0337      Job No.: WO-00008310  
Manufacturer: Hach      Page: 1 of 5  
Condition: In Condition  
Covers: Open (Max)      Locations heating Block: Left and Right

Customer: Integrated Research Center Co., Ltd.  
122 Moo 2, Tambol Thatoom,  
Amphur Srimahaphote, Prachinburi 25140 Thailand

Environment Condition: Temperature: 24 °C ± 0.7 °C  
Humidity: 52 %RH ± 4.8 %RH  
Voltage: 231 VAC ± 2.5 VAC

Calibration Place: Double A (1991) Public Company Limited. ( Water Laboratory IP1 )  
1 Moo 2, Thatoom, Srimahaphot,  
Prachinburi 25140 Thailand.

Calibration By: Mr. Suphanimit Khamnonphoem  
Calibration Date: 31 October 2023

The Method used: In house method, base on Direct Measurement with Standard Thermometer  
Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Limited. Certificate No. C10230001

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
31 Oct 2023			31 Oct 2023		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		<i>General</i>			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การแสดงผล Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การทำงาน พัดลม	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	6. สภาพ Lever of Ventilation valve	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สภาพ Lever door open / close	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. สภาพ Door seal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. การทำงานของระบบ Safety	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. การทำงานของระบบทำความเย็น	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	11. การทำงานของระบบทำความร้อน	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	12. สภาพตัวเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	13. สภาวะแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

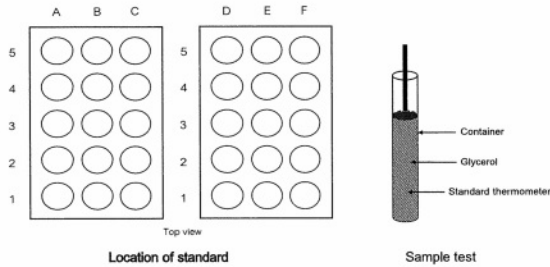
ขอแนะนำ: \_\_\_\_\_

Mr. Suphanimit Khamnonphoem  
Service Engineer

Person in charge

Authorized signatory

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



## Standard Installation Locations

The standard thermometer touches the lower end of the boring

## Definitions

- Indicating Temperature:** The average reading of indicating device which forms the integral part of the unit under calibration.
- Measured Temperature:** The average reading of standards at any positions or location.
- Measured Stability:** The one-half of greatest maximum difference of measured temperatures at any one probe.

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## Calibration Results:

## Without Adjustment

Measured temperature at the spread locations:

Locations heating Block:	Setting (°C)	Unit Under Calibration (°C)
Left	150	150
Right	150	150

Location heating Block:	Measured Temperature (°C)	Correction of UUC (°C)	Uncertainty (± °C)
A1	149.09	-0.91	0.65
A2	149.43	-0.57	0.66
A3	151.24	1.24	0.65
A4	149.63	-0.37	0.65
A5	150.71	0.71	0.65
B1	150.14	0.14	0.65
B2	150.06	0.06	0.65
B3	150.35	0.35	0.65
B4	149.97	-0.03	0.66
B5	150.01	0.01	0.66
C1	150.08	0.08	0.65
C2	150.23	0.23	0.69
C3	151.13	1.13	0.65
C4	150.61	0.61	0.65
C5	149.47	-0.53	0.66
D1	150.36	0.36	0.65
D2	150.87	0.87	0.65
D3	151.24	1.24	0.65
D4	150.73	0.73	0.65
D5	151.10	1.10	0.65
E1	148.88	-1.12	0.65
E2	153.51	3.51	0.65
E3	149.55	-0.45	0.65
E4	147.55	-2.45	0.65
E5	148.94	-1.06	0.65
F1	149.97	-0.03	0.65
F2	151.10	1.10	0.65
F3	150.87	0.87	0.66
F4	150.55	0.55	0.65
F5	150.24	0.24	0.65

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## Characterization of the unit under calibration:

Locations heating Block	Desired (°C)	Unit Under Calibration (°C)		Measured Temperature (°C)
		Setting	Reading	Stability (± °C)
Left	150	150	150	0.14
Right	150	150	150	0.09

The End of Certificate

## ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: WO-00008310

ชนิดเครื่องมือ: COD Reactor

รุ่น: DRB200

หมายเลขเครื่อง: 19070C0337

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
31 Oct 2023			31 Oct 2023		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การแสดงผล Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. สภาพ Hole	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. สภาพฝาปิด	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สภาพตัวเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. สภาพแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ชื่อและนามสกุล:

Service Engineer

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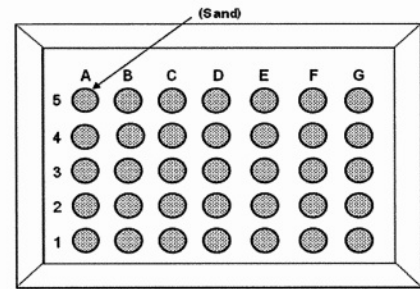
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## Certificate of Calibration

Certificate No.: C29230040

Page: 2 of 3

Fig. 1.: Top view



Equipment: Block Digestion Unit  
Model: SC2100-35V240  
Serial No. (or ID.): 2021CEP296  
Manufacturer: Environmental Express  
Condition: In Condition

Certificate No.: C29230040  
Issued Date: 16 November 2023  
Job No.: WO-00008310  
Page: 1 of 3  
Digestion Block: 18 holes.

Customer: Integrated Research Center Co.,Ltd.  
122 Moo 2, Tambol Thatoom,  
Amphur Srimahaphote, Prachinburi 25140 Thailand

Environment Condition: Temperature: 26 °C ± 0.7 °C  
Humidity: 54 %RH ± 5.3 %RH  
Voltage: 230 VAC ± 3.5 VAC

Calibration Place: Double A (1991) Public Company Limited. ( Water Laboratory IP1 )  
1 Moo 2, Thatoom, Srimahaphot,  
Prachinburi 25140 Thailand.

Calibration By: Mr. Suphanimit Khamnonphom  
Calibration Date: 31 October 2023  
The Method used: In house method, base on by comparison with standard  
Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through N.M. Technical Center Laboratory (NTL)  
Certificate No.: TC22/0080



This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.  
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).  
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## Definitions

**Indicating Temperature:** The average reading of indicating device which forms the integral part of the Digestion block.

**Measured Temperature:** The average reading of working standard at any positions or location.

## Calibration Results:

## Before adjustment

Locations	Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
A1	104.0	104.0	104.0	98.4	-5.6	1.4
A3				99.0	-5.0	1.4
A5				99.1	-4.9	1.4
B2				98.5	-5.5	1.4
B4				98.6	-5.4	1.4
C1				99.0	-5.0	1.4
C3				98.3	-5.7	1.4
C5				98.4	-5.6	1.4
D2				99.4	-4.6	1.4
D4				99.0	-5.0	1.4
E1				99.4	-4.6	1.4
E3				98.5	-5.5	1.4
E5				98.3	-5.7	1.4
F2				99.6	-4.4	1.4
F4				99.0	-5.0	1.4
G1				99.3	-4.7	1.4
G3				98.3	-5.7	1.4
G5				98.6	-5.4	1.4

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Certificate No.: C29230040

Page: 3 of 3

## Calibration Results:

## After adjustment

Locations	Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
A1	95.0	95.0	95.0	94.5	-0.5	1.4
A3				95.2	0.2	1.4
A5				94.8	-0.2	1.4
B2				95.3	0.3	1.4
B4				95.0	0.0	1.4
C1				95.3	0.3	1.4
C3				95.0	0.0	1.4
C5				94.6	-0.4	1.4
D2				95.2	0.2	1.4
D4				95.0	0.0	1.4
E1				95.4	0.4	1.4
E3				95.0	0.0	1.4
E5				94.5	-0.5	1.4
F2				94.4	-0.6	1.4
F4				95.2	0.2	1.4
G1				95.1	0.1	1.4
G3				95.5	0.5	1.4
G5				95.0	0.0	1.4

Locations	Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
A1	104.0	104.0	104.0	103.8	-0.2	1.4
A3				104.2	0.2	1.4
A5				104.3	0.3	1.4
B2				103.9	-0.1	1.4
B4				103.9	-0.1	1.4
C1				104.2	0.2	1.4
C3				103.5	-0.5	1.4
C5				103.7	-0.3	1.4
D2				104.4	0.4	1.4
D4				104.0	0.0	1.4
E1				104.5	0.5	1.4
E3				103.8	-0.2	1.4
E5				103.2	-0.8	1.4
F2				104.6	0.6	1.4
F4				104.1	0.1	1.4
G1				104.3	0.3	1.4
G3				103.6	-0.4	1.4
G5				103.8	-0.2	1.4

The End of Certificate

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## ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: WO-00008310

ชนิดเครื่องมือ: Block Digestion Unit รุ่น: SC2100-35V240

หมายเลขเครื่อง: 2021CEP296

ตรวจสอบ (รับ)	31 Oct 2023	รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
			31 Oct 2023		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
<b>General</b>					
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การแสดงผล Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. สภาพ Hole	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	6. สภาพฝาปิด	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สภาพตัวเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. สภาพแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ขอแนะนำ:

Service Engineer

บริษัท เทคโนโลยี เคเอ็ม จำกัด  
DKSH Technology Limited  
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## Certificate of Calibration

Certificate No.: C29230041

Page: 2 of 3

Equipment: Block Digestion Unit  
Model: KT 20s-BS  
Serial No. (or ID.): GER5720190108  
Manufacturer: Gerhardt  
Condition: In Condition

Certificate No.: C29230041  
Issued Date: 16 November 2023  
Job No.: WO-00008310  
Page: 1 of 3  
Digestion Block: 20 holes.

Customer: Integrated Research Center Co.,Ltd.  
122 Moo 2, Tambol Thatoom,  
Amphur Srimahaphote, Prachinburi 25140 Thailand

Environment Condition: Temperature: 26 °C ± 0.7 °C  
Humidity: 54 %RH ± 4.7 %RH  
Voltage: 230 VAC ± 3.5 VAC

Calibration Place: Double A (1991) Public Company Limited. ( Water Laboratory IP1 )  
1 Moo 2, Thatoom, Srimahaphot,  
Prachinburi 25140 Thailand.

Calibration By: Mr. Suphanimit Khamnonphoem  
Calibration Date: 01 November 2023  
The Method used: In house method, base on by comparison with standard  
Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through N.M. Technical Center Laboratory (NTL)  
Certificate No.: TC22/0080

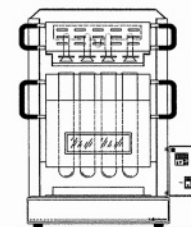
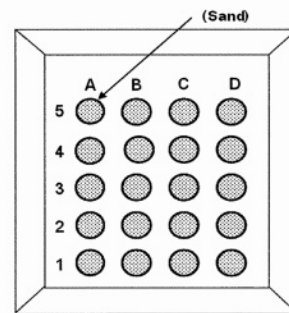


Fig. 1.: Front view



Location of standard

Fig. 2.: Digestion block

## Definitions

**Indicating Temperature:** The average reading of indicating device which forms the integral part of the Digestion block.

**Measured Temperature:** The average reading of working standard at any positions or location.

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CAL-FM-C29-07: 20 Jul 2022

Certificate No.: C29230041

Page: 3 of 3

Calibration Results:  
Without adjustment

Locations	Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
A1	380	380	380	380.8	0.8	1.5
A2				381.1	1.1	1.5
A3				380.9	0.9	1.5
A4				381.1	1.1	1.5
A5				381.2	1.2	1.5
B1				380.0	0.0	1.5
B2				380.6	0.6	1.5
B3				380.1	0.1	1.5
B4				380.4	0.4	1.5
B5				380.8	0.8	1.5
C1				379.3	-0.7	1.5
C2				379.4	-0.6	1.5
C3				379.8	-0.2	1.5
C4				380.0	0.0	1.5
C5				379.9	-0.1	1.5
D1				376.7	-3.3	1.5
D2				376.9	-3.1	1.5
D3				377.9	-2.1	1.5
D4				378.6	-1.4	1.5
D5				377.5	-2.5	1.5

The End of Certificate

## ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: WO-00008310

ชนิดเครื่องมือ: Block Digestion Unit

รุ่น: KT 20s-BS

หมายเลขเครื่อง: GER5720190108

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
01 Nov 2023			01 Nov 2023		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
General					
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การแสดงผล Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. สภาพ Hole	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	6. สภาพฝาปิด	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สภาพตัวเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. สภาพแวดล้อม สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ขอแนะนำ:

Service Engineer



## Certificate of Calibration

Certificate No.: C02232073 Page 2 of 2

## Calibration Results:

Nominal Value	Marking	Conventional Mass	Uncertainty ( $\pm$ mg)	MPE Class ( $\pm$ mg)
1 g	None	1 g + 0.043 mg	0.030	0.10 F1

Note : These MPE Class are only conventional mass.

The End of Certificate

Equipment: Standard Weight Certificate No.: C02232073  
Model: 1 g Issued Date: 7 November 2023  
Serial No. (or ID.): Weight 001 Job No.: WO-00009104  
Manufacturer: LS Page: 1 of 2  
Condition: In condition Class: -

Customer: Integrated Research Center Co.,Ltd.  
122 Moo 2, Tambol Thatoom,  
Amphur Srimahaphote, Prachinburi 25140 Thailand

Environment Condition: Temperature 22 °C  $\pm$  2 °C  
Relative Humidity 50 %RH  $\pm$  10 %RH  
Atmospheric Pressure 980-1030 mbar

Calibration Place: Mass Laboratory, DKSH Technology Limited.  
2533 Sukhumvit Road, Bangchak,  
Phrakhanong, Bangkok 10260 Thailand

Calibration By: Mr. Palchiet Saefong  
Calibration Date: 07 November 2023  
The Method used: In house method, CAL-WI-48, base on OIML R111-1  
Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (Thailand), NIMT through DKSH Technology Limited. Certificate No. C02231914.



This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.  
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor ( $k=2$ ) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).  
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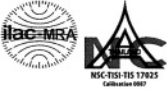
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## Certificate of Calibration

Certificate No.: C02232074 Page 2 of 2

## Calibration Results:

Nominal Value	Marking	Conventional Mass	Uncertainty ( $\pm$ mg)	MPE Class ( $\pm$ mg)
100 g	None	100 g - 0.06 mg	0.16	0.5 F1

Note : These MPE Class are only conventional mass.

The End of Certificate

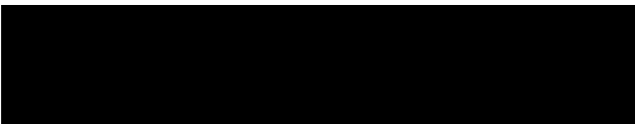
Equipment: Standard Weight Certificate No.: C02232074  
Model: 100 g Issued Date: 7 November 2023  
Serial No. (or ID.): Weight 002 Job No.: WO-00009104  
Manufacturer: LS Page: 1 of 2  
Condition: In condition Class: -

Customer: Integrated Research Center Co.,Ltd.  
122 Moo 2, Tambol Thatoom,  
Amphur Srimahaphote, Prachinburi 25140 Thailand

Environment Condition: Temperature 22 °C  $\pm$  2 °C  
Relative Humidity 50 %RH  $\pm$  10 %RH  
Atmospheric Pressure 980-1030 mbar

Calibration Place: Mass Laboratory, DKSH Technology Limited.  
2533 Sukhumvit Road, Bangchak,  
Phrakhanong, Bangkok 10260 Thailand

Calibration By: Mr. Palchiet Saefong  
Calibration Date: 07 November 2023  
The Method used: In house method, CAL-WI-48, base on OIML R111-1  
Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (Thailand), NIMT through DKSH Technology Limited. Certificate No. C02231914.



This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.  
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor ( $k=2$ ) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).  
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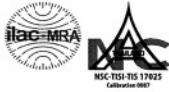
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## Certificate of Calibration

### Calibration Results:

Nominal Value	Marking	Conventional Mass	Uncertainty ( $\pm$ mg)	MPE Class ( $\pm$ mg)
200 g	None	200 g - 0.36 mg	0.30	1.0 F1

Note : These MPE Class are only conventional mass.

The End of Certificate

**Equipment:** Standard Weight  
**Model:** 200 g  
**Serial No. (or ID.):** Weight 003  
**Manufacturer:** LS  
**Condition:** In condition  
**Certificate No.:** C02232075  
**Issued Date:** 7 November 2023  
**Job No.:** WO-00009104  
**Page:** 1 of 2  
**Class:** -

**Customer:** Integrated Research Center Co.,Ltd.  
122 Moo 2, Tambol Thatoom,  
Amphur Srimahaphote, Prachinburi 25140 Thailand

**Environment Condition:** Temperature 22 °C  $\pm$  2 °C  
Relative Humidity 50 %RH  $\pm$  10 %RH  
Atmospheric Pressure 980-1030 mbar

**Calibration Place:** Mass Laboratory, DKSH Technology Limited.  
2533 Sukhumvit Road, Bangchak,  
Phrakhanong, Bangkok 10260 Thailand

**Calibration By:** Mr. Palchet Saefong  
**Calibration Date:** 07 November 2023  
**The Method used:** In house method, CAL-WI-48, base on OIML R111-1

**Traceability:** This certificate is traceable to the SI Units maintained by National Institute of Metrology (Thailand), NIMT through DKSH Technology Limited. Certificate No. C02231914.



