

ภาคผนวก ง  
หนังสือรับรองการขึ้นทะเบียน  
ห้องปฏิบัติการวิเคราะห์เอกชน

ที่ อก ๐๓๐๘(๑)/ ๕๖ ๕ ๓



กรมโรงงานอุตสาหกรรม  
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท  
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๐๗ กรกฎาคม ๒๕๖๕

เรื่อง เปลี่ยนแปลงบุคลากรและสารมลพิษที่วิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท ยูนิเทค แอนนาลิติก แอนด์ เอ็นจิเนียริ่ง คอนซัลแตนท์ จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน  
ลงวันที่ ๔ พฤษภาคม ๒๕๖๔

สิ่งที่ส่งมาด้วย เอกสารแนบท้ายหนังสือเปลี่ยนแปลงบุคลากรและสารมลพิษที่วิเคราะห์

บริษัท ยูนิเทค แอนนาลิติก แอนด์ เอ็นจิเนียริ่ง คอนซัลแตนท์ จำกัด จำนวน ๒ แผ่น

ตามที่หนังสืออ้างถึง บริษัท ยูนิเทค แอนนาลิติก แอนด์ เอ็นจิเนียริ่ง คอนซัลแตนท์ จำกัด  
ห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ๖-๑๔๕ สถานที่ตั้งเลขที่ ๓ ซอยอุดมสุข ๔๑ ถนนสุขุมวิท  
แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร ขอเปลี่ยนแปลงบุคลากรและสารมลพิษที่วิเคราะห์ที่  
ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว มีความเห็นดังนี้

๑. ให้อยกเลิกเจ้าหน้าที่ห้องปฏิบัติการวิเคราะห์เอกชน จำนวน ๓ ราย

๑) นายสุชนันท์ พันสิงห์ ทะเบียนเลขที่ ๖-๑๔๕-๖-๐๐๐๓

๒) นางสาวสุกฤษา เอียนเงิน ทะเบียนเลขที่ ๖-๑๔๕-๖-๐๑๔๔

๓) นางสาววชิราภรณ์ ภิรมย์ ทะเบียนเลขที่ ๖-๑๔๕-๖-๐๑๔๖

๒. ให้เพิ่มผู้ควบคุมห้องปฏิบัติการวิเคราะห์เอกชน จำนวน ๑ ราย

นายสุชนันท์ พันสิงห์ ทะเบียนเลขที่ ๖-๑๔๕-๖-๐๐๐๓

๓. ให้เพิ่มข้อข่ายสารมลพิษที่วิเคราะห์ในน้ำได้ดิน ยาเคมี และดิน ตามสิ่งที่ส่งมาด้วย

อนึ่ง หนังสือฉบับนี้จะมีผลใช้บังคับเมื่อพ้นวันขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

ในวันที่ ๒ กุมภาพันธ์ ๒๕๖๕

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายประจักษ์ สว่างฤทธิ์)

ผู้อำนวยการกองอนามัยสิ่งแวดล้อม  
กรมโรงงานอุตสาหกรรม

กองวิจัยและพัฒนาสิ่งแวดล้อมโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๕๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕

โทรสาร ๐ ๒๕๓๐ ๖๓๑๒ ต่อ ๒๑๑๔

ไปรษณีย์อิเล็กทรอนิกส์ sarabang@dlw.mail.go.th



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"อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว"



- ๒ -

3. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Acid Digestion of Sediments, Sludges, and Soils. SW-846 Method 3050B, 1996.

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6. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Flame Atomic Absorption Spectrophotometry. SW-846 Method 7000B, 2007.

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8. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Soil and Waste pH. SW-846 Method 9045D, 2004.