This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.  
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor ( $k=2$ ) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).  
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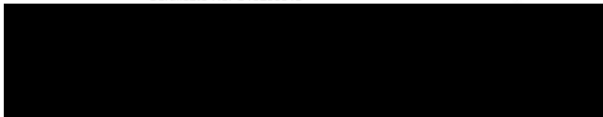
**Equipment:** COD Reactor  
**Model:** DRB 200  
**Serial No. (or ID.):** 19050C0191  
**Manufacturer:** Hach  
**Condition:** In Condition  
**Covers:** Open (Max)  
**Locations heating Block:** Left and Right  
**Certificate No.:** C17230199  
**Issued Date:** 21 November 2023  
**Job No.:** WO-00010182  
**Page:** 1 of 4

**Customer:** Integrated Research Center Co.,Ltd.  
122 Moo 2, Tambol Thatoom,  
Amphur Srimahaphote, Prachinburi 25140 Thailand

**Environment Condition:** Temperature: 23 °C  $\pm$  5.0 °C  
Humidity: 50 %RH  $\pm$  15.0 %RH  
Voltage: 230 VAC  $\pm$  11.0 VAC

**Calibration Place:** Temperature Laboratory, DKSH Technology Limited.  
2533 Sukhumvit Road, Bangchak,  
Phrakhanong, Bangkok 10260 Thailand

**Calibration By:** Mr. Bovon Jannantha  
**Calibration Date:** 20 November 2023  
**The Method used:** In house method, base on Direct Measurement with Standard Thermometer  
**Traceability:** This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Limited. Certificate No. C10230015

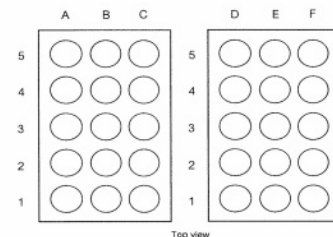


This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.  
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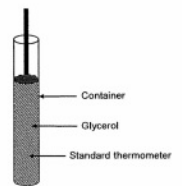
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Location of standard



Sample test

### Standard Installation Locations

The standard thermometer touches the lower end of the boring

### Definitions

**Indicating Temperature:** The average reading of indicating device which forms the integral part of the unit under calibration.  
**Measured Temperature:** The average reading of standards at any positions or location.  
**Measured Stability:** The one-half of greatest maximum difference of measured temperatures at any one probe.

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## Calibration Results:

## Without Adjustment

Measured temperature at the spread locations:

Locations heating Block:	Setting (°C)	Unit Under Calibration (°C)
Left	150	150
Right	150	150

Location heating Block:	Measured Temperature (°C)	Correction of UUC (°C)	Uncertainty (± °C)
A1	148.65	-1.35	0.68
A2	151.14	1.14	0.67
A3	151.18	1.18	0.66
A4	148.99	-1.01	0.69
A5	149.00	-1.00	0.68
B1	151.08	1.08	0.68
B2	150.79	0.79	0.69
B3	151.35	1.35	0.66
B4	149.39	-0.61	0.69
B5	149.77	-0.23	0.68
C1	151.06	1.06	0.69
C2	151.21	1.21	0.69
C3	150.16	0.16	0.67
C4	149.48	-0.52	0.68
C5	148.75	-1.25	0.67
D1	150.34	0.34	0.67
D2	150.48	0.48	0.68
D3	149.47	-0.53	0.67
D4	148.70	-1.30	0.69
D5	149.29	-0.71	0.67
E1	150.64	0.64	0.66
E2	148.93	-1.07	0.69
E3	151.31	1.31	0.67
E4	149.17	-0.83	0.65
E5	148.46	-1.54	0.68
F1	149.08	-0.92	0.65
F2	149.23	-0.77	0.65
F3	148.69	-1.31	0.65
F4	148.23	-1.77	0.65
F5	149.71	-0.29	0.65

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## Characterization of the unit under calibration:

Locations heating Block	Desired (°C)	Unit Under Calibration (°C)		Measured Temperature (°C)
	(°C)	Setting	Reading	Stability (±°C)
Left	150	150	150	0.22
Right	150	150	150	0.22

The End of Certificate

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CAL-FM-C17-08: 20 Jul 2022

## ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: WO-00010182

ชนิดเครื่องมือ: COD Reactor

รุ่น: DRB 200

หมายเลขเครื่อง: 19050C0191

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
20 Nov 2023			20 Nov 2023		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การแสดงผล Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. สลักไฟ Hole	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. สลักฝาปิด	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สลักตัวเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. สลักแฉกต่อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ข้อแนะนำ:

Service Engineer

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## Certificate of Calibration

Equipment:	TURBIDIMETER	Certificate No.:	C08230180
Model:	2100Q	Issued Date:	03 November 2023
Serial No. (or ID.):	14090C035505	Job No.:	WO-00008310
Manufacturer:	HACH	Page:	1 of 2
Condition:	In Condition		

Customer: Integrated Research Center Co.,Ltd.  
122 Moo 2, Tambol Thatoom,  
Amphur Srimahaphote, Prachinburi 25140 Thailand

Environment Condition: Temperature 26 °C ± 0.3 °C  
Humidity 63 %RH ± 3 %RH

Calibration Place: Double A (1991) Public Company Limited. (Water Laboratory IP1)  
1 Moo 2, Thatoom, Srimahaphot,  
Prachinburi 25140 Thailand.

Calibration By: Mr.Piyapat Saidoung

Calibration Date: 01 November 2023

The Method used: In house method, CAL-WI-23, base on Hach Manufacturer Method 8195

Traceability: This certificate is traceable to Primary standard Fromazin and StabCal accepted by United States Environmental Protection Agency (EPA) through Hach Company Certificate No. A2005 , A3004 , A3012 , A3004

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.  
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CAL-FM-C08-08: 20 Jul 2022

## ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: WO-00008310

## Calibration Results:

## Before Adjustment

Std Turbidity (NTU)	UUC Reading	Correction	Deviation	Uncertainty
0.080	0.20	-0.120	0.0	0.070
20.50	23.0	-2.50	0.1	1.0
103.0	109	-6.0	0.6	7.0
824.0	917	-93.0	0.8	45

## After Adjustment

Std Turbidity (NTU)	UUC Reading	Correction	Deviation	Uncertainty
0.080	0.07	0.010	0.0	0.070
20.50	20.5	0.00	0.1	1.0
103.0	104	-1.0	0.5	7.0
824.0	823	1.0	0.7	45

The End of Certificate

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CAL-FM-C08-08: 20 Jul 2022

ชนิดเครื่องมือ: TURBIDIMETER

รุ่น: 2100Q

หมายเลขเครื่อง: 14090C035505

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
01 Nov 2023			01 Nov 2023		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		<i>General</i>			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. ความสมบูรณ์เครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสะอาด ( ช่องใส่ตัวอย่าง, ภายใน-นอกเครื่อง)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. สวิตช์ ปิด - เปิด เครื่อง (On-Off Switch)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. ปุ่มกด (Keypad)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. หน้าจอ (Display, Screen Contrast)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
		<i>Spectrophotometer</i>			
<input type="checkbox"/>	<input type="checkbox"/>	6. แรงดันไฟฟ้า (Battery Backup) >= 2.5 VDC	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	7. ตัวหมุนเลือกความยาวคลื่น (Wavelength Control)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	8. ความยาวคลื่น (Wavelength Check)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	9. แหล่งกำเนิดแสง (UV < 3,000 hour)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	10. แหล่งกำเนิดแสง (Visible < 5,000 hour)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	11. ช่องวัดหลายตัวอย่าง (Carousel Module)	<input type="checkbox"/>	<input type="checkbox"/>	
		<i>pH Meter and Conductivity Meter</i>			
<input type="checkbox"/>	<input type="checkbox"/>	12. ขั้วไฟฟ้า ( Electrode and Connection Cable )	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	13. ระดับสารละลายใน Electrode (Level KCl )	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	14. ฝาปิดกันปลาย Electrode (Dust Protection Hood)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	15. ขาตั้งขั้วไฟฟ้า (Stand)	<input type="checkbox"/>	<input type="checkbox"/>	
		<i>Turbidimeter</i>			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	16. ค่าความขุ่นที่ต่ำสุด (No Sample)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	0.58/0.03 NTU
<input type="checkbox"/>	<input type="checkbox"/>	17. ระดับการส่องสว่างของแสง (≥ 2.5 ไม่น้อย 3.0)	<input type="checkbox"/>	<input type="checkbox"/>	
		<i>Automatic titrator</i>			
<input type="checkbox"/>	<input type="checkbox"/>	18. สภาพ Piston Burettes	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	19. Function Rinsing and Dosing	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	20. ระบบท่อสายยางและอุปกรณ์ประกอบ	<input type="checkbox"/>	<input type="checkbox"/>	

เพื่อเพิ่ม/ซ่อมแซม:

Service Engineer

บริษัท ดีเคเอส อีเซีย จำกัด  
DKSH Technology Limited  
2533 Sukhumvit Road, Bangkok, Prachinburi 25140  
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

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## CALIBRATION CERTIFICATE

Certificate No. : S2023090749-0004

Date Issued : 05-Nov-23

Customer : Integrated Research Center Co., Ltd  
122 Moo 2, Thatoom, Srimahaphote, Prachinburi 25140 Thailand

Equipment : Cool room

Manufacturer : Dixell  
Model : XRO6CX-5NOC1  
Serial No. : LIOGBXB500  
ID No./Tag No. : DARC-TE15028  
Date Received : 30-Oct-23  
Date Calibrated : 30-Oct-23  
Calibrated by : Mr. Wisut Pansuupchua

## Calibration Method or Calibration Procedure Used

Standard method : CP-05 TLAS G-20.

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

## Result of Calibration

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

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Certificate No. : S2023090749-0004

Environment : Ambient Temperature : Start record 28.2 °C, Stop record 28.4 °C  
Relative Humidity : Start record 48.6 %RH, Stop record 49.5 %RH

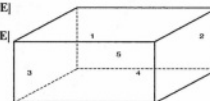
Calibration Temperature (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Stability <sup>1</sup> (°C)	Measured Uniformity <sup>2</sup> (°C)	Overall Variation <sup>3</sup> (°C)
4	4.0	4.0	1.24	0.98	2.63

Without adjustment

Calibration Temperature (°C)	STD No. 1 (°C)	STD No. 2 (°C)	STD No. 3 (°C)	STD No. 4 (°C)	STD No. 5 (°C)	Uncertainty <sup>4</sup> ±°C
4	4.22	4.37	4.01	3.95	3.86	1.5

Calibration Temperature (°C)	MPE (±°C)	Pass / Fail with Guard Band				
		STD No. 1 (°C)	STD No. 2 (°C)	STD No. 3 (°C)	STD No. 4 (°C)	STD No. 5 (°C)
4	3	Pass	Pass	Pass	Pass	Pass

Note : Probe No. 5 is Reference Probe

Pass =  $|\text{error}| + |\text{uncertainty}| \leq |\text{MPE}|$ Fail =  $|\text{error}| + |\text{uncertainty}| > |\text{MPE}|$ 

Condition As-Received : Used Item

The measurement results and statements of conformity only relate to the item calibrated.

## Measurement Standards Used &amp; Traceability :

The International System of Units (SI) through

MIT Certificate No. L202309114-0001 for Digital Thermometer with Probe (Agilent) Module 1 (172) NTC Serial No. US37011204, Due 11-Mar-24

- Notes : 1. The temperature stability is the one-half of greatest maximum difference of measured temperatures at any one probe.  
2. The temperature uniformity is the maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time.  
3. Overall variation is the difference of maximum and minimum measured temperatures throughout observation time.  
4. The uncertainty of measurement is included temperature stability.

End of Certificate

Page 2 of 2



## CALIBRATION CERTIFICATE

Certificate No. : S2023090749-0001  
Date Issued : 05-Nov-23

Customer : Integrated Research Center Co., Ltd  
122 Moo 2, Thatoom, Srimahaphote, Prachinburi 25140 Thailand

Equipment : Conductivity Meter

Manufacturer : METTLER TOLEDO

Model : Seven Eacy

Serial No. : 1232025828

ID No./Tag No. : DARC-TE11047

Date Received : 30-Oct-23

Date Calibrated : 30-Oct-23

Calibrated by : Mr. Wisut Pansuupchua

### Calibration Method or Calibration Procedure Used

In-house method : CP-148 by direct measurement with certified reference material.

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

### Result of Calibration

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

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Page 1 of 2

Certificate No : S2023090749-0001

Environment : Ambient Temperature : Start record 25.4 °C, Stop record 25.3 °C  
Relative Humidity : Start record 55.2 %RH, Stop record 55.6 %RH

Adjustment :  
X Without Adjustment

STD	Before Adjusted	After Adjusted	Error	Uncertainty	MPE	Pass / Fail
Conductivity Solution	UUC Reading	UUC Reading		(±)	(± µS/cm)	with Guard Band
1415 µS/cm at 25.00°C	1415 µS/cm at 25.5 °C	- µS/cm	0 µS/cm	7.7 µS/cm $k = 2.00$	14.15	Pass

STD = Standard Pass =  $|\text{error}| + |\text{uncertainty}| \leq |\text{MPE}|$

UUC = Unit Under Calibration Fail =  $|\text{error}| + |\text{uncertainty}| > |\text{MPE}|$

Description of UUC : Scale Division 1 µS/cm

Condition As-Received : Used Item  
The measurement results and statements of conformity with specification only relate to the item calibrated.

### Standard Conductivity Solution :

### Standard Conductivity Solution & Traceability :

The International System of Units (SI) through

MIT Certificate No. L202305082-002 for Density solution 1.0 g/ml Serial No. D1713161117, Due 04-May-24

Hanna Certificate No. 05122 for Conductivity 1413 µS/cm @ 25°C Lot No. 8201, Due 05 OCT 2027

End of Certificate

Page 2 of 2



## CALIBRATION CERTIFICATE

Certificate No. : S2023090749-0002  
Date Issued : 05-Nov-23

Customer : Integrated Research Center Co., Ltd  
122 Moo 2, Thatoom, Srimahaphote, Prachinburi 25140 Thailand

Equipment : pH/DO Meter

Manufacturer : METTLER TOLEDO

Model : Seven Go Duo

Serial No. : B932068736

ID No./Tag No. : -

Date Received : 30-Oct-23

Date Calibrated : 30-Oct-23

Calibrated by : Mr. Wisut Pansuupchua

### Calibration Method or Calibration Procedure Used

In-house method : CP-42 by direct measurement with pH buffer solution.

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

### Result of Calibration

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

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Page 1 of 2

Certificate No : S2023090749-0002

Environment : Ambient Temperature : Start record 25.2 °C, Stop record 25.1 °C  
Relative Humidity : Start record 55.2 %RH, Stop record 55.4 %RH

### DC Voltage Measurement Results Part

Nominal Value	STD Applied DC Voltage	UUC Reading	UUC Reading	UUC Error	Uncertainty	MPE	Pass / Fail
(pH)	(mV)	(mV)	(pH)	(mV)	(± mV)	(± mV)	with Guard Band
0.00	414.12	414.1	0.00	-0.02	0.17	0.3	Pass
4.00	177.48	177.5	4.00	0.02	0.12	0.3	Pass
7.00	0.00	0.0	7.00	0.00	0.059	0.3	Pass
10.00	-177.48	-177.5	10.00	-0.02	0.12	0.3	Pass
14.00	-414.12	-414.2	14.00	-0.08	0.17	0.3	Pass

### Electrode Test Results Part

pH Electrode Serial No. : -

3 points calibration using standard buffer solutions of pH 4.01, pH 7.01, pH 10.01

Percent Slope : 101.19 at pH 6.985 and 4.005, 95.67 at pH 6.985 and 10.003

Set Slope :

- NIMT Lot No. 040822 for pH 4.003 Buffer Solution, Due 28 DEC 2023
- CPA chem Lot No. 845826 for pH 6.985 Buffer Solution, Due 14 OCT 2024
- NIMT Lot No. 230822 for pH 10.003 Buffer Solution, Due 28 DEC 2023

Standard	Before Adjusted	After Adjusted	UUC Error	Uncertainty	MPE	Pass / Fail
pH Solution @ 25° C (pH)	UUC Reading (pH)	UUC Reading (pH)	(pH)	(± pH)	(± pH)	with Guard Band
4.003	4.05	4.01	0.007	0.0091	0.5	Pass
6.985	7.11	7.00	0.015	0.0091	0.5	Pass
10.003	10.12	10.01	0.007	0.0085	0.5	Pass

STD = Standard Pass =  $|\text{error}| + |\text{uncertainty}| \leq |\text{MPE}|$

UUC = Unit Under Calibration Fail =  $|\text{error}| + |\text{uncertainty}| > |\text{MPE}|$

Description of UUC : Range pH 0 to pH 14  
-2000 mV to 2000 mV

Condition As-Received : Used Item  
The measurement results and statements of conformity with specification only relate to the item calibrated.