กานันท์

เอกสารแนบท้ายหนังสือเปลี่ยนแปลงบุคลากรและสารมลพิษที่วิเคราะห์  
บริษัท ยูนิเทค แอนนาลิติก แอนด์ เอ็นจิเนียริ่ง คอนซัลแตนท์ จำกัด เลขทะเบียน ๖-๑๔๕  
ที่ อก ๐๓๐๘(๑)/ ๕๖ ๕ ๓ ลงวันที่ ๐๗ กรกฎาคม ๒๕๖๕

ขอขย้ายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๑๑ รายการ

น้ำได้ดิน จำนวน ๔ รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Aluminum	Digestion, Inductively Coupled Plasma Method <sup>[1]</sup>
2	Copper	1) Digestion, Flame Atomic Absorption Spectrometric Method <sup>[2]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[1]</sup>
3	Iron	1) Digestion, Flame Atomic Absorption Spectrometric Method <sup>[1]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[1]</sup>
4	Molybdenum	Digestion, Inductively Coupled Plasma Method <sup>[1]</sup>

อากาศเสีย (ปล่อยระบาย) จำนวน 1 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Oxides of Nitrogen	Absorption Sampling, Ion Chromatographic Method <sup>[2]</sup>

ดิน จำนวน 6 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Aluminum	Digestion, Inductively Coupled Plasma Method <sup>[3,4]</sup>
2	Copper	1) Digestion, Flame Atomic Absorption Spectrometric Method <sup>[3,4]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[3,4]</sup>
3	Iron	1) Digestion, Flame Atomic Absorption Spectrometric Method <sup>[3,4]</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>[3,4]</sup>
4	Molybdenum	Digestion, Inductively Coupled Plasma Method <sup>[3,4]</sup>
5	pH	Electrometric Method <sup>[5]</sup>
6	TPH (C <sub>5</sub> -C <sub>6</sub> )	Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method <sup>[6,7]</sup>

เอกสารอ้างอิง

1. APHA, AWWA, WEF. Standard Methods for the Examination of Water and Wastewater. 24<sup>th</sup> ed. Washington, DC: APHA, 2023.

2. United States Environmental Protection Agency. Standards of Performance for New Stationary Sources. 40 CFR 60, Appendix A, 2023.

3. United States...

ที่ อก ๐๓๐๘(๑)/ ๕๖ ๕ ๓



กรมโรงงานอุตสาหกรรม  
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท  
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๒๕ กุมภาพันธ์ ๒๕๖๕

เรื่อง ยกเลิกบุคลากรของห้องปฏิบัติการวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท ยูนิเทค แอนนาลิติก แอนด์ เอ็นจิเนียริ่ง คอนซัลแตนท์ จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน  
ลงวันที่ ๑๘ กุมภาพันธ์ ๒๕๖๔

ตามคำขอที่อ้างถึง บริษัท ยูนิเทค แอนนาลิติก แอนด์ เอ็นจิเนียริ่ง คอนซัลแตนท์ จำกัด  
ห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ๖-๑๔๕ สถานที่ตั้งเลขที่ ๓ ซอยอุดมสุข ๔๑ ถนนสุขุมวิท  
แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร ขอยกเลิกบุคลากร ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้อยกเลิกเจ้าหน้าที่ห้องปฏิบัติการวิเคราะห์เอกชน  
จำนวน ๓ ราย ได้แก่

๑) นายอภิสิทธิ์ ศรีคงแก้ว ทะเบียนเลขที่ ๖-๑๔๕-๖-๐๐๕๕

๒) นางสาวนันธิดา พรหมกวดถ้ำ ทะเบียนเลขที่ ๖-๑๔๕-๖-๐๑๓๐

๓) นายภูวดล เบ็ญมา ทะเบียนเลขที่ ๖-๑๔๕-๖-๐๑๓๕

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายอิทธิพล อธิราชกุล ณ สุธงษา)

รองอธิบดี ปฏิบัติราชการแทน

อธิบดีกรมโรงงานอุตสาหกรรม

กองวิจัยและพัฒนาสิ่งแวดล้อมโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๕๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕

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ลำดับ	สารเคมี	วิธีวิเคราะห์
25	Endrin aldehyde	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup>
26	Formaldehyde	Distillation, Colorimetric Method <sup>(2)</sup>
27	Free Chlorine	1) Iodometric Method <sup>(4)</sup> 2) DPD Ferrous Titrimetric Method <sup>(4)</sup>
28	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup>
29	Heptachlor Epoxide	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup>
30	Hexavalent Chromium	Colorimetric Method <sup>(4)</sup>
31	Lead	1) Digestion, Direct Air-Acetylene Flame Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup>
32	Manganese	1) Digestion, Direct Air-Acetylene Flame Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup>
33	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>(4)</sup>
34	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup>
35	Nickel	1) Digestion, Direct Air-Acetylene Flame Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup>
36	Oil & Grease	1) Liquid-Liquid, Partition-Gravimetric Method <sup>(4)</sup> 2) Soxhlet Extraction Method <sup>(4)</sup>
37	pH	Electrometric Method <sup>(4)</sup>
38	Phenols	1) Distillation, Chloroform Extraction Method <sup>(4)</sup> 2) Distillation, Direct Photometric Method <sup>(4)</sup>
39	Selenium	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup>
40	Sulfide	1) Iodometric Method <sup>(4)</sup> 2) Methylene Blue Method <sup>(4)</sup>
41	Temperature	Laboratory and Field Methods <sup>(4)</sup>
42	Total Dissolved Solids	Dried at 180 °C <sup>(4)</sup>
43	Total Kjeldahl Nitrogen	Semi-Micro-Kjeldahl Method <sup>(4)</sup>
44	Total Suspended Solids	Dried from 103 to 105 °C <sup>(4)</sup>
45	Trivalent Chromium	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>
46	Zinc	1) Digestion, Direct Air-Acetylene Flame Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup>

น้ำใต้ดิน...

น้ำใต้ดิน จำนวน 126 รายการ

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

14 Benzo(a)pyrene...

ลำดับ	สารเคมี	วิธีวิเคราะห์
14	Benzo(a)pyrene	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
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/Mass Spectrometric 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...

ลำดับ	สารเคมี	วิธีวิเคราะห์
29	Chlorobenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
30	Chlorodibromomethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
31	Chloroform	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
32	2-Chlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
33	Chromium	1) Digestion, Direct Air-Acetylene Flame Method <sup>(4)</sup> 2) 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)	Colorimetric 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>
37	Cyanide	Distillation, Colorimetric 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	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...



ลำดับ	สารมลพิษ	วิธีวิเคราะห์
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-Dichloropropane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
55	1,3-Dichloropropane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
56	1,3-Dichloropropene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
57	Dieldrin	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	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...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
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	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  $\alpha$ -HCH...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
74	$\alpha$ -HCH	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
75	$\beta$ -HCH	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
76	$\gamma$ -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	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup> 2) 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	1) Digestion, Direct Air-Acetylene Flame Method <sup>(4)</sup> 2) 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	1) Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(4)</sup> 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
86	Methyl bromide	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>

87 Methylene chloride...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
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, 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 - 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...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
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	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>8</sub> - C <sub>6</sub> )	1) Purge and Trap, Gas Chromatographic Method <sup>(12,22)</sup> 2) Purge and Trap, Gas Chromatographic/Mass spectrometric Method <sup>(12,27)</sup>
110	TPH (C <sub>10</sub> - C <sub>16</sub> )	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(9,22)</sup>
111	TPH (C <sub>18</sub> - C <sub>35</sub> )	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(9,22)</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...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
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	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
125	Xylene (Total)	Purge and Trap Gas Chromatographic/Mass Spectrometric Method <sup>(4)</sup>
126	Zinc	1) Digestion, Direct Air-Acetylene Flame Method <sup>(4)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(4)</sup>