### Certified Reference Material & Traceability of Certificate :

The International System of Units (SI) through

- Na Cal. Certificate No. E1U231268 for HANDY CAL CA150 Serial No. 23L2009, Due 22-Mar-24

- NIMT Lot No. 040822 for pH 4.003 Buffer Solution, Due 28 DEC 2023

- CPA chem Lot No. 845826 for pH 6.985 Buffer Solution, Due 14 OCT 2024

- NIMT Lot No. 230822 for pH 10.003 Buffer Solution, Due 28 DEC 2023

End of Certificate

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## CALIBRATION CERTIFICATE

Certificate No. : S2023090749-0003  
Date Issued : 05-Nov-23

Customer : Integrated Research Center Co., Ltd  
122 Moo 2, Thatoom, Srimahaphote, Prachinburi 25140 Thailand

Equipment : Thermometer claudard

Manufacturer : -

Model : -

Serial No. : 19009

ID No./Tag No. : -

Date Received : 30-Oct-23

Date Calibrated : 30-Oct-23

Calibrated by : Mr. Praphan Thangsakul

### Calibration Method or Calibration Procedure Used

In-house method : CP-136 by comparing against Standard Thermometer.

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

### Result of Calibration

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

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Page 1 of 2

Certificate No. : S2023090749-0003

Environment : Ambient Temperature : Start record 25.7 °C, Stop record 25.4 °C  
Relative Humidity : Start record 55.4 %RH, Stop record 55.3 %RH

Description of UUC : Range : -10 to 250 °C  
Scale Division : 0.5 °C  
Resolution : 0.1 °C  
UUC Reference scale : 0 °C  
Measured Reference temperature : 0.012 °C  
Type : Total Immersion

STD	Unit Under Calibration	UUC Error	Measurement	MPE	Pass / Fail
Reading (°C)	Reading (°C)	(°C)	Uncertainty (±°C)	±(°C)	with Guard Band
0.027	0.0	-0.027	0.32	1	Pass
50.019	50.0	-0.019	0.35	1	Pass
100.019	100.0	-0.019	0.35	1	Pass

STD = Standard Pass =  $|\text{error}| + |\text{uncertainty}| \leq |\text{MPE}|$

UUC = Unit Under Calibration Fail =  $|\text{error}| + |\text{uncertainty}| > |\text{MPE}|$

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

### Measurement Standards Used & Traceability :

The International System of Units (SI) through

MIT Certificate No. L202301188-025 for Digital Thermometer with PRT Serial No. 75827, Due 15-Mar-24

End of Certificate

Page 2 of 2



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## CALIBRATION CERTIFICATE

Certificate No. : S2023090749-0006  
Date Issued : 05-Nov-23

Customer : Integrated Research Center Co., Ltd  
122 Moo 2, Thatoom, Srimahaphote, Prachinburi 25140 Thailand

Equipment : Moisture analyzer

Manufacturer : Sartorius

Model : MA35

Serial No. : SWB26303311

ID No./Tag No. : -

Date Received : 30-Oct-23

Date Calibrated : 30-Oct-23

Calibrated by : Mr. Wisut Pansuuphuch

### Calibration Method or Calibration Procedure Used

In-house method : CP-06 base on UKAS LAB 14 Edition 5 July 2015.

In-house method : CP-69 In-situ technique by comparing against Standard Thermometer.

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

### Result of Calibration

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

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Page 1 of 3

Certificate No. : S2023090749-0006

Environment : Ambient Temperature : Start record 25.7 °C, Stop record 25.9 °C  
Relative Humidity : Start record 55.7 %RH, Stop record 55.6 %RH  
Atmospheric Pressure : Start record 1009.3 mbar, Stop record 1009.5 mbar  
Max. Capacity : 35 g Resolution : 0.001 g

### Departure from nominal value

Nominal Value (g)	Before Adjusted Correction (g)	After Adjusted Correction (g)	Uncertainty ± g	MPE ± g	Pass / Fail with Guard Band
0.0 *	0.000	-	0.00082	0.003	Pass
3.5	0.000	-	0.00083	0.003	Pass
7.0	0.000	-	0.00083	0.003	Pass
10.5	0.000	-	0.00083	0.003	Pass
14.0	0.000	-	0.00084	0.003	Pass
17.5	0.000	-	0.00086	0.003	Pass
21.0	0.000	-	0.00084	0.003	Pass
24.5	0.000	-	0.00084	0.003	Pass
28.0	0.000	-	0.00087	0.003	Pass
31.5	0.000	-	0.00085	0.003	Pass
35.0	0.000	-	0.00086	0.003	Pass

Marked \* are not included in the NSC-ONSC accreditation schedule for our laboratory.

Pass =  $|\text{error}| + |\text{uncertainty}| \leq |\text{MPE}|$

Fail =  $|\text{error}| + |\text{uncertainty}| > |\text{MPE}|$

### Repeatability of reading

Load (g) : 35  
Standard deviation (g) : 0.0000  
Maximum difference (g) : 0.000  
between successive reading

### Off-centre loading

Load (g) : 15  
Position A (g) : 15.000  
Position B (g) : 15.000  
Position C (g) : 15.000  
Position D (g) : 15.000  
Position E (g) : 15.000  
Maximum (g) : 0.000  
difference



Front View

Condition As-Received: Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

### Measurement Standards Used & Traceability :

The International System of Units (SI) through

Calibtech Certificate No. 66-210346-1 for Weight Standard 6 kg (F1) Serial No. MIT-STD-20, Due 13-Jul-24

Page 2 of 3



## Temperature \*

Setting (°C)	Display Reading (°C)	Before Adjusted STD Reading (°C)	After Adjusted STD Reading (°C)	Error (°C)	Uncertainty (± °C)	MPE (± °C)	Pass / Fail with Guard Band
75	75	75.2	-	-0.2	0.49	1	Pass
105	105	105.3	-	-0.3	0.49	1	Pass

Marked \* are not included in the NSC-ONSC accreditation schedule for our laboratory.

Pass =  $|\text{error}| + |\text{uncertainty}| \leq |\text{MPE}|$

Fail =  $|\text{error}| + |\text{uncertainty}| > |\text{MPE}|$

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

## Measurement Standards Used &amp; Traceability :

The International System of Units (SI) through

MIT Certificate No. L202302323-020 for Sound Level Meter (Temperature Measurement Function) Serial No. Q671506, Due 29-Mar-24

End of Certificate

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## CALIBRATION CERTIFICATE

Certificate No. : L202309364-0002

Date Issued : 06-Nov-23

Customer : Integrated Research Center Co., Ltd  
122 Moo 2, Thatoom, Srimahaphote, Prachinburi 25140 Thailand

Equipment : Digital Thermo - Hygrometer

Manufacturer : Thermopro

Model : TP55

Serial No. : -

ID No./Tag No. : WL-2022/01

Date Received : 31-Oct-23

Date Calibrated : 02-Nov-23

Calibrated by : Mr. Apiwat Peanrungrat

## Calibration Method or Calibration Procedure Used

In-house method : CP-19 by comparing against Standard Digital Humidity / Temperature Meter

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

## Result of Calibration

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

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Page 1 of 2

Certificate No. : L202309364-0002

Environment : Ambient Temperature :  $(25 \pm 2)^\circ\text{C}$   
Relative Humidity :  $(50 \pm 15)\%\text{RH}$

Function : Temperature Measurement Humidity Control :  $(50 \pm 15)\%\text{RH}$

STD Reading (°C)	UUC Reading (°C)	UUC Error (°C)	Measurement Uncertainty (±°C)	MPE (±°C)	Pass / Fail with Guard Band
20.00	20.2	0.20	0.35	1	Pass
24.98	25.1	0.12	0.35	1	Pass

Function : Humidity Measurement Temperature Control :  $(25 \pm 5)^\circ\text{C}$

STD Reading (%RH)	UUC Reading (%RH)	UUC Error (%RH)	Measurement Uncertainty (±%RH)	MPE (±%RH)	Pass / Fail with Guard Band
30.00	32	2.00	2.5	5	Pass
49.99	52	2.01	2.5	5	Pass
70.00	71	1.00	2.5	5	Pass

STD = Standard

Pass =  $|\text{error}| + |\text{uncertainty}| \leq |\text{MPE}|$

UUC = Unit Under Calibration

Fail =  $|\text{error}| + |\text{uncertainty}| > |\text{MPE}|$

Description of UUC : Range (-50) to 70 °C Internal Sensor / 10 to 99 %RH  
Resolution 0.1 °C / 1 %RH

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

## Measurement Standards Used &amp; Traceability :

The International System of Units (SI) through

MIT Certificate No. L202210258-006 for Digital Thermometer with Probe (Fluke) Serial No. 5856603, Due 10-Nov-23

MIT Certificate No. L202306247-010 for Digital Humidity Meter Serial No. D1650010, Due 24-Dec-23

End of Certificate

Page 2 of 2



## CALIBRATION CERTIFICATE

Certificate No. : L202309364-0003

Date Issued : 06-Nov-23

Customer : Integrated Research Center Co., Ltd  
122 Moo 2, Thatoom, Srimahaphote, Prachinburi 25140 Thailand

Equipment : Digital Thermo - Hygrometer

Manufacturer : Thermopro

Model : TP55

Serial No. : -

ID No./Tag No. : WL-2022/02

Date Received : 31-Oct-23

Date Calibrated : 02-Nov-23

Calibrated by : Mr. Apiwat Peanrungrat

## Calibration Method or Calibration Procedure Used

In-house method : CP-19 by comparing against Standard Digital Humidity / Temperature Meter

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

## Result of Calibration

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

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Page 1 of 2

Certificate No. : L202309364-0003  
Environment : Ambient Temperature : (25 ± 2) °C  
Relative Humidity : (50 ± 15)%RH

Function : Temperature Measurement Humidity Control : (50 ± 15) %RH

STD	UUC Reading	UUC Error	Measurement	MPE	Pass / Fail
Reading (°C)	(°C)	(°C)	Uncertainty (±°C)	±°C	with Guard Band
20.00	20.3	0.30	0.35	1	Pass
24.98	25.1	0.12	0.35	1	Pass

Function : Humidity Measurement Temperature Control : (25 ± 5)°C

STD	UUC Reading	UUC Error	Measurement	MPE	Pass / Fail
Reading (%RH)	(%RH)	(%RH)	Uncertainty (±%RH)	(±%RH)	with Guard Band
30.00	32	2.00	2.5	5	Pass
49.99	52	2.01	2.5	5	Pass
70.00	72	2.00	2.5	5	Pass

STD = Standard Pass = |error| + |uncertainty| ≤ |MPE|  
UUC = Unit Under Calibration Fail = |error| + |uncertainty| > |MPE|

Description of UUC : Range (-50) to 70 °C Internal Sensor / 10 to 99 %RH  
Resolution 0.1 °C / 1 %RH

Condition As-Received : Used Item  
The measurement results and statements of conformity with specification only relate to the item calibrated.

#### Measurement Standards Used & Traceability :

The International System of Units (SI) through  
MIT Certificate No. L202210258-006 for Digital Thermometer with Probe (Fluke) Serial No. 5856603, Due 10-Nov-23  
MIT Certificate No. L202306247-010 for Digital Humidity Meter Serial No. D1650010, Due 24-Dec-23

End of Certificate

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## CALIBRATION CERTIFICATE

Certificate No. : L202309364-0001  
Date Issued : 06-Nov-23

Customer : Integrated Research Center Co., Ltd  
122 Moo 2, Thatoom, Srimahaphote, Prachinburi 25140 Thailand

Equipment : Digital Thermo - Hygrometer

Manufacturer : Digicon  
Model : TH-03  
Serial No. : 094AA0886  
ID No./Tag No. : -  
Date Received : 31-Oct-23  
Date Calibrated : 02-Nov-23  
Calibrated by : Mr. Apiwat Peanrungrat

#### Calibration Method or Calibration Procedure Used

In-house method : CP-19 by comparing against Standard Digital Humidity / Temperature Meter

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

#### Result of Calibration

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

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Page 1 of 2

Certificate No. : L202309364-0001  
Environment : Ambient Temperature : (25 ± 2) °C  
Relative Humidity : (50 ± 15)%RH

Function : Temperature Measurement Humidity Control : (50 ± 15) %RH

STD	UUC Reading	UUC Error	Measurement	MPE	Pass / Fail
Reading (°C)	(°C)	(°C)	Uncertainty (±°C)	±°C	with Guard Band
20.00	20	0.00	0.67	1	Pass
24.98	25	0.02	0.67	1	Pass

Function : Humidity Measurement Temperature Control : (25 ± 5)°C

STD	UUC Reading	UUC Error	Measurement	MPE	Pass / Fail
Reading (%RH)	(%RH)	(%RH)	Uncertainty (±%RH)	(±%RH)	with Guard Band
30.00	10	-20.00	2.5	5	Failed
49.99	10	-39.99	2.5	5	Failed
70.00	28	-42.00	2.5	5	Failed

STD = Standard Pass = |error| + |uncertainty| ≤ |MPE|  
UUC = Unit Under Calibration Fail = |error| + |uncertainty| > |MPE|

Description of UUC : Range (-10) to 50 °C Internal Sensor / 20 to 99 %RH  
Resolution 1 °C / 1 %RH

Condition As-Received : Used Item  
The measurement results and statements of conformity with specification only relate to the item calibrated.

#### Measurement Standards Used & Traceability :

The International System of Units (SI) through  
MIT Certificate No. L202210258-006 for Digital Thermometer with Probe (Fluke) Serial No. 5856603, Due 10-Nov-23  
MIT Certificate No. L202306247-010 for Digital Humidity Meter Serial No. D1650010, Due 24-Dec-23

End of Certificate

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## CALIBRATION CERTIFICATE

Certificate No. : S2023090749-0005  
Date Issued : 05-Nov-23

Customer : Integrated Research Center Co., Ltd  
122 Moo 2, Thatoom, Srimahaphote, Prachinburi 25140 Thailand

Equipment : Furnace

Manufacturer : CARBOLITE  
Model : CWE 12/5  
Serial No. : 296/521  
ID No./Tag No. : -  
Date Received : 30-Oct-23  
Date Calibrated : 30-Oct-23  
Calibrated by : Mr. Praphan Thangsakul

#### Calibration Method or Calibration Procedure Used

In-house method : CP-61 by comparison against Standard Thermometer.

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

#### Result of Calibration

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

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Page 1 of 2

**Environment :** Ambient Temperature : Start record 25.1 °C, Stop record 25.5 °C  
Relative Humidity : Start record 55.8 %RH, Stop record 55.9 %RH

UUC	UUC Display Maximum	UUC Display Minimum	STD Reading Before Adjusted	STD Reading After Adjusted	Uncertainty	MPE	Pass / Fail with Guard Band
Setting (°C)	(°C)	(°C)	(°C)	(°C)	(± °C)	(± °C)	
550	550	550	550.3	-	3.2	5	Pass

<b>STD = Standard</b>	<b>Pass =</b> $ \text{error}  +  \text{uncertainty}  \leq  \text{MPE} $
<b>UUC = Unit Under Calibration</b>	<b>Fail =</b> $ \text{error}  +  \text{uncertainty}  >  \text{MPE} $

The measurement results and statements of conformity with specification only relate to the item calibrated.