## ภาคผนวก (ต่อหน้า) จำนวน 25 รายการ

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

Chromium (ต่อ)...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
6	Chromium (ต่อ)	2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>(3)</sup>
7	Cobalt	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>(3)</sup>
8	Copper	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method <sup>(3)</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>(3)</sup>
9	Cresol	Absorption Sampling, Gas Chromatographic Method <sup>(3)</sup>
10	Dioxins/Furans	Isokinetic Sampling <sup>(3)</sup>
11	Hydrogen Chloride	Isokinetic Sampling, Ion Chromatographic Method <sup>(3)</sup>
12	Hydrogen Fluoride	Isokinetic Sampling, Ion Chromatographic Method <sup>(3)</sup>
13	Hydrogen Sulfide	Absorption Sampling, Iodometric Method <sup>(3)</sup>
14	Lead	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method <sup>(3)</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>(3)</sup>
15	Manganese	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method <sup>(3)</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>(3)</sup>
16	Mercury	Isokinetic Sampling, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>(3)</sup>
17	Nickel	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method <sup>(3)</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>(3)</sup>
18	Opacity	Ringelmann's Method <sup>(2)</sup>
19	Oxides of Nitrogen	1) Absorption Sampling, Phenoldisulfonic acid Method <sup>(3)</sup> 2) Instrumental Analyzer Method <sup>(3)</sup>
20	Selenium	1) Isokinetic Sampling, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>(3)</sup> 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>(3)</sup>
21	Sulfur Dioxide	1) Absorption Sampling, Barium-Thorin Titrimetric Method <sup>(3)</sup> 2) Instrumental Analyzer Method <sup>(3)</sup>
22	Sulfuric Acid	Isokinetic Sampling, Barium-Thorin Titrimetric Method <sup>(3)</sup>

23 Total Suspended Particulate...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
23	Total Suspended Particulate	Isokinetic Sampling, Gravimetric Method <sup>(3)</sup>
24	Vanadium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method <sup>(3)</sup>
25	Xylene	1) Bag Sampling, Gas Chromatographic Method <sup>(3)</sup> 2) Adsorption Sampling, Gas Chromatographic Method <sup>(3)</sup>

## ดัชนีถูกหวั่นไหวที่สุดที่ไม่ขึ้นตัว จำนวน 35 รายการ

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
1	Aldrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(3,9,23)</sup> 2) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,23)</sup>
2	Antimony	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(3,6,14)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup>
3	Arsenic	1) Waste Extraction, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>(3,6,16)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(3,6,14)</sup> 3) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>(7,14)</sup> 4) Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup>
4	Barium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(3,6,14)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup>
5	Beryllium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(3,6,14)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup>
6	Cadmium	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method <sup>(3,6,13)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(3,6,14)</sup> 3) Digestion, Flame Atomic Absorption Spectrometric Method <sup>(7,14)</sup> 4) Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup>
7	Chlordane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(3,9,23)</sup> 2) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,23)</sup>

8 Chromium...



ลำดับ	สารมลพิษ	วิธีวิเคราะห์
8	Chromium	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method <sup>(3.6.13)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(3.6.14)</sup> 3) Digestion, Flame Atomic Absorption Spectrometric Method <sup>(7.13)</sup> 4) Digestion, Inductively Coupled Plasma Method <sup>(7.14)</sup>
9	Chromium (III)	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method; Waste Extraction, Colorimetric Method; Calculation <sup>(3.6.15,17)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method; Waste Extraction, Colorimetric Method; Calculation <sup>(3.6.14,17)</sup> 3) Digestion, Flame Atomic Absorption Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation <sup>(7.8.13,17)</sup> 4) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation <sup>(7.8.14,17)</sup>
10	Chromium (VI)	1) Waste Extraction, Colorimetric Method <sup>(3.17)</sup> 2) Alkaline Digestion, Colorimetric Method <sup>(8.17)</sup>
11	Cobalt	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(3.6.14)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(7.14)</sup>
12	Copper	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method <sup>(3.6.15)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(3.6.14)</sup> 3) Digestion, Flame Atomic Absorption Spectrometric Method <sup>(7.13)</sup> 4) Digestion, Inductively Coupled Plasma Method <sup>(7.14)</sup>
13	2,4-D	1) Waste Extraction, Gas Chromatographic Method <sup>(3.9.2)</sup> 2) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10.23)</sup>
14	DDD	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(3.9.23)</sup> 2) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10.23)</sup>