The International System of Units (SI) through

MIT Certificate No. L202309228-0003 for Thermocouple Sensor (Type N) Serial No. 44703002/02-63, Due 30-Sep-24

NA Cal. Certificate No. E2U2300038 for Multifunction Calibrator (MCX II) Serial No. 01269, Due 21-May-24

**End of Certificate**



เอกสารแนบ จ

สำเนาหนังสืออนุญาตขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

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บริษัท ยูไนเต็ด แอนนาลิสต์ แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด

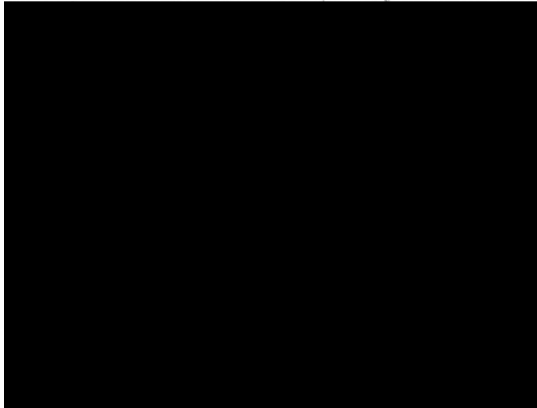
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## ๑๓ พฤษภาคม ๒๕๖๗

เรื่อง เปลี่ยนแปลงบุคลากร สารมลพิษที่วิเคราะห์และเอกสารอ้างอิงวิธีวิเคราะห์สารมลพิษ

เรียน กรรมการผู้จัดการ บริษัท ยูโนเด็ค แอนนาลิสต์ แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด

อ้างถึง ๑. คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน  
ลงวันที่ ๔ มีนาคม ๒๕๖๗๒. คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน  
ลงวันที่ ๑๒ มีนาคม ๒๕๖๗สิ่งที่ส่งมาด้วย เอกสารแนบท้ายหนังสือเปลี่ยนแปลงบุคลากร สารมลพิษที่วิเคราะห์และเอกสารอ้างอิง  
วิธีวิเคราะห์สารมลพิษ บริษัท ยูโนเด็ค แอนนาลิสต์ แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด  
จำนวน ๑๙ แผ่นตามคำขออ้างถึง ๑ และ ๒ บริษัท ยูโนเด็ค แอนนาลิสต์ แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด  
ห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ๖-๓๕๔ สถานที่ตั้งเลขที่ ๓ ซอยสุขุมสุข ๕๑ ถนนสุขุมวิท แขวงบางจาก  
เขตพระโขนง กรุงเทพมหานคร ขอเปลี่ยนแปลงบุคลากร สารมลพิษที่วิเคราะห์และเอกสารอ้างอิงวิธีวิเคราะห์  
สารมลพิษ ความละเอียดดังนี้

๑๒) นางสาวปวีณา...

ตามรายการเอกสาร  
๑๘๗๗ ลงวันที่๕. ให้วิเคราะห์สารมลพิษตามข้อบ่งชี้ที่ได้รับขึ้นทะเบียนวิเคราะห์ในน้ำดื่ม น้ำดื่ม  
และสิ่งปฏิกูลหรือวัสดุที่ไม่ให้แล้ว ตามเอกสารแนบท้ายหนังสือเปลี่ยนแปลงบุคลากร สารมลพิษที่วิเคราะห์และ  
เอกสารอ้างอิงวิธีวิเคราะห์สารมลพิษ ดังสิ่งที่ส่งมาด้วยอนึ่ง หนังสือแนบท้ายจะหมดอายุพร้อมหนังสือที่ยื่นขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน  
ในวันที่ ๒ กุมภาพันธ์ ๒๕๖๘

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ



กองวิจัยและพัฒนายุทธศาสตร์โรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและระบบจัดการมลพิษ

โทร. ๐ ๒๕๓๐ ๖๓๑๒ ต่อ ๒๑๐๖๕

โทรสาร ๐ ๒๕๓๐ ๖๓๑๒ ต่อ ๒๑๑๗๗

ไปรษณีย์อิเล็กทรอนิกส์ saraban@dlw.mail.go.th



“อุตสาหกรรมก้าวหน้า ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว”

เอกสารแนบท้ายหนังสือเปลี่ยนแปลงบุคลากร สารมลพิษที่วิเคราะห์และเอกสารอ้างอิงวิธีวิเคราะห์สารมลพิษ  
บริษัท ยูโนเด็ค แอนนาลิสต์ แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด เลขทะเบียน ๖-๓๕๔  
ที่ อก ๐๓๑๐(๑)/ ๕๓ ๓ ๕ ลงวันที่ ๑๓ พฤษภาคม ๒๕๖๗

ข้อบ่งชี้สารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๒๐๗ รายการ

น้ำ/น้ำเสีย จำนวน ๔๖ รายการ

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
1	Aldrin	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>
2	Arsenic	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>[3]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[3]</sup> Digestion, Inductively Coupled Plasma Method <sup>[3]</sup>
3	Barium	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>
4	α-BHC	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>
5	β-BHC	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>
6	δ-BHC	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>
7	γ-BHC	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>
8	Biochemical Oxygen Demand	1) 5-Day BOD Test, Azide Modification Method <sup>[3]</sup> 2) 5-Day BOD Test, Membrane Electrode Method <sup>[3]</sup>
9	Cadmium	1) Digestion, Direct Air-Acetylene Flame Method <sup>[3]</sup> 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method <sup>[3]</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>[3]</sup>
10	Chemical Oxygen Demand	1) Closed Reflux, Titrimetric Method <sup>[3]</sup> 2) Closed Reflux, Colorimetric Method <sup>[3]</sup> 3) Open Reflux, Titrimetric Method <sup>[3]</sup>
11	Chlordane	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>
12	Chromium	1) Digestion, Direct Air-Acetylene Flame Method <sup>[3]</sup> 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method <sup>[3]</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>[3]</sup>
13	Color	ADMI Weighted-Ordinate Spectrophotometric Method <sup>[3]</sup>
14	Copper	1) Digestion, Direct Air-Acetylene Flame Method <sup>[3]</sup> 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method <sup>[3]</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>[3]</sup>
15	Cyanide	1) Distillation, Colorimetric Method <sup>[3]</sup> 2) Flow Injection Analysis Method <sup>[3]</sup>
16	o,p'-DDT	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>

17 4,4'-DDD...

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ลำดับ	สารมลพิษ	วิธีวิเคราะห์
17	4,4'-DDD	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>
18	4,4'-DDE	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>
19	4,4'-DDT	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>
20	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>
21	Endosulfan I	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>
22	Endosulfan II	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>
23	Endosulfan sulfate	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>
24	Endrin	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>
25	Endrin aldehyde	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>
26	Formaldehyde	Distillation, Colorimetric Method <sup>[3]</sup>
27	Free Chlorine	1) Iodometric Method <sup>[3]</sup> 2) DPD Ferrous Titrimetric Method <sup>[3]</sup>
28	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>
29	Heptachlor Epoxide	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>
30	Hexavalent Chromium	1) Colorimetric Method <sup>[3]</sup> 2) Extraction, Direct Air-Acetylene Flame Method <sup>[3]</sup>
31	Lead	1) Digestion, Direct Air-Acetylene Flame Method <sup>[3]</sup> 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method <sup>[3]</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>[3]</sup>
32	Manganese	1) Digestion, Direct Air-Acetylene Flame Method <sup>[3]</sup> 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method <sup>[3]</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>[3]</sup>
33	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>[3]</sup>
34	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>
35	Nickel	1) Digestion, Direct Air-Acetylene Flame Method <sup>[3]</sup> 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method <sup>[3]</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>[3]</sup>
36	Oil & Grease	1) Extraction, Partitioning 2) Soxhlet Extraction Method <sup>[3]</sup>
37	pH	Electrometric Method <sup>[3]</sup>

38 Phenols...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
38	Phenols	1) Distillation, Chloroform Extraction Method <sup>[3]</sup> 2) Distillation, Direct Photometric Method <sup>[3]</sup>
39	Selenium	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>[3]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[3]</sup>
40	Sulfide	1) Iodometric Method <sup>[3]</sup> 2) Methylene Blue Method <sup>[3]</sup>
41	Temperature	Laboratory and Field Methods <sup>[3]</sup>
42	Total Dissolved Solids	Dried at 180 °C <sup>[3]</sup>
43	Total Kjeldahl Nitrogen	Semi-Micro-Kjeldahl Method <sup>[3]</sup>
44	Total Suspended Solids	Dried from 103 to 105 °C <sup>[3]</sup>
45	Trivalent Chromium	1) Digestion, Direct Air-Acetylene Flame Method; Colorimetric Method; Calculation <sup>[3]</sup> 2) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation <sup>[3]</sup>
46	Zinc	1) Digestion, Direct Air-Acetylene Flame Method <sup>[3]</sup> 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method <sup>[3]</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>[3]</sup>

น้ำใต้ดิน จำนวน 126 รายการ

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[3]</sup>
2	Acetone	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>[3]</sup>
3	Aldrin	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[3]</sup>
4	Anthracene	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[3]</sup>

5 Antimony...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
5	Antimony	Digestion, Inductively Coupled Plasma Method <sup>[3]</sup>
6	Arsenic	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>[3]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[3]</sup>
7	Atrazine	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[3]</sup>
8	Barium	1) Digestion, Electrothermal Atomic Absorption Spectrometric Method <sup>[3]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[3]</sup>
9	Benz(a)anthracene	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[3]</sup>
10	Benzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>[3]</sup>
11	Benzo(b)fluoranthene	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[3]</sup>
12	Benzo(k)fluoranthene	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[3]</sup>
13	Benzoic acid	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[3]</sup>
14	Benzo(a)pyrene	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[3]</sup>
15	Benzo(g,h,i)perylene	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[3]</sup>
16	Beryllium	Digestion, Inductively Coupled Plasma Method <sup>[3]</sup>
17	Bis(2-chloroethyl)ether	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[3]</sup>
18	Bis(2-ethylhexyl)phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[3]</sup>

19 Bromochloromethane...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
19	Bromodichloromethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>[3]</sup>
20	Bromoform	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>[3]</sup>
21	Butanol	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>[3]</sup>
22	Butyl benzyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[3]</sup>
23	Cadmium	1) Digestion, Direct Air-Acetylene Flame Method <sup>[3]</sup> 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method <sup>[3]</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>[3]</sup>
24	Carbazole	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[3]</sup>
25	Carbon disulfide	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>[3]</sup>
26	Carbon tetrachloride	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>[3]</sup>
27	Chlordane	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[3]</sup>
28	p-Chloroaniline	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[3]</sup>
29	Chlorobenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>[3]</sup>
30	Chlorodibromomethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>[3]</sup>
31	Chloroform	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>[3]</sup>
32	2-Chlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[3]</sup>
33	Chromium	1) Digestion, Direct Air-Acetylene Flame Method; Colorimetric Method; Calculation <sup>[3]</sup> 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method <sup>[3]</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>[3]</sup>

34 Chromium (III)...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
34	Chromium (III)	1) Digestion, Direct Air-Acetylene Flame Method; Colorimetric Method; Calculation <sup>[3]</sup> 2) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation <sup>[3]</sup>
35	Chromium (VI)	1) Colorimetric Method <sup>[3]</sup> 2) Extraction, Air-Acetylene Flame Method <sup>[3]</sup>
36	Chrysene	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[3]</sup>
37	Cyanide	Distillation, Colorimetric Method <sup>[3]</sup>
38	2,4-D	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup>
39	DDD	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[3]</sup>
40	DDE	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[3]</sup>
41	DDT	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[3]</sup>
42	Dibenz(a,h)anthracene	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>[3]</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[3]</sup>
43	Di-n-butyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[3]</sup>
44	1,2-Dichlorobenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>[3]</sup>
45	1,3-Dichlorobenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>[3]</sup>
46	1,4-Dichlorobenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>[3]</sup>
47	3,3'-Dichlorobenzidine	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>[3]</sup>

48 1,1-Dichloroethane...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
48	1,1-Dichloroethane	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
49	1,2-Dichloroethane	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
50	1,1-Dichloroethylene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
51	cis-1,2-Dichloroethylene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
52	trans-1,2-Dichloroethylene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
53	2,4-Dichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
54	1,2-Dichloropropane	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
55	1,3-Dichloropropane	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
56	1,3-Dichloropropene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
57	Dieldrin	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(3)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
58	Diethyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
59	2,4-Dimethylphenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
60	2,4-Dinitrophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
61	2,4-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
62	2,6-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
63	Di n Octyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
64	Endosulfan	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(3)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>

65 Endrin...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
65	Endrin	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(3)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
66	Ethylbenzene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
67	Fluoranthene	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(3)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
68	Fluorene	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(3)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
69	Heptachlor	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(3)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
70	Heptachlor epoxide	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(3)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
71	Hexachlorobenzene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
72	Hexachloro-1,3-butadiene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
73	n-Hexane	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
74	α-HCH	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(3)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
75	β-HCH	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(3)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>

76 γ-HCH...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
76	γ-HCH	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(3)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
77	Hexachlorocyclopentadiene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
78	Hexachloroethane	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
79	Indeno(1,2,3-cd)pyrene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
80	Isophorone	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
81	Lead	1) Digestion, Direct Air-Acetylene Flame Method <sup>(3)</sup> 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method <sup>(3)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(3)</sup>
82	Manganese	1) Digestion, Direct Air-Acetylene Flame Method <sup>(3)</sup> 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method <sup>(3)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(3)</sup>
83	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>(3)</sup>
84	Methanol	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
85	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(3)</sup>
86	Methyl bromide	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
87	Methylene chloride	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
88	2-Methylphenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
89	2-Methylnaphthalene	1) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
90	Methyl tert-butyl ether	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>

91 Naphthalene...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
91	Naphthalene	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(3)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
92	Nickel	1) Digestion, Direct Air-Acetylene Flame Method <sup>(3)</sup> 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method <sup>(3)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(3)</sup>
93	Nitrobenzene	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
94	N-Nitrosodiphenylamine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
95	N-Nitrosodi-n-propylamine	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
96	Polychlorinated Biphenyls - PCB 1016 - PCB 1221 - PCB 1232 - PCB-1242 - PCB-1248 - PCB-1254 - PCB-1260	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(3)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
97	Pentachlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
98	pH	Electrometric Method <sup>(3)</sup>
99	Phenanthrene	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(3)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
100	Phenol	1) Distillation, Chloroform Extraction Method <sup>(3)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
101	Pyrene	1) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>

102 Selenium...



ลำดับ	สารมลพิษ	วิธีวิเคราะห์
102	Selenium	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>(3)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(3)</sup>
103	Silver	Digestion, Inductively Coupled Plasma Method <sup>(3)</sup>
104	Styrene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
105	1,1,2,2-Tetrachloroethane	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
106	Tetrachloroethylene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
107	Toluene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
108	Toxaphene	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(3)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
109	TPH (C <sub>3</sub> - C <sub>6</sub> )	1) Purge and Trap, Gas Chromatographic Method <sup>(1),(2)</sup> 2) Purge and Trap, Gas Chromatographic/ Mass spectrometric Method <sup>(1),(2)</sup>
110	TPH (C <sub>8</sub> - C <sub>15</sub> )	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(7),(2)</sup>
111	TPH (C <sub>16</sub> - C <sub>30</sub> )	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(7),(2)</sup>
112	1,2,4-Trichlorobenzene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
113	1,1,1-Trichloroethane	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
114	1,1,2-Trichloroethane	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
115	Trichloroethylene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
116	2,4,5-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
117	2,4,6-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
118	1,3,5-Trimethylbenzene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>

119 Vanadium...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
119	Vanadium	Digestion, Inductively Coupled Plasma Method <sup>(3)</sup>
120	Vinyl acetate	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
121	Vinyl chloride	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
122	m-Xylene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
123	o-Xylene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
124	p-Xylene	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
125	Xylene (Total)	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method <sup>(3)</sup>
126	Zinc	1) Digestion, Direct Air-Acetylene Flame Method <sup>(3)</sup> 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method <sup>(3)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(3)</sup>

สิ่งปกคลุมหรือวัสดุที่ไม่ใช่แก้ว จำนวน 35 รายการ

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
1	Aldrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(1),(7),(2)</sup> 2) Ultrasonic Extraction, Gas Chromatographic Method <sup>(8),(2)</sup>
2	Antimony	Digestion, Inductively Coupled Plasma Method <sup>(5),(2)</sup>
3	Arsenic	1) Waste Extraction, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>(1),(4),(2)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1),(4),(2)</sup> 3) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>(5),(4)</sup> 4) Digestion, Inductively Coupled Plasma Method <sup>(1),(4),(2)</sup>
4	Barium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1),(4),(2)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(1),(4),(2)</sup>

5 Beryllium...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
5	Beryllium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1),(4),(2)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(5),(2)</sup>
6	Cadmium	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method <sup>(1),(4),(3)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1),(4),(2)</sup> 3) Digestion, Flame Atomic Absorption Spectrometric Method <sup>(5),(3)</sup> 4) Digestion, Inductively Coupled Plasma Method <sup>(5),(2)</sup>
7	Chlordane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(1),(7),(2)</sup> 2) Ultrasonic Extraction, Gas Chromatographic Method <sup>(8),(2)</sup>
8	Chromium	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method <sup>(1),(4),(3)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1),(4),(2)</sup> 3) Digestion, Flame Atomic Absorption Spectrometric Method <sup>(5),(3)</sup> 4) Digestion, Inductively Coupled Plasma Method <sup>(5),(2)</sup>
9	Chromium (III)	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method; Waste Extraction, Colorimetric Method; Calculation <sup>(1),(4),(3),(5)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method; Waste Extraction, Colorimetric Method; Calculation <sup>(1),(4),(2),(5)</sup> 3) Digestion, Flame Atomic Absorption Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation <sup>(5),(4),(3),(5)</sup> 4) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation <sup>(5),(4),(2),(5)</sup>
10	Chromium (VI)	1) Waste Extraction, Colorimetric Method; Alkaline Digestion, Colorimetric Method; Calculation <sup>(5),(4),(2),(5)</sup> 2) Alkaline Digestion, Colorimetric Method; Calculation <sup>(5),(4),(2),(5)</sup>
11	Cobalt	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1),(4),(2)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(1),(4),(2)</sup>

12 Copper...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
12	Copper	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method <sup>(1),(4),(3)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1),(4),(2)</sup> 3) Digestion, Flame Atomic Absorption Spectrometric Method <sup>(5),(3)</sup> 4) Digestion, Inductively Coupled Plasma Method <sup>(5),(2)</sup>
13	2,4-D	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(1),(7),(2)</sup> 2) Ultrasonic Extraction, Gas Chromatographic Method <sup>(8),(2)</sup>
14	DDD	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(1),(7),(2)</sup> 2) Ultrasonic Extraction, Gas Chromatographic Method <sup>(8),(2)</sup>
15	DDE	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(1),(7),(2)</sup> 2) Ultrasonic Extraction, Gas Chromatographic Method <sup>(8),(2)</sup>
16	DDT	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(1),(7),(2)</sup> 2) Ultrasonic Extraction, Gas Chromatographic Method <sup>(8),(2)</sup>
17	Dieldrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(1),(7),(2)</sup> 2) Ultrasonic Extraction, Gas Chromatographic Method <sup>(8),(2)</sup>
18	Endrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(1),(7),(2)</sup> 2) Ultrasonic Extraction, Gas Chromatographic Method <sup>(8),(2)</sup>
19	Heptachlor	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(1),(7),(2)</sup> 2) Ultrasonic Extraction, Gas Chromatographic Method <sup>(8),(2)</sup>

20 Lead...



ลำดับ	สารมลพิษ	วิธีวิเคราะห์
20	Lead	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method <sup>(1,4,13)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1,4,12)</sup> 3) Digestion, Flame Atomic Absorption Spectrometric Method <sup>(5,13)</sup> 4) Digestion, Inductively Coupled Plasma Method <sup>(5,12)</sup>
21	Lindane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(1,7,21)</sup> 2) Ultrasonic Extraction, Gas Chromatographic Method <sup>(8,21)</sup>
22	Mercury	1) Waste Extraction, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>(1,4,16)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1,4,12)</sup> 3) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>(1,7)</sup> 4) Digestion, Inductively Coupled Plasma Method <sup>(5,12)</sup> 5) Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method <sup>(8)</sup>
23	Methoxychlor	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(1,7,21)</sup> 2) Ultrasonic Extraction, Gas Chromatographic Method <sup>(8,21)</sup>
24	Molybdenum	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1,4,12)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(5,12)</sup>
25	Nickel	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method <sup>(1,4,13)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1,4,12)</sup> 3) Digestion, Flame Atomic Absorption Spectrometric Method <sup>(5,13)</sup> 4) Digestion, Inductively Coupled Plasma Method <sup>(5,12)</sup>

26 Polychlorinated Biphenyls...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
26	Polychlorinated Biphenyls - Aroclor 1016 - Aroclor 1221 - Aroclor 1232 - Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1260 - 2-Chlorobiphenyl - 2,3-Dichlorobiphenyl - 2,2',5'-Trichlorobiphenyl - 2,4',5'-Trichlorobiphenyl - 2,2',3,5'-Tetrachlorobiphenyl - 2,2',5,5'-Tetrachlorobiphenyl - 2,3',4,4'-Tetrachlorobiphenyl - 2,2',3,4,5'-Pentachlorobiphenyl - 2,2',4,5,5'-Pentachlorobiphenyl - 2,3,3',4',6'-Pentachlorobiphenyl - 2,2',3,4,4',5'-Hexachlorobiphenyl - 2,2',3,4,5,5'-Hexachlorobiphenyl - 2,2',3,5,5',6'-Hexachlorobiphenyl - 2,2',4,4',5,5'-Hexachlorobiphenyl - 2,2',3,3',4,4',5'-Heptachlorobiphenyl - 2,2',3,4,4',5,5'-Heptachlorobiphenyl - 2,2',3,4,4',5,6'-Heptachlorobiphenyl - 2,2',3,4',5,5',6'-Heptachlorobiphenyl - 2,2',3,3',4,4',5,5',6'-Nonachlorobiphenyl	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(1,7,22)</sup> 2) Ultrasonic Extraction, Gas Chromatographic Method <sup>(8,22)</sup>

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
27	Pentachlorophenol	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(1,7,24)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(8,24)</sup> Electrometric Method <sup>(23,24)</sup>
28	pH	
29	Selenium	1) Waste Extraction, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>(1,4,19)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1,4,12)</sup> 3) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>(5,19)</sup> 4) Digestion, Inductively Coupled Plasma Method <sup>(5,12)</sup>
30	Silver	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1,4,12)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(5,12)</sup>
31	Thallium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1,4,12)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(5,12)</sup>
32	Toxaphene	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(1,7,21)</sup> 2) Ultrasonic Extraction, Gas Chromatographic Method <sup>(8,21)</sup>
33	Trichloroethylene	1) Waste Extraction, Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(1,10,23)</sup> 2) Waste Extraction, Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method <sup>(1,9,23)</sup> 3) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(1,1,23)</sup> 4) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method <sup>(9,23)</sup>
34	Vanadium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1,4,12)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(5,12)</sup>

35 Zinc...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
35	Zinc	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method <sup>(1,4,13)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(1,4,12)</sup> 3) Digestion, Flame Atomic Absorption Spectrometric Method <sup>(5,13)</sup> 4) Digestion, Inductively Coupled Plasma Method <sup>(5,12)</sup>

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กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบและประเมินผลเชิงปฏิบัติ การ ก่อสร้างและปรับปรุงโครงสร้าง การโรงงานอุตสาหกรรม โทร. ๐ ๒๕๓๐ ๖๓๒๒ ต่อ ๒๑๐๔-๕

ที่ อก ๐๓๑๐(๑)/ ๑๖ ๕ ๑ ๘



กรมโรงงานอุตสาหกรรม  
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท  
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

๑๓ ธันวาคม ๒๕๖๖

เรื่อง เปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท ยูโนเด็ค แอนาไลติกส์ แอนด์ เอ็นจิเนียริ่ง คอนซัลแตนท์ จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารเคมีของห้องปฏิบัติการวิเคราะห์เอกชน ลงวันที่ ๗ พฤศจิกายน ๒๕๖๖

ตามที่หนังสือที่อ้างถึง บริษัท ยูโนเด็ค แอนาไลติกส์ แอนด์ เอ็นจิเนียริ่ง คอนซัลแตนท์ จำกัด ห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ๖-๑๕๕ สถานที่ตั้งเลขที่ ๓ ซอยอุดมสุข ๔๑ ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร ขอเปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์ที่ ความละเอียดแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้เพิ่มเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๖ ราย ได้แก่



อนึ่ง หนังสือฉบับนี้จะหมดอายุพร้อมหนังสือต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน คือในวันที่ ๒ กุมภาพันธ์ ๒๕๖๘ ทั้งนี้ สามารถยื่นคำขอผ่านระบบอิเล็กทรอนิกส์ได้ที่หน้าเว็บไซต์ กรมโรงงานอุตสาหกรรม

จึงเรียนมาเพื่อทราบ



กองวิจัยและพัฒนาย้อมสิทธิ์โรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบและประเมินผลเชิงปฏิบัติ การ

โทร. ๐ ๒๕๓๐ ๖๓๒๒ ต่อ ๒๑๐๔-๕

โทรสาร ๐ ๒๕๓๐ ๖๓๒๒ ต่อ ๒๑๐๔

ไปรษณีย์อิเล็กทรอนิกส์ sarabang@dlw.mail.go.th



"อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกับพัฒนา อุตสาหกรรมสีเขียว"



ที่ อก ๐๓๑๐(๑)/ ๘๗ ๒ ๕



กรมโรงงานอุตสาหกรรม  
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท  
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

๒๕ พฤษภาคม ๒๕๖๖

เรื่อง เปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์

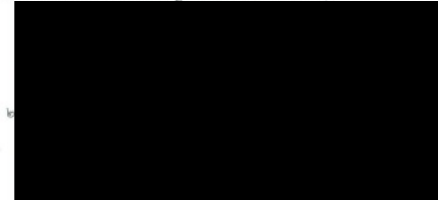
เรียน กรรมการผู้จัดการ บริษัท ยูโนเด็ค แอนาไลติกส์ แอนด์ เอ็นจิเนียริ่ง คอนซัลแตนท์ จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารเคมีของห้องปฏิบัติการวิเคราะห์เอกชน ลงวันที่ ๑๖ พฤษภาคม ๒๕๖๖

ตามที่หนังสือที่อ้างถึง บริษัท ยูโนเด็ค แอนาไลติกส์ แอนด์ เอ็นจิเนียริ่ง คอนซัลแตนท์ จำกัด ห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ๖-๑๕๕ สถานที่ตั้งเลขที่ ๓ ซอยอุดมสุข ๔๑ ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร ขอเปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์ที่ ความละเอียดแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว มีความเห็นดังนี้

๑. ให้ออกเลิกเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๕ ราย



อนึ่ง หนังสือฉบับนี้จะหมดอายุพร้อมหนังสือต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน คือในวันที่ ๒ กุมภาพันธ์ ๒๕๖๘ ทั้งนี้ สามารถยื่นคำขอผ่านระบบอิเล็กทรอนิกส์ได้ที่หน้าเว็บไซต์ กรมโรงงานอุตสาหกรรม

จึงเรียนมาเพื่อทราบ



กองวิจัยและพัฒนาย้อมสิทธิ์โรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบและประเมินผลเชิงปฏิบัติ การ

โทร. ๐ ๒๕๓๐ ๖๓๒๒ ต่อ ๒๑๐๔-๕

โทรสาร ๐ ๒๕๓๐ ๖๓๒๒ ต่อ ๒๑๐๔

ไปรษณีย์อิเล็กทรอนิกส์ sarabang@dlw.mail.go.th



"อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกับพัฒนา อุตสาหกรรมสีเขียว"



ที่ อก ๐๓๑๐(๑)/ ๖ ๐ ๒ ๘



กรมโรงงานอุตสาหกรรม  
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท  
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

๒ ๒ มีนาคม ๒๕๖๖

เรื่อง เปลี่ยนแปลงบุคลากรและสารมลพิษที่วิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท ยูโนเด็ค แอนาไลติกส์ แอนด์ เอ็นจิเนียริ่ง คอนซัลแตนท์ จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน  
ลงวันที่ ๓๐ มกราคม ๒๕๖๖

สิ่งที่ส่งมาด้วย เอกสารแนบท้ายหนังสือเปลี่ยนแปลงบุคลากรและสารมลพิษที่วิเคราะห์  
บริษัท ยูโนเด็ค แอนาไลติกส์ แอนด์ เอ็นจิเนียริ่ง คอนซัลแตนท์ จำกัด จำนวน ๒ แผ่น

ตามหนังสือที่อ้างถึง บริษัท ยูโนเด็ค แอนาไลติกส์ แอนด์ เอ็นจิเนียริ่ง คอนซัลแตนท์ จำกัด  
ห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ๖-๑๔๕ สถานที่ตั้งเลขที่ ๓ ซอยอุดมสุข ๔๑ ถนนสุขุมวิท  
แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร ขอเปลี่ยนแปลงบุคลากรและสารมลพิษที่วิเคราะห์ที่  
ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว มีความเห็นดังนี้

๑. ให้ออกใบแจ้งเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๒ ราย



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อำนาจ

อนึ่ง...

- ๒ -

อนึ่ง หนังสือฉบับนี้จะมีผลต่ออายุหนังสือขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน  
ที่ อก ๐๓๑๐(๑)/๑๔๗๙๔ ลงวันที่ ๙ กุมภาพันธ์ ๒๕๖๕ คือในวันที่ ๒ กุมภาพันธ์ ๒๕๖๘ ทั้งนี้ สามารถยื่นคำขอ  
ผ่านระบบอิเล็กทรอนิกส์ได้ทั้งนี้ขึ้นกับจุดตรวจโรงงานอุตสาหกรรม ตาม QR Code ที่แนบมาด้วย

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ



เป็นคำขอผ่านระบบอิเล็กทรอนิกส์

กองวิจัยและเตือนภัยมลพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๕๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕ โทรสาร ๐ ๒๕๓๐ ๖๓๑๒ ต่อ ๒๑๑๙๔

ไปรษณีย์อิเล็กทรอนิกส์ saraban@div.mail.go.th

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"อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว"



เอกสารแนบท้ายหนังสือเปลี่ยนแปลงบุคลากรและสารมลพิษที่วิเคราะห์

บริษัท ยูโนเด็ค แอนาไลติกส์ แอนด์ เอ็นจิเนียริ่ง คอนซัลแตนท์ จำกัด เลขทะเบียน ๖-๑๔๕

ที่ อก ๐๓๑๐(๑)/ ๖ ๐ ๒ ๘

ลงวันที่ ๒ ๒ มีนาคม ๒๕๖๖

ขอขยายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๑๖ รายการ

คืน จำนวน 16 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Benzene	Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method <sup>(1,2)</sup>
2	Carbon tetrachloride	Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method <sup>(1,2)</sup>
3	1,2-Dichloroethane	Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method <sup>(1,2)</sup>
4	1,1-Dichloroethylene	Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method <sup>(1,2)</sup>
5	cis-1,2-Dichloroethylene	Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method <sup>(1,2)</sup>
6	trans-1,2-Dichloroethylene	Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method <sup>(1,2)</sup>
7	Ethylbenzene	Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method <sup>(1,2)</sup>
8	Methylene chloride	Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method <sup>(1,2)</sup>
9	Styrene	Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method <sup>(1,2)</sup>
10	Tetrachloroethylene	Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method <sup>(1,2)</sup>
11	Toluene	Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method <sup>(1,2)</sup>
12	Trichloroethylene	Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method <sup>(1,2)</sup>
13	m-Xylene	Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method <sup>(1,2)</sup>
14	o-Xylene	Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method <sup>(1,2)</sup>
15	p-Xylene	Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method <sup>(1,2)</sup>
16	Xylene (Total)	Equilibrium Headspace, Gas Chromatographic/ Mass Spectrometric Method <sup>(1,2)</sup>

เอกสารอ้างอิง...

- ๒ -

เอกสารอ้างอิง

1. United States Environmental Protection Agency, Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Volatile Organic Compounds in Various Sample Matrices Using Equilibrium Headspace Analysis. SW-846 Method 5021A, 2014.
2. United States Environmental Protection Agency, Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry. SW-846 Method 8260D, 20

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กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ กองวิจัยและเตือนภัยมลพิษโรงงาน กรมโรงงานอุตสาหกรรม โทร. ๐ ๒๕๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕



ที่ อก ๐๓๑๐(๑)/ ๑๕๕๕๓



กรมโรงงานอุตสาหกรรม  
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท  
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

๒๕ ตุลาคม ๒๕๖๕

เรื่อง เปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท ยูโนเด็ค แอนนาลิสต์ แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด

อ้างถึง คำขอขึ้นทะเบียน/เปลี่ยนแปลงบุคลากร และชนิดสารเคมีของห้องปฏิบัติการวิเคราะห์เอกชน  
ลงวันที่ ๑๘ ตุลาคม ๒๕๖๕

ตามหนังสือที่อ้างถึง บริษัท ยูโนเด็ค แอนนาลิสต์ แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด  
ห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ๖-๑๕๕๕ สถานที่ตั้งเลขที่ ๓ ซอยอุดมสุข ๔๑ ถนนสุขุมวิท แขวงบางจาก  
เขตพระโขนง กรุงเทพมหานคร ขอเปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์ ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว มีความเห็นดังนี้

๑. ให้อยกเลิกเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๔ ราย



อนึ่ง หนังสือฉบับนี้...