15 DDE...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
15	DDE	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(3.9.23)</sup> 2) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10.23)</sup>
16	DOT	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(3.9.23)</sup> 2) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10.23)</sup>
17	Dieldrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(3.9.23)</sup> 2) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10.23)</sup>
18	Endrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(3.9.23)</sup> 2) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10.23)</sup>
19	Heptachlor	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(3.9.23)</sup> 2) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10.23)</sup>
20	Lead	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method <sup>(3.6.13)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(3.6.14)</sup> 3) Digestion, Flame Atomic Absorption Spectrometric Method <sup>(7.13)</sup> 4) Digestion, Inductively Coupled Plasma Method <sup>(7.14)</sup>
21	Lindane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(3.9.23)</sup> 2) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10.23)</sup>
22	Mercury	1) Waste Extraction, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>(3.19)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(3.6.14)</sup> 3) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>(7.13)</sup> 4) Digestion, Inductively Coupled Plasma Method <sup>(7.14)</sup>

Mercury (III)...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
22	Mercury (III)	5) Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method <sup>(20)</sup>
23	Methoxychlor	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(3.9.23)</sup> 2) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10.23)</sup>
24	Molybdenum	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(3.6.14)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(7.14)</sup>
25	Nickel	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method <sup>(3.6.13)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(3.6.14)</sup> 3) Digestion, Flame Atomic Absorption Spectrometric Method <sup>(7.13)</sup> 4) Digestion, Inductively Coupled Plasma Method <sup>(7.14)</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',5,5'-Tetrachlorobiphenyl - 2,3',4,4'-Tetrachlorobiphenyl - 2,2',3,4,5'-Pentachlorobiphenyl - 2,2',4,5,5'-Pentachlorobiphenyl - 2,3,3',4,6'-Pentachlorobiphenyl	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(3.9.23)</sup> 2) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10.23)</sup>

Polychlorinated Biphenyls (สคป)...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
27	Polychlorinated Biphenyls (สคป) - 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>(3.9.28)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10.28)</sup> Electrometric Method <sup>(3.13)</sup>
28	pH	Electrometric Method <sup>(3.13)</sup>
29	Selenium	1) Waste Extraction, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>(3.6.21)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(3.6.14)</sup> 3) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>(7.21)</sup> 4) Digestion, Inductively Coupled Plasma Method <sup>(7.14)</sup>
30	Silver	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(3.6.14)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(7.14)</sup>
31	Thallium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(3.6.14)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(7.14)</sup>

32 Toxaphene...



ลำดับ	สารมลพิษ	วิธีวิเคราะห์
32	Toxaphene	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method <sup>(3,9,23)</sup> 2) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,23)</sup>
33	Trichloroethylene	1) Waste Extraction, Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(3,12,27)</sup> 2) Waste Extraction, Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method <sup>(3,11,27)</sup> 3) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(13,27)</sup> 4) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method <sup>(11,27)</sup>
34	Vanadium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(3,6,14)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup>
35	Zinc	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method <sup>(3,6,15)</sup> 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method <sup>(3,6,14)</sup> 3) Digestion, Flame Atomic Absorption Spectrometric Method <sup>(7,13)</sup> 4) Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup>

ฉบับ จำนวน 125 รายการ

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,23)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
2	Acetone	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(13,27)</sup>
3	Aldrin	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,23)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
4	Anthracene	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,23)</sup>

Anthracene (ต่อ)...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
4	Anthracene (ต่อ)	2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
5	Antimony	Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup>
6	Arsenic	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>(7,14)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup>
7	Atrazine	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
8	Barium	Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup>
9	Benz(a)anthracene	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,23)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
10	Benzene	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(13,27)</sup> 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method <sup>(11,27)</sup>
11	Benzo(b)fluoranthene	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,23)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
12	Benzo(k)fluoranthene	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,23)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
13	Benzoic acid	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
14	Benzo(a)pyrene	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,23)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
15	Benzo(g,h,i)perylene	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,23)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
16	Beryllium	Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup>

17 Bis(2-chloroethyl)ether...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
17	Bis(2-chloroethyl)ether	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
18	Bis(2-ethylhexyl)phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
19	Bromodichloromethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(13,27)</sup>
20	Bromoform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(13,27)</sup>
21	Butanol	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(13,27)</sup>
22	Butyl benzyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
23	Cadmium	1) Digestion, Flame Atomic Absorption Spectrometric Method <sup>(7,13)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup>
24	Carbazole	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
25	Carbon disulfide	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(13,27)</sup>
26	Carbon tetrachloride	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(13,27)</sup> 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method <sup>(11,27)</sup>
27	Chlordane	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,23)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
28	p-Chloroaniline	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
29	Chlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(13,27)</sup>
30	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(13,27)</sup>
31	Chloroform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(13,27)</sup>
32	2-Chlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>

33 Chromium...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
33	Chromium	1) Digestion, Flame Atomic Absorption Spectrometric Method <sup>(7,13)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup>
34	Chromium (III)	1) Digestion, Flame Atomic Absorption Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation <sup>(7,8,15,17)</sup> 2) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation <sup>(7,8,14,17)</sup>
35	Chromium (VI)	Alkaline Digestion, Colorimetric Method <sup>(8,17)</sup>
36	Chrysene	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,23)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
37	Cyanide	Extraction, Distillation, Colorimetric Method <sup>(29,30)</sup>
38	2,4-D	Ultrasonic Extraction, Gas Chromatographic Method <sup>(26)</sup>
39	DDD	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,23)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
40	DDE	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,23)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
41	DDT	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,23)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
42	Dibenz(a,h)anthracene	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,23)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
43	Di-n-butyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
44	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(13,27)</sup>

45 1,3-Dichlorobenzene...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
45	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(13,27)</sup>
46	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(13,27)</sup>
47	3,3'-Dichlorobenzidine	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
48	1,1-Dichloroethane	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(13,27)</sup> 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method <sup>(11,27)</sup>
49	1,2-Dichloroethane	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(13,27)</sup> 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method <sup>(11,27)</sup>
50	1,1-Dichloroethylene	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(13,27)</sup> 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method <sup>(11,27)</sup>
51	cis-1,2-Dichloroethylene	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(13,27)</sup> 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method <sup>(11,27)</sup>
52	trans-1,2-Dichloroethylene	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(13,27)</sup> 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method <sup>(11,27)</sup>
53	2,4-Dichlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
54	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(13,27)</sup>
55	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(13,27)</sup>
56	1,3-Dichloropropene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(13,27)</sup>
57	Dieldrin	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,23)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>

58 Diethyl phthalate...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
58	Diethyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
59	2,4-Dimethylphenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
60	2,4-Dinitrophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
61	2,4-Dinitrotoluene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
62	2,6-Dinitrotoluene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
63	Di-n-Octyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
64	Endosulfan	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,23)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
65	Endrin	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,23)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
66	Ethylbenzene	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(13,27)</sup> 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method <sup>(11,27)</sup>
67	Fluoranthene	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,23)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
68	Fluorene	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,23)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
69	Heptachlor	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,23)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
70	Heptachlor epoxide	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,23)</sup>

Heptachlor epoxide (ต่อ)...


ลำดับ	สารมลพิษ	วิธีวิเคราะห์
70	Heptachlor epoxide (ต่อ)	2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
71	Hexachlorobenzene	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,23)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
72	Hexachloro-1,3-butadiene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(13,27)</sup>
73	n-Hexane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(13,27)</sup>
74	α-HCH	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,23)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
75	β-HCH	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,23)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
76	γ-HCH	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,23)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
77	Hexachlorocyclopentadiene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
78	Hexachloroethane	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
79	Indeno(1,2,3-cd)pyrene	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,23)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
80	Isophorone	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
81	Lead	1) Digestion, Flame Atomic Absorption Spectrometric Method <sup>(7,15)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup>
82	Manganese	1) Digestion, Flame Atomic Absorption Spectrometric Method <sup>(7,15)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup>