- ๒ -

อนึ่ง หนังสือฉบับนี้จะมีผลตั้งแต่วันที่ ๑๕ ตุลาคม ๒๕๖๕ ถึงวันที่ ๑๕ ตุลาคม ๒๕๖๕ ทั้งนี้ สามารถยื่นคำขอ  
ผ่านระบบอิเล็กทรอนิกส์ได้ที่หน้าเว็บไซต์กรมโรงงานอุตสาหกรรม ตาม QR Code ท้ายหนังสือฉบับนี้

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ



ยื่นคำขอผ่านระบบอิเล็กทรอนิกส์

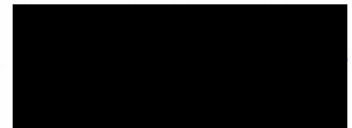
กองวิจัยและเตือนภัยมลพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๕๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕

โทรสาร ๐ ๒๕๓๐ ๖๓๑๒ ต่อ ๒๑๑๕

ไปรษณีย์อิเล็กทรอนิกส์ saraban@dlw.mail.go.th



"อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว"



ที่ อก ๐๓๑๐(๑)/ ๑๒ ๑๓ ๓



กรมโรงงานอุตสาหกรรม  
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท  
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

๐๑ กันยายน ๒๕๖๕

เรื่อง เปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์

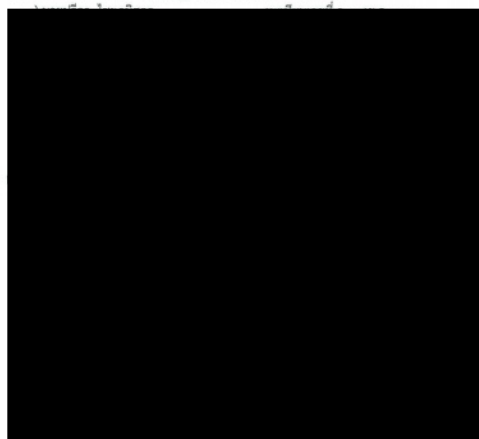
เรียน กรรมการผู้จัดการ บริษัท ยูโนเด็ค แอนนาลิสต์ แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด

อ้างถึง คำขอขึ้นทะเบียน/เปลี่ยนแปลงบุคลากร และชนิดสารเคมีของห้องปฏิบัติการวิเคราะห์เอกชน  
ลงวันที่ ๒๖ สิงหาคม ๒๕๖๕

ตามหนังสือที่อ้างถึง บริษัท ยูโนเด็ค แอนนาลิสต์ แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด  
ห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ๖-๑๕๕๕ สถานที่ตั้งเลขที่ ๓ ซอยอุดมสุข ๔๑ ถนนสุขุมวิท แขวงบางจาก  
เขตพระโขนง กรุงเทพมหานคร ขอเปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์ ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว มีความเห็นดังนี้

๑. ให้อยกเลิกเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๔ ราย



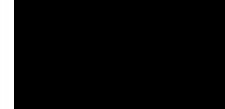
อนึ่ง หนังสือฉบับนี้...

- ๒ -

อนึ่ง หนังสือฉบับนี้จะมีผลตั้งแต่วันที่ ๑๕ ตุลาคม ๒๕๖๕ ถึงวันที่ ๑๕ ตุลาคม ๒๕๖๕ ทั้งนี้ สามารถยื่นคำขอ  
ผ่านระบบอิเล็กทรอนิกส์ได้ที่หน้าเว็บไซต์กรมโรงงานอุตสาหกรรม ตาม QR Code ท้ายหนังสือฉบับนี้

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ



ยื่นคำขอผ่านระบบอิเล็กทรอนิกส์

กองวิจัยและเตือนภัยมลพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๕๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕

โทรสาร ๐ ๒๕๓๐ ๖๓๑๒ ต่อ ๒๑๑๕

ไปรษณีย์อิเล็กทรอนิกส์ saraban@dlw.mail.go.th



UAE  
ANALYST AND CHEMISTS  
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"อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว"





ที่ อก ๐๓๑๐(๑)/ ๔๗๘ ๗



กรมโรงงานอุตสาหกรรม  
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท  
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๒๑ เมษายน ๒๕๖๕

เรื่อง เปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท ยูนิเด็ค แอนนาลิสต์ แอนด์ เอ็นจิเนียริ่ง คอนซัลแตนท์ จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารเคมีของห้องปฏิบัติการวิเคราะห์เอกชน  
ลงวันที่ ๓๐ มีนาคม ๒๕๖๕

ตามหนังสือที่อ้างถึง บริษัท ยูนิเด็ค แอนนาลิสต์ แอนด์ เอ็นจิเนียริ่ง คอนซัลแตนท์ จำกัด  
ห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ๖-๓๔๕ สถานที่ตั้งเลขที่ ๓ ซอยอุดมสุข ถนนสุขุมวิท แขวงบางจาก  
เขตพระโขนง กรุงเทพมหานคร ขอเปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์ ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว มีความเห็นดังนี้

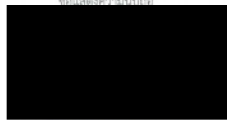
๑. ให้อยู่ใต้อำนาจควบคุมดูแลของห้องปฏิบัติการวิเคราะห์ จำนวน ๒ ราย



อนึ่ง หนังสือฉบับนี้จะหมดอายุพร้อสมควรมีข้อต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน  
ที่ อก ๐๓๑๐(๑)/๔๗๘๗ ลงวันที่ ๙ กุมภาพันธ์ ๒๕๖๕ คือในวันที่ ๒ กุมภาพันธ์ ๒๕๖๕ ทั้งนี้ สามารถยื่นคำขอ  
ผ่านระบบอิเล็กทรอนิกส์ได้ที่หน้าเว็บไซต์กรมโรงงานอุตสาหกรรม ตาม QR Code ที่แนบหนังสือฉบับนี้

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ



ยื่นผ่านระบบอิเล็กทรอนิกส์

กองวิจัยและเตือนภัยมลพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและระบบจัดการกากของเสีย

โทร. ๐ ๒๔๓๐ ๖๓๒๒ ต่อ ๒๑๐๓-๕ โทรสาร ๐ ๒๔๓๐๖๓๒๒ ต่อ ๒๑๐๓๕๔

ไปรษณีย์อิเล็กทรอนิกส์ saraban@dw.m.go.th

"อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว"



ที่ อก ๐๓๑๐(๑)/ ๑๘๗ ๘



กรมโรงงานอุตสาหกรรม  
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท  
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๑๙ กุมภาพันธ์ ๒๕๖๕

เรื่อง ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท ยูนิเด็ค แอนนาลิสต์ แอนด์ เอ็นจิเนียริ่ง คอนซัลแตนท์ จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารเคมีของห้องปฏิบัติการวิเคราะห์เอกชน  
ลงวันที่ ๒๗ ธันวาคม ๒๕๖๔

สิ่งที่ส่งมาด้วย ๑. รายชื่อผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๔๐ ราย

๒. รายชื่อเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๐๖ ราย

๓. ขอบข่ายสารเคมีที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม

ตามหนังสือที่อ้างถึง บริษัท ยูนิเด็ค แอนนาลิสต์ แอนด์ เอ็นจิเนียริ่ง คอนซัลแตนท์ จำกัด  
ขอต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ๖-๓๔๕ สถานที่ตั้งเลขที่ ๓  
ซอยอุดมสุข ๔๓ ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้อยู่ใต้อำนาจควบคุมดูแลของห้องปฏิบัติการวิเคราะห์เอกชน โดยมอบให้ประกอบดังนี้

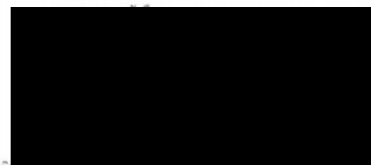
ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๔๐ ราย ตามสิ่งที่ส่งมาด้วย ๑

ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๐๖ ราย ตามสิ่งที่ส่งมาด้วย ๒

ค. ขอบข่ายสารเคมีที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย น้ำใต้ดิน อากาศเสีย สิ่งปฏิกูล  
หรือวัสดุที่ไม่ใช่แล้ว และดิน ตามสิ่งที่ส่งมาด้วย ๓

หนังสือฉบับนี้จะหมดอายุในวันที่ ๒ กุมภาพันธ์ ๒๕๖๘ หากประสงค์จะต่ออายุหนังสือ  
รับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอต่อ  
กรมโรงงานอุตสาหกรรมภายใน ๓๐ วัน ก่อนวันสิ้นสุดอายุของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน  
ทั้งนี้ สามารถยื่นคำขอผ่านระบบอิเล็กทรอนิกส์ได้ที่หน้าเว็บไซต์กรมโรงงานอุตสาหกรรม ตาม QR Code ที่แนบ  
หนังสือฉบับนี้

จึงเรียนมาเพื่อทราบ



กองวิจัยและเตือนภัยมลพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและระบบจัดการกากของเสีย

โทร. ๐ ๒๔๓๐ ๖๓๒๒ ต่อ ๒๑๐๓-๕

โทรสาร ๐ ๒๔๓๐ ๖๓๒๒ ต่อ ๒๑๐๓๕๔

ไปรษณีย์อิเล็กทรอนิกส์ saraban@dw.m.go.th

สิ่งที่ส่งมาด้วย ๑

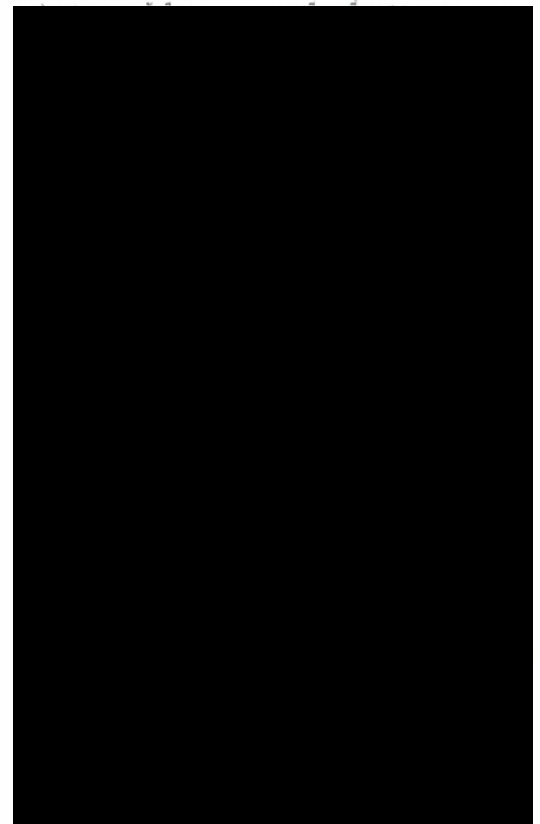
เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

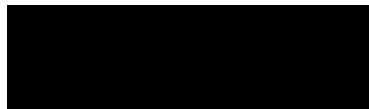
บริษัท ยูนิเด็ค แอนนาลิสต์ แอนด์ เอ็นจิเนียริ่ง คอนซัลแตนท์ จำกัด เลขทะเบียน ๖-๓๔๕

ที่ อก ๐๓๑๐(๑)/ ๑๘๗ ๘

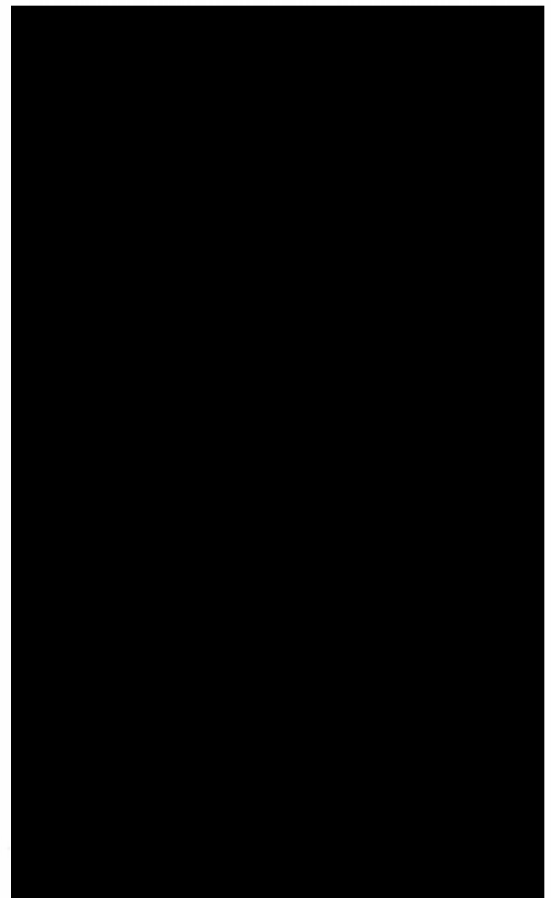
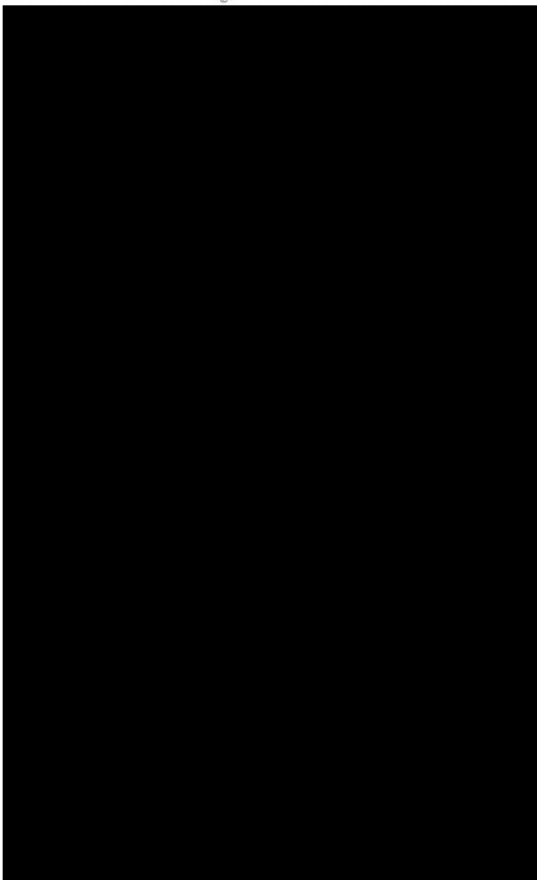
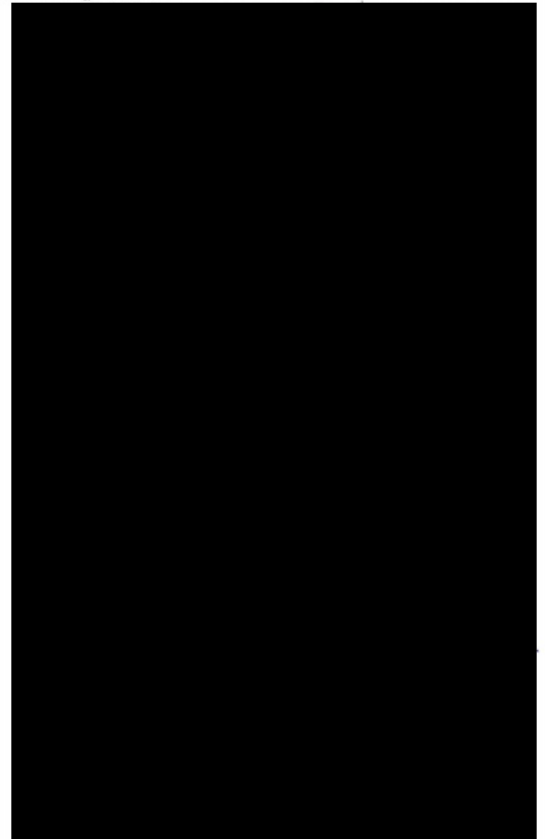
ลงวันที่ ๑๙ กุมภาพันธ์ ๒๕๖๕

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๔๐ ราย





ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๐๖ ราย



เอกสารแนบท้ายหนังสือรับข้ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน  
บริษัท ยูโนเทค แอนาไลติกส์ แอนด์ เซอร์วิส จำกัด เลขทะเบียน ๖-๑๔๕  
ที่ ๒๓ ๐๓๑๐(๑)/ ๑๔๕ ๕๔ ลงวันที่ ๑๕ กุมภาพันธ์ ๒๕๖๕

ขอขยายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๑๕๗ รายการ

น้ำเสีย จำนวน ๔๖ รายการ

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
1	Aldrin	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(๑)</sup>
2	Arsenic	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>(๑)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(๑)</sup>
3	Barium	Digestion, inductively Coupled Plasma Method <sup>(๑)</sup>
4	α-BHC	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(๑)</sup>
5	β-BHC	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(๑)</sup>
6	δ-BHC	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(๑)</sup>
7	γ-BHC	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(๑)</sup>
8	Biochemical Oxygen Demand	1) 5-Day BOD Test, Azide Modification Method <sup>(๑)</sup> 2) 5-Day BOD Test, Membrane Electrode Method <sup>(๑)</sup>
9	Cadmium	1) Digestion, Direct Air-Acetylene Flame Method <sup>(๑)</sup> 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method <sup>(๑)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(๑)</sup>
10	Chemical Oxygen Demand	1) Closed Reflux, Titrimetric Method <sup>(๑)</sup> 2) Closed Reflux, Colorimetric Method <sup>(๑)</sup> 3) Open Reflux, Titrimetric Method <sup>(๑)</sup>
11	Chlordane	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(๑)</sup>
12	Chromium	1) Digestion, Direct Air-Acetylene Flame Method <sup>(๑)</sup> 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method <sup>(๑)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(๑)</sup>
13	Color	ADMI Weighted-Ordinate Spectrophotometric Method <sup>(๑)</sup>
14	Copper	1) Digestion, Direct Air-Acetylene Flame Method <sup>(๑)</sup> 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method <sup>(๑)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(๑)</sup>
15	Cyanide	1) Distillation, Colorimetric Method <sup>(๑)</sup> 2) Flow Injection Analysis Method <sup>(๑)</sup>

16 o,p'-DDT...

-๒-

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
16	o,p'-DDT	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(๑)</sup>
17	4,4'-DDD	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(๑)</sup>
18	4,4'-DDE	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(๑)</sup>
19	4,4'-DDT	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(๑)</sup>
20	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(๑)</sup>
21	Endosulfan I	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(๑)</sup>
22	Endosulfan II	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(๑)</sup>
23	Endosulfan sulfate	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(๑)</sup>
24	Endrin	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(๑)</sup>
25	Endrin aldehyde	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(๑)</sup>
26	Formaldehyde	Distillation, Colorimetric Method <sup>(๑)</sup>
27	Free Chlorine	1) Iodometric Method <sup>(๑)</sup> 2) DPD Ferrous Titrimetric Method <sup>(๑)</sup>
28	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(๑)</sup>
29	Heptachlor Epoxide	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(๑)</sup>
30	Hexavalent Chromium	1) Colorimetric Method <sup>(๑)</sup> 2) Extraction, Direct Air-Acetylene Flame Method <sup>(๑)</sup>
31	Lead	1) Digestion, Direct Air-Acetylene Flame Method <sup>(๑)</sup> 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method <sup>(๑)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(๑)</sup>
32	Manganese	1) Digestion, Direct Air-Acetylene Flame Method <sup>(๑)</sup> 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method <sup>(๑)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(๑)</sup>
33	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>(๑)</sup>
34	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(๑)</sup>
35	Nickel	1) Digestion, Direct Air-Acetylene Flame Method <sup>(๑)</sup> 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method <sup>(๑)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(๑)</sup>

36 Oil & Grease...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
36	Oil & Grease	1) Liquid-Liquid, Partition-Gravimetric Method <sup>(๑)</sup> 2) Soxhlet Extraction Method <sup>(๑)</sup>
37	pH	Electrometric Method <sup>(๑)</sup>
38	Phenols	1) Distillation, Chloroform Extraction Method <sup>(๑)</sup> 2) Distillation, Direct Photometric Method <sup>(๑)</sup>
39	Selenium	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>(๑)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(๑)</sup>
40	Sulfide	1) Iodometric Method <sup>(๑)</sup> 2) Methylene Blue Method <sup>(๑)</sup>
41	Temperature	Laboratory and Field Methods <sup>(๑)</sup>
42	Total Dissolved Solids	Dried at 180 °C <sup>(๑)</sup>
43	Total Kjeldahl Nitrogen	Semi-Micro-Kjeldahl Method <sup>(๑)</sup>
44	Total Suspended Solids	Dried at 103-105 °C <sup>(๑)</sup>
45	Trivalent Chromium	1) Digestion, Direct Air-Acetylene Flame Method; Colorimetric Method; Calculation <sup>(๑)</sup> 2) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation <sup>(๑)</sup>
46	Zinc	1) Digestion, Direct Air-Acetylene Flame Method <sup>(๑)</sup> 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method <sup>(๑)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(๑)</sup>

น้ำใต้ดิน จำนวน 126 รายการ

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(๑)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(๑)</sup>
2	Acetone	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(๑)</sup>
3	Aldrin	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(๑)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(๑)</sup>

4 Anthracene...

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ลำดับ	สารมลพิษ	วิธีวิเคราะห์
4	Anthracene	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(๑)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(๑)</sup>
5	Antimony	Digestion, Inductively Coupled Plasma Method <sup>(๑)</sup>
6	Arsenic	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>(๑)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(๑)</sup>
7	Atrazine	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(๑)</sup>
8	Barium	1) Digestion, Electrothermal Atomic Absorption Spectrometric Method <sup>(๑)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(๑)</sup>
9	Benz(a)anthracene	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(๑)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(๑)</sup>
10	Benzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(๑)</sup>
11	Benzo(b)fluoranthene	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(๑)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(๑)</sup>
12	Benzo(k)fluoranthene	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(๑)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(๑)</sup>
13	Benzoic acid	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(๑)</sup>
14	Benzo(a)pyrene	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(๑)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(๑)</sup>

15 Benzo(g,h,i)perylene...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
15	Benzo(g,h,i)perylene	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
16	Beryllium	Digestion, Inductively Coupled Plasma Method <sup>(4)</sup>
17	Bis(2-chloroethyl)ether	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
18	Bis(2-ethylhexyl)phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
19	Bromodichloromethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
20	Bromoform	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
21	Butanol	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
22	Butyl benzyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
23	Cadmium	1) Digestion, Direct Air-Acetylene Flame Method <sup>(4)</sup> 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method <sup>(4)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup>
24	Carbazole	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
25	Carbon disulfide	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
26	Carbon tetrachloride	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
27	Chlordane	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
28	p-Chloroaniline	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
29	Chlorobenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>

30 Chlorodibromomethane...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
30	Chlorodibromomethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
31	Chloroform	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
32	2-Chlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
33	Chromium	1) Digestion, Direct Air-Acetylene Flame Method <sup>(4)</sup> 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method <sup>(4)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup>
34	Chromium (III)	1) Digestion, Direct Air-Acetylene Flame Method; Colorimetric Method; Calculation <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation <sup>(4)</sup>
35	Chromium (VI)	1) Colorimetric Method <sup>(4)</sup> 2) Extraction, Air-Acetylene Flame Method <sup>(4)</sup>
36	Chrysene	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup> Distillation, Colorimetric Method <sup>(4)</sup>
37	Cyanide	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup>
38	2,4-D	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup>
39	DDD	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
40	DDE	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
41	DDT	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>

42 Dibenzo(a,h)anthracene...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
42	Dibenz(a,h)anthracene	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
43	Di-n-butyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
44	1,2-Dichlorobenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
45	1,3-Dichlorobenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
46	1,4-Dichlorobenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
47	3,3'-Dichlorobenzidine	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
48	1,1-Dichloroethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
49	1,2-Dichloroethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
50	1,1-Dichloroethylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
51	cis-1,2-Dichloroethylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
52	trans-1,2-Dichloroethylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
53	2,4-Dichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
54	1,2-Dichloropopane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
55	1,3-Dichloropropane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
56	1,3-Dichloropropene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
57	Dieldrin	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>

58 Diethyl phthalate...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
58	Diethyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
59	2,4-Dimethylphenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
60	2,4-Dinitrophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
61	2,4-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
62	2,6-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
63	Di-n-Octyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
64	Endosulfan	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
65	Endrin	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
66	Ethylbenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
67	Fluoranthene	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
68	Fluorene	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
69	Heptachlor	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>

70 Heptachlor epoxide...



ลำดับ	สารมลพิษ	วิธีวิเคราะห์
70	Heptachlor epoxide	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
71	Hexachlorobenzene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
72	Hexachloro-1,3-butadiene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
73	n-Hexane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
74	α-HCH	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
75	β-HCH	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
76	γ-HCH	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
77	Hexachlorocyclopentadiene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
78	Hexachloroethane	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
79	Indeno(1,2,3-cd)pyrene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
80	Isophorone	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
81	Lead	1) Digestion, Direct Air-Acetylene Flame Method <sup>(4)</sup> 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method <sup>(4)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup>

82 Manganese...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
82	Manganese	1) Digestion, Direct Air-Acetylene Flame Method <sup>(4)</sup> 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method <sup>(4)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup>
83	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>(4)</sup>
84	Methanol	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
85	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup>
86	Methyl bromide	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
87	Methylene chloride	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
88	2-Methylphenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
89	2-Methylnaphthalene	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
90	Methyl tert-butyl ether	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
91	Naphthalene	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
92	Nickel	1) Digestion, Direct Air-Acetylene Flame Method <sup>(4)</sup> 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method <sup>(4)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup>
93	Nitrobenzene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
94	N-Nitrosodiphenylamine	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
95	N-Nitrosodi-n-propylamine	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>

96 Polychlorinated Biphenyls...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
96	Polychlorinated Biphenyls - PCB 1016 - PCB 1221 - PCB 1232 - PCB 1242 - PCB 1248 - PCB 1254 - PCB 1260	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
97	Pentachlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
98	pH	Electrometric Method <sup>(4)</sup>
99	Phenanthrene	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
100	Phenol	1) Distillation, Chloroform Extraction Method <sup>(4)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
101	Pyrene	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
102	Selenium	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup>
103	Silver	Digestion, Inductively Coupled Plasma Method <sup>(4)</sup>
104	Styrene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
105	1,1,2,2-Tetrachloroethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
106	Tetrachloroethylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
107	Toluene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>

108 Toxaphene...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
108	Toxaphene	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
109	TPH (C <sub>5</sub> - C <sub>9</sub> )	1) Purge and Trap, Gas Chromatographic Method <sup>(11,21)</sup> 2) Purge and Trap, Gas Chromatographic/Mass spectrometric Method <sup>(11,20)</sup>
110	TPH (C <sub>10</sub> - C <sub>16</sub> )	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(9,21)</sup>
111	TPH (C <sub>16</sub> - C <sub>35</sub> )	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(9,21)</sup>
112	1,2,4-Trichlorobenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
113	1,1,1-Trichloroethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
114	1,1,2-Trichloroethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
115	Trichloroethylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
116	2,4,5-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
117	2,4,6-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
118	1,3,5-Trimethylbenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
119	Vanadium	Digestion, Inductively Coupled Plasma Method <sup>(4)</sup>
120	Vinyl acetate	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
121	Vinyl chloride	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
122	m-Xylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
123	o-Xylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>

124 p-Xylene...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
124	p-Xylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(6)</sup>
125	Xylene (Total)	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(6)</sup>
126	Zinc	1) Digestion, Direct Air-Acetylene Flame Method <sup>(6)</sup> 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method <sup>(6)</sup> 3) Digestion, Inductively Coupled Plasma Method <sup>(6)</sup>

## อากาศเสีย (ปล่อยระบาย) จำนวน 25 รายการ

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
1	Antimony	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>(5)</sup>
2	Arsenic	1) Isokinetic Sampling, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>(5)</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>(5)</sup>
3	Cadmium	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method <sup>(5)</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>(5)</sup>
4	Carbon Monoxide	Instrumental Analyzer Method <sup>(5)</sup>
5	Chlorine	Isokinetic Sampling, Ion Chromatographic Method <sup>(5)</sup>
6	Chromium	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method <sup>(5)</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>(5)</sup>
7	Cobalt	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>(5)</sup>
8	Copper	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method <sup>(5)</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>(5)</sup>
9	Cresol	Absorption Sampling, Gas Chromatographic/Mass Spectrometric Method <sup>(6)</sup>

10 Dioxins/Furans...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
10	Dioxins/Furans	Isokinetic Sampling <sup>(5)</sup>
11	Hydrogen Chloride	Isokinetic Sampling, Ion Chromatographic Method <sup>(5)</sup>
12	Hydrogen Fluoride	Isokinetic Sampling, Ion Chromatographic Method <sup>(5)</sup>
13	Hydrogen Sulfide	Absorption Sampling, Iodometric Method <sup>(5)</sup>
14	Lead	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method <sup>(5)</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>(5)</sup>
15	Manganese	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method <sup>(5)</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>(5)</sup>
16	Mercury	Isokinetic Sampling, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>(5)</sup>
17	Nickel	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method <sup>(5)</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>(5)</sup>
18	Opacity	Ringelmann's Method <sup>(1)</sup>
19	Oxides of Nitrogen	1) Absorption Sampling, Phenoldisulfonic acid Method <sup>(5)</sup> 2) Instrumental Analyzer Method <sup>(5)</sup>
20	Selenium	1) Isokinetic Sampling, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>(5)</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>(5)</sup>
21	Sulfur Dioxide	1) Absorption Sampling, Barium-Thorin Titrimetric Method <sup>(5)</sup> 2) Instrumental Analyzer Method <sup>(5)</sup>
22	Sulfuric Acid	Isokinetic Sampling, Barium-Thorin Titrimetric Method <sup>(5)</sup>
23	Total Suspended Particulate	Isokinetic Sampling, Gravimetric Method <sup>(5)</sup>
24	Vanadium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>(5)</sup>
25	Xylene	1) Absorption Sampling, Gas Chromatographic/Mass Spectrometric Method <sup>(6)</sup> 2) Absorption Sampling, Gas Chromatographic/Mass Spectrometric Method <sup>(6)</sup>

สิ่งปนเปื้อน...

## สิ่งปนเปื้อนหรือวัสดุที่ไม่ใช้แล้ว จำนวน 35 รายการ

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
1	Aldrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(2,9,22)</sup> 2) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,22)</sup>
2	Antimony	Digestion, Inductively Coupled Plasma Method <sup>(7,13)</sup>
3	Arsenic	1) Waste Extraction, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>(2,6,15)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(2,6,13)</sup> 3) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>(7,13)</sup> 4) Digestion, Inductively Coupled Plasma Method <sup>(7,13)</sup>
4	Barium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(2,6,13)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(7,13)</sup>
5	Beryllium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(2,6,13)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(7,13)</sup>
6	Cadmium	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method <sup>(2,6,16)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(2,6,13)</sup> 3) Digestion, Flame Atomic Absorption Spectrometric Method <sup>(7,14)</sup> 4) Digestion, Inductively Coupled Plasma Method <sup>(7,13)</sup>
7	Chlordane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(2,9,22)</sup> 2) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,22)</sup>
8	Chromium	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method <sup>(2,6,16)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(2,6,13)</sup>

3) Digestion,...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
9	Chromium (III)	3) Digestion, Flame Atomic Absorption Spectrometric Method <sup>(7,14)</sup> 4) Digestion, Inductively Coupled Plasma Method <sup>(7,13)</sup> 1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method; Waste Extraction, Colorimetric Method; Calculation <sup>(2,6,13,16)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method; Waste Extraction, Colorimetric Method; Calculation <sup>(2,6,13,16)</sup>
10	Chromium (VI)	3) Digestion, Flame Atomic Absorption Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation <sup>(7,8,13,16)</sup> 4) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation <sup>(7,8,13,16)</sup>
11	Cobalt	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(2,6,13)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(7,13)</sup>
12	Copper	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method <sup>(2,6,16)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(2,6,13)</sup> 3) Digestion, Flame Atomic Absorption Spectrometric Method <sup>(7,14)</sup> 4) Digestion, Inductively Coupled Plasma Method <sup>(7,13)</sup>
13	2,4-D	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(2,9,22)</sup> 2) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,22)</sup>
14	DDD	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(2,9,22)</sup> 2) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,22)</sup>

15 DOE...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
15	DDE	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(2,9,22)</sup> 2) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,22)</sup>
16	DDT	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(2,9,22)</sup> 2) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,22)</sup>
17	Dieldrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(2,9,22)</sup> 2) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,22)</sup>
18	Endrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(2,9,22)</sup> 2) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,22)</sup>
19	Heptachlor	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(2,9,22)</sup> 2) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,22)</sup>
20	Lead	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method <sup>(2,6,14)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(2,6,13)</sup> 3) Digestion, Flame Atomic Absorption Spectrometric Method <sup>(7,14)</sup> 4) Digestion, Inductively Coupled Plasma Method <sup>(7,13)</sup>
21	Lindane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(2,9,22)</sup> 2) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,22)</sup>
22	Mercury	1) Waste Extraction, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>(2,17)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(2,6,13)</sup>

3) Digestion,...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
23	Methoxychlor	3) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>(2,16)</sup> 4) Digestion, Inductively Coupled Plasma Method <sup>(7,13)</sup> 5) Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method <sup>(2,9)</sup>
24	Molybdenum	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(2,9,22)</sup> 2) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,22)</sup>
25	Nickel	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(2,6,13)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(7,13)</sup> 1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method <sup>(2,6,14)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(2,6,13)</sup> 3) Digestion, Flame Atomic Absorption Spectrometric Method <sup>(7,14)</sup> 4) Digestion, Inductively Coupled Plasma Method <sup>(7,13)</sup>
26	Polychlorinated Biphenyls - Aroclor 1016 - Aroclor 1221 - Aroclor 1232 - Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1260 - 2-Chlorobiphenyl - 2,3-Dichlorobiphenyl - 2,2',5-Trichlorobiphenyl - 2,4',5-Trichlorobiphenyl - 2,2',3,5'-Tetrachlorobiphenyl - 2,2',5'-Tetrachlorobiphenyl - 2,3',4,4'-Tetrachlorobiphenyl - 2,2',3,4,5'-Pentachlorobiphenyl	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(2,9,22)</sup> 2) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,22)</sup>


  
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- 2,2',4,5,5'...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
27	- 2,2',4,5,5'-Pentachlorobiphenyl - 2,3,3',4',6-Pentachlorobiphenyl - 2,2',3,4,4',5'-Hexachlorobiphenyl - 2,2',3,4,5,5'-Hexachlorobiphenyl - 2,2',3,5,5',6'-Hexachlorobiphenyl - 2,2',4,4',5,5'-Hexachlorobiphenyl - 2,2',3,3',4,4',5-Heptachlorobiphenyl - 2,2',3,4,4',5,5'-Heptachlorobiphenyl - 2,2',3,4,4',5,6-Heptachlorobiphenyl - 2,2',3,4',5,5',6-Heptachlorobiphenyl - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl Pentachlorophenol	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(2,9,28)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup> Electrometric Method <sup>(31,32)</sup>
28	pH	
29	Selenium	1) Waste Extraction, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>(2,6,20)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(2,6,13)</sup> 3) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>(2,7,20)</sup> 4) Digestion, Inductively Coupled Plasma Method <sup>(2,6,13)</sup>

30 Silver...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
30	Silver	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(2,6,13)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(7,13)</sup>
31	Thallium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(2,6,13)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(7,13)</sup>
32	Toxaphene	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(2,9,22)</sup> 2) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,22)</sup>
33	Trichloroethylene	1) Waste Extraction, Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(2,12,23)</sup> 2) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(12,23)</sup>
34	Vanadium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(2,6,13)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(7,13)</sup>
35	Zinc	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method <sup>(2,6,14)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(2,6,13)</sup> 3) Digestion, Flame Atomic Absorption Spectrometric Method <sup>(7,14)</sup> 4) Digestion, Inductively Coupled Plasma Method <sup>(7,13)</sup>

สิ้น จำนวน 125 รายการ

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,24)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup>
2	Acetone	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(10,24)</sup>


  
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3 Aldrin...