83 Mercury...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
83	Mercury	1) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method <sup>(19)</sup> 2) Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method <sup>(20)</sup>
84	Methanol	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(13,27)</sup>
85	Methoxychlor	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,23)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
86	Methyl bromide	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(13,27)</sup>
87	Methylene chloride	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(13,27)</sup> 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method <sup>(11,27)</sup>
88	2-Methylphenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
89	2-Methylnaphthalene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
90	Methyl tert-butyl ether	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(13,27)</sup>
91	Naphthalene	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,23)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
92	Nickel	1) Digestion, Flame Atomic Absorption Spectrometric Method <sup>(7,15)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup>
93	Nitrobenzene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
94	N-Nitrosodiphenylamine	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
95	N-Nitrosodi-n-propylamine	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
96	Polychlorinated Biphenyls - Aroclor 1016	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,23)</sup>

Polychlorinated Biphenyls(ต่อ)...



ลำดับ	สารมลพิษ	วิธีวิเคราะห์
96	Polychlorinated Biphenyls(คอป) - Aroclor 1221 - Aroclor 1232 - Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1260 Polychlorinated Biphenyls - 2-Chlorobiphenyl - 2,3-Dichlorobiphenyl - 2,2',5-Trichlorobiphenyl - 2,4',5-Trichlorobiphenyl - 2,2',3,5'-Tetrachlorobiphenyl - 2,2',5,5'-Tetrachlorobiphenyl - 2,3',4,4'-Tetrachlorobiphenyl - 2,2',3,4,5'- Pentachlorobiphenyl - 2,2',4,5,5'- Pentachlorobiphenyl - 2,3,3',4',6'- Pentachlorobiphenyl - 2,2',3,4,4',5'- Hexachlorobiphenyl - 2,2',3,4,5,5'- Hexachlorobiphenyl - 2,2',3,5,5',6'- Hexachlorobiphenyl - 2,2',4,4',5,5'- Hexachlorobiphenyl - 2,2',3,3',4,4',5'- Heptachlorobiphenyl - 2,2',3,4,4',5,5'- Heptachlorobiphenyl - 2,2',3,4,4',5',6'- Heptachlorobiphenyl - 2,2',3,4',5,5',6'- Heptachlorobiphenyl - 2,2',3,3',4,4',5,5',6'- Nonachlorobiphenyl	2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>  Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,28)</sup>   <b>ดำเนินการถูกต้อง</b> UNITED ANALYST AND ENGINEERS CONSULTANT COMPANY LIMITED

97 Pentachlorophenol...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
97	Pentachlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
98	Phenanthrene	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,25)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
99	Phenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
100	Pyrene	1) Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,25)</sup> 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
101	Selenium	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method <sup>(7,21)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup>
102	Silver	Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup>
103	Styrene	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(13,27)</sup> 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method <sup>(11,27)</sup>
104	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(13,27)</sup>
105	Tetrachloroethylene	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(13,27)</sup> 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method <sup>(11,27)</sup>
106	Toluene	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(13,27)</sup> 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method <sup>(11,27)</sup>
107	Toxaphene	Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,23)</sup>
108	TPH (C <sub>9</sub> -C <sub>8</sub> )	1) Purge and Trap, Gas Chromatographic Method <sup>(13,27)</sup> 2) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(13,27)</sup>
109	TPH (C <sub>9</sub> -C <sub>16</sub> )	Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,23)</sup>
110	TPH (C <sub>9</sub> -C <sub>35</sub> )	Ultrasonic Extraction, Gas Chromatographic Method <sup>(10,23)</sup>