ลำดับ	สารมลพิษ	วิธีวิเคราะห์
3	Aldrin	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,22)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup>
4	Anthracene	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,26)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup>
5	Antimony	Digestion, Inductively Coupled Plasma Method <sup>(7,13)</sup>
6	Arsenic	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>(7,13)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(7,13)</sup>
7	Atrazine	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup>
8	Barium	Digestion, Inductively Coupled Plasma Method <sup>(7,13)</sup>
9	Benz(a)anthracene	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,26)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup>
10	Benzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(12,25)</sup>
11	Benzo(b)fluoranthene	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,26)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup>
12	Benzo(k)fluoranthene	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,26)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup>
13	Benzoic acid	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup>
14	Benzo(a)pyrene	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,26)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup>

15 Benzo(g,h,i)perylene...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
15	Benzo(g,h,i)perylene	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,22)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup>
16	Beryllium	Digestion, Inductively Coupled Plasma Method <sup>(7,13)</sup>
17	Bis(2-chloroethyl)ether	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup>
18	Bis(2-ethylhexyl)phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup>
19	Bromodichloromethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(12,25)</sup>
20	Bromoform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(12,25)</sup>
21	Butanol	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(12,25)</sup>
22	Butyl benzyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup>
23	Cadmium	1) Digestion, Flame Atomic Absorption Spectrometric Method <sup>(7,14)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(7,13)</sup>
24	Carbazole	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup>
25	Carbon disulfide	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(12,25)</sup>
26	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(12,25)</sup>
27	Chlordane	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,22)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup>
28	p-Chloroaniline	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup>
29	Chlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(12,25)</sup>
30	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(12,25)</sup>

31 Chloroform...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
31	Chloroform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(12,25)</sup>
32	2-Chlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup>
33	Chromium	1) Digestion, Flame Atomic Absorption Spectrometric Method <sup>(7,14)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(7,13)</sup>
34	Chromium (III)	1) Digestion, Flame Atomic Absorption Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation <sup>(7,13,14)</sup> 2) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation <sup>(7,13,14)</sup>
35	Chromium (VI)	Alkaline Digestion, Colorimetric Method <sup>(8,14)</sup>
36	Chrysene	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,26)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup>
37	Cyanide	Extraction, Distillation, Colorimetric Method <sup>(28,29,30)</sup>
38	2,4-D	Ultrasonic Extraction, Gas Chromatographic Method <sup>(27)</sup>
39	DDD	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,22)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup>
40	DDE	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,22)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup>
41	DDT	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,22)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup>
42	Dibenz(a,h)anthracene	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,26)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup>

43 Di-n-butyl phthalate...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
43	Di-n-butyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup>
44	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(12,25)</sup>
45	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(12,25)</sup>
46	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(12,25)</sup>
47	3,3'-Dichlorobenzidine	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup>
48	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(12,25)</sup>
49	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(12,25)</sup>
50	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(12,25)</sup>
51	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(12,25)</sup>
52	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(12,25)</sup>
53	2,4-Dichlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup>
54	1,2-Dichloropane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(12,25)</sup>
55	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(12,25)</sup>
56	1,3-Dichloropropene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(12,25)</sup>
57	Dieldrin	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,22)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup>
58	Diethyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup>
59	2,4-Dimethylphenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup>

60 2,4-Dinitrophenol...





ลำดับ	สารเคมี	วิธีวิเคราะห์
97	- 2,2',3,4',5,5',6'-Heptachlorobiphenyl - 2,2',3,3',4,4',5,5',6'-Nonachlorobiphenyl Pentachlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup>
98	Phenanthrene	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,26)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup>
99	Phenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup>
100	Pyrene	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,26)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup>
101	Selenium	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>(7,22)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(7,13)</sup>
102	Silver	Digestion, Inductively Coupled Plasma Method <sup>(7,13)</sup>
103	Styrene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(12,25)</sup>
104	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(12,25)</sup>
105	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(12,25)</sup>
106	Toluene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(12,25)</sup>
107	Toxaphene	Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,22)</sup>
108	TPH (C <sub>7</sub> -C <sub>9</sub> )	1) Purge and Trap, Gas Chromatographic Method <sup>(12,21)</sup> 2) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(12,25)</sup>
109	TPH (C <sub>9</sub> -C <sub>13</sub> )	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup>
110	TPH (C <sub>13</sub> -C <sub>25</sub> )	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup>
111	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(12,25)</sup>

ลำดับ	สารเคมี	วิธีวิเคราะห์
112	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(12,25)</sup>
113	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(12,25)</sup>
114	Trichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(12,25)</sup>
115	2,4,5-Trichlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup>
116	2,4,6-Trichlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,26)</sup>
117	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(12,25)</sup>
118	Vanadium	Digestion, Inductively Coupled Plasma Method <sup>(7,13)</sup>
119	Vinyl acetate	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(12,25)</sup>
120	Vinyl chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(12,25)</sup>
121	m-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(12,25)</sup>
122	o-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(12,25)</sup>
123	p-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(12,25)</sup>
124	Xylene (Total)	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(12,25)</sup>
125	Zinc	1) Digestion, Flame Atomic Absorption Spectrometric Method <sup>(7,14)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(7,13)</sup>

## เอกสารอ้างอิง

- กระทรวงอุตสาหกรรม. ประกาศกระทรวงมหาดไทย เรื่อง ประกาศกระทรวงอุตสาหกรรมว่าด้วยรายชื่อสารเคมีที่ห้ามใช้และรายชื่อสารเคมีที่ห้ามใช้แล้ว. ราชกิจจานุเบกษา. 4 ธันวาคม 2549. เล่มที่ 123 ตอนที่ 123 ข.
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3. สมาคมวิศวกรรม...

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บริษัท อินทิเกรตเต็ด รีเสิร์ช เซ็นเตอร์ จำกัด

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ที่ อก ๐๓๒๐/๑๗๐๓๒

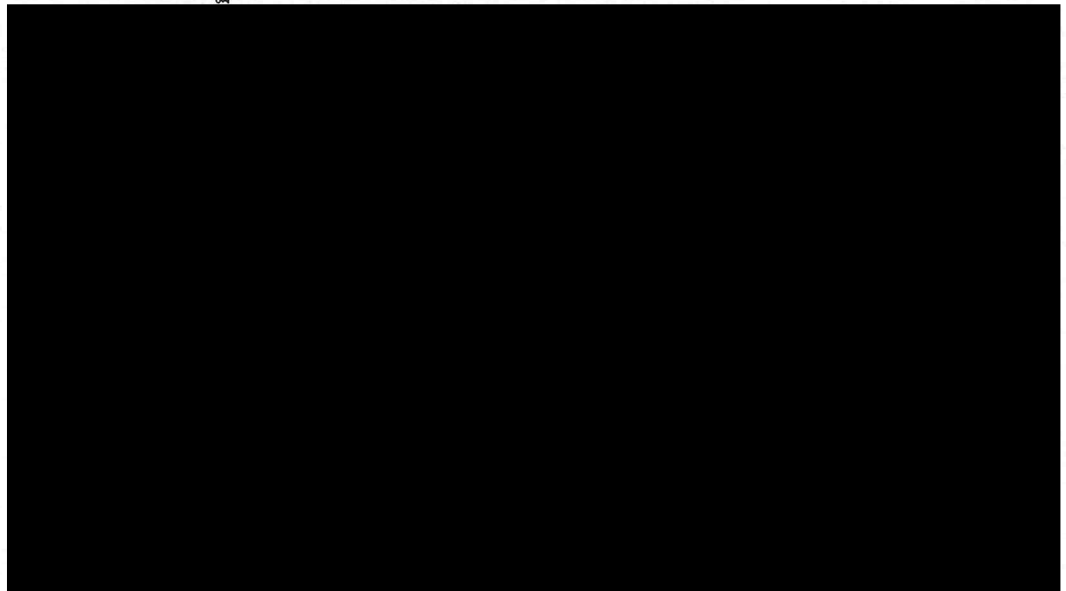
กรมโรงงานอุตสาหกรรม  
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท  
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๒๒ พฤศจิกายน ๒๕๖๕

เรื่อง ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน  
เรียน กรรมการผู้จัดการ บริษัท อินทิเกรตเต็ด รีเสิร์ช เซ็นเตอร์ จำกัด  
อ้างถึง คำขอต่ออายุของห้องปฏิบัติการวิเคราะห์เอกชน ลงวันที่ ๕ ตุลาคม ๒๕๖๕  
สิ่งที่ส่งมาด้วย เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน  
บริษัท อินทิเกรตเต็ด รีเสิร์ช เซ็นเตอร์ จำกัด จำนวน ๓ แผ่น

ตามหนังสือที่อ้างถึง บริษัท อินทิเกรตเต็ด รีเสิร์ช เซ็นเตอร์ จำกัด ขอต่ออายุหนังสือ  
รับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ว-๑๙๙ สถานที่ตั้งเลขที่ ๑๒๒ หมู่ที่ ๒ ตำบลท่าตูม  
อำเภอศรีมหาโพธิ จังหวัดปราจีนบุรี ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท อินทิเกรตเต็ด รีเสิร์ช เซ็นเตอร์ จำกัด  
ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน โดยมีองค์ประกอบดังนี้



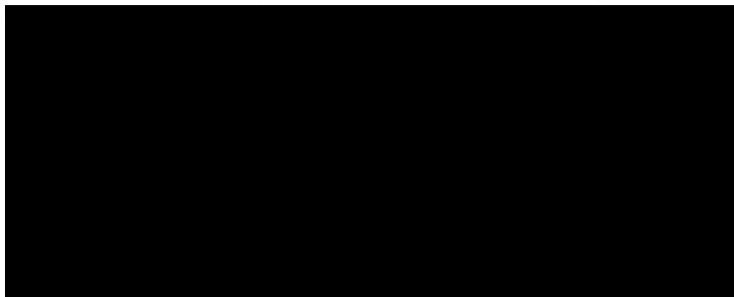
ค. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย จำนวน ๒๓ รายการ น้ำใต้ดิน  
จำนวน ๑๒ รายการ และสิ่งปนเปื้อนหรือวัสดุที่ไม่ใช่แล้ว จำนวน ๑๐ รายการ รวมทั้งสิ้นจำนวน ๔๕ รายการ  
ตามสิ่งที่ส่งมาด้วย

หนังสือ...

หนังสือฉบับนี้จะหมดอายุในวันที่ ๑๘ พฤศจิกายน ๒๕๖๘ หากประสงค์จะต่ออายุหนังสือ  
รับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอต่อกรมโรงงาน  
อุตสาหกรรมภายใน ๓๐ วัน ก่อนวันสิ้นอายุของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ซึ่งคำขอ  
ต่ออายุดังกล่าวขอรับได้ที่กรมโรงงานอุตสาหกรรม ทั้งนี้ สามารถยื่นคำขอผ่านระบบอิเล็กทรอนิกส์ได้ที่หน้า  
เว็บไซต์กรมโรงงานอุตสาหกรรม ตาม QR Code ท้ายหนังสือนี้

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ



ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก

โทร. ๐ ๓๓๑๓ ๖๐๕๙ ต่อ ๕๐๐๑-๒

ไปรษณีย์อิเล็กทรอนิกส์ [eirw@diw.mail.go.th](mailto:eirw@diw.mail.go.th)



ยื่นคำขอผ่านระบบอิเล็กทรอนิกส์



เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท อินทิเกรตเต็ด รีเสิร์ช เซ็นเตอร์ จำกัด

ที่ อก ๐๓๒๐/๑๗๐๓๒

เลขทะเบียน ว-๑๙๙

ลงวันที่ ๒๒ พฤศจิกายน ๒๕๖๕

ขอขยายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๔๕ รายการ  
น้ำเสีย จำนวน 23 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Arsenic	Digestion, Inductively Coupled Plasma Method <sup>[1]</sup>
2	Barium	Digestion, Inductively Coupled Plasma Method <sup>[1]</sup>
3	Biochemical Oxygen Demand	1) 5-Day BOD Test, Azide Modification Method <sup>[1]</sup> 2) 5-Day BOD Test, Membrane Electrode Method <sup>[1]</sup>
4	Cadmium	Digestion, Inductively Coupled Plasma Method <sup>[1]</sup>
5	Chemical Oxygen Demand	Closed Reflux, Colorimetric Method <sup>[1]</sup>
6	Color	ADMI Weighted – Ordinate Spectrophotometric Method <sup>[1]</sup>
7	Copper	Digestion, Inductively Coupled Plasma Method <sup>[1]</sup>
8	Free Chlorine	Iodometric Method <sup>[1]</sup>
9	Hexavalent Chromium	Filtration, Colorimetric Method <sup>[1]</sup>
10	Lead	Digestion, Inductively Coupled Plasma Method <sup>[1]</sup>
11	Manganese	Digestion, Inductively Coupled Plasma Method <sup>[1]</sup>
12	Nickle	Digestion, Inductively Coupled Plasma Method <sup>[1]</sup>
13	Oil and Grease	Liquid-Liquid, Partition-Gravimetric Method <sup>[1]</sup>
14	pH	Electrometric Method <sup>[1]</sup>
15	Selenium	Digestion, Inductively Coupled Plasma Method <sup>[1]</sup>
16	Sulfide	ZnS Precipitation, Iodometric Method <sup>[1]</sup>
17	Temperature	Field Method <sup>[1]</sup>
18	Total Chromium	Digestion, Inductively Coupled Plasma Method <sup>[1]</sup>
19	Total Dissolved Solids	Dried at 180 °C <sup>[1]</sup>
20	Total Kjeldahl Nitrogen	Macro Kjeldahl Method <sup>[1]</sup>
21	Total Suspended Solids	Dried at 103-105 °C <sup>[1]</sup>
22	Trivalent Chromium	Digestion, Inductively Coupled Plasma Method Filtration, Colorimetric Method, Calculation <sup>[1]</sup>
23	Zinc	Digestion, Inductively Coupled Plasma Method <sup>[1]</sup>

น้ำใต้ดิน จำนวน 12 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Arsenic	Digestion, Inductively Coupled Plasma Method <sup>[1]</sup>
2	Barium	Digestion, Inductively Coupled Plasma Method <sup>[1]</sup>
3	Cadmium	Digestion, Inductively Coupled Plasma Method <sup>[1]</sup>
4	Chromium	Digestion, Inductively Coupled Plasma Method <sup>[1]</sup>
5	Hexavalent Chromium	Filtration, Colorimetric Method <sup>[1]</sup>
6	Lead	Digestion, Inductively Coupled Plasma Method <sup>[1]</sup>
7	Manganese	Digestion, Inductively Coupled Plasma Method <sup>[1]</sup>
8	Nickel	Digestion, Inductively Coupled Plasma Method <sup>[1]</sup>
9	pH	Electrometric Method <sup>[1]</sup>
10	Selenium	Digestion, Inductively Coupled Plasma Method <sup>[1]</sup>
11	Trivalent Chromium	Inductively Coupled Plasma Method; Filtration, Colorimetric Method; Calculation <sup>[1]</sup>
12	Zinc	Digestion, Inductively Coupled Plasma Method <sup>[1]</sup>

สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน 10 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Arsenic	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[2,4,5]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[3,5]</sup>
2	Barium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[2,4,5]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[3,5]</sup>
3	Cadmium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[2,4,5]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[3,5]</sup>
4	Chromium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[2,4,5]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[3,5]</sup>
5	Lead	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[2,4,5]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[3,5]</sup>
6	Manganese	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[2,4,5]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[3,5]</sup>



ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
7	Nickel	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[2,4,5]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[3,5]</sup>
8	pH	Electrometric Method <sup>[6]</sup>
9	Selenium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[2,4,5]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[3,5]</sup>
10	Zinc	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>[2,4,5]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[3,5]</sup>

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