111 1,2,4-Trichlorobenzene...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
111	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(13,27)</sup>
112	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(13,27)</sup>
113	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(13,27)</sup>
114	Trichloroethylene	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(13,27)</sup> 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method <sup>(11,27)</sup>
115	2,4,5-Trichlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
116	2,4,6-Trichlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method <sup>(10,28)</sup>
117	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(13,27)</sup>
118	Vanadium	Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup>
119	Vinyl acetate	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(13,27)</sup>
120	Vinyl chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(13,27)</sup>
121	m-Xylene	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(13,27)</sup> 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method <sup>(11,27)</sup>
122	o-Xylene	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(13,27)</sup> 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method <sup>(11,27)</sup>
123	p-Xylene	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(13,27)</sup> 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method <sup>(11,27)</sup>
124	Xylene (Total)	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method <sup>(13,27)</sup> 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method <sup>(11,27)</sup>

125 Zinc...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
125	Zinc	1) Digestion, Flame Atomic Absorption Spectrometric Method <sup>(7,15)</sup> 2) Digestion, Inductively Coupled Plasma Method <sup>(7,14)</sup>

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- United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Closed System Purge and Trap and Extraction for Volatile Organics in Soil and Waste Sample. SW-846 Method 5035A, 2000.
- United States...

14. United States...



27. 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, 2018.
28. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. **Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry**. SW-846 Method 8270E, 2018.
29. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. **Cyanide Extraction Procedure for Solids and Oils**. SW-846 Method 9013A, 2014.
30. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. **Cyanide in Waters and Extracts using Titrimetric and Manual Spectrophotometric Procedures**. SW-846 Method 9014, 2014.
31. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. **pH Electrometric Measurement**. SW-846 Method 9040C, 2004.
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List of Instruments Certification for Air Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Ambient									
1	Standard Gases (Mixture)	Nitrogen Dioxide Sulphur Dioxide Carbon Monoxide	Airgas	EB0159156 2015PSIG	Airgas an Air Liquide company	E04NI99E15A01D3	6 Nov 23	6 Nov 26	-
2	Standard Gas	Total Hydrocarbons	Air Liquide	CC143232	Airgas an Air Liquide company	E03AI99E15A006C	16 Oct 20	16 Oct 28	-
3	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42i CM22387040	UAE Consultant Co.,Ltd.	20092024	20 Sep 24	19 Sep 25	-
4	Nitrogen Dioxide Analyzer	Nitrogen Dioxide		42i CM22387037	UAE Consultant Co.,Ltd.	4102024	4 Oct 24	4 Oct 25	-
5	Sulphur Dioxide Analyzer	Sulphur Dioxide	Thermo Scientific	43i 1180540065	UAE Consultant Co.,Ltd.	4092024	4 Sep 24	4 Sep 25	-
6	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo Scientific	48i CM08140004	UAE Consultant Co.,Ltd.	03092024	3 Sep 24	3 Sep 25	-
7	Total Hydrocarbons Analyzer	Total Hydrocarbons	Thermo Scientific	APHA-370 93JN1MN9	UAE Consultant Co.,Ltd.	2092024	2 Sep 24	2 Sep 25	-
8	Sound Level Meter Class 1 UAE.EFM.109/2561	Calibrate Sound Level Meter	SVANTEK	SVAN 971 80390	Innovative Instrument Co.,Ltd.	23-SLM-329	26 Sep 23	25 Sep 24	-
9	Sound Level Meter	<div>L<sub>Aeq</sub> 1 hr L<sub>Aeq</sub> 24 hrs L<sub>Amax</sub> L<sub>A90</sub></div> <div>เสียงรบกวน</div>	Larson Davis	LxT2 0006757	Electrical And Electronics Institute Foundation For Industrial Development	CP20240321EA	22 Aug 24	21 Aug 25	-



List of Instruments Certification for Water Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Water									
10	pH Meter	pH Meter	HANNA Instruments	HI2020-02 C0051107	National Food Institute, Ministry of Industry, Thailand	2404042-001-01	14 Aug 24	13 Aug 25	-
11	Balance	ของแข็งแขวนลอยทั้งหมด (Total Suspended Solids)	Mettler-Toledo	XPE205/ B748058497	Mettler-Toledo (Thailand) Ltd.	TH2084-013-092024-ACC-TH	21 Sep 24	21 Sep 25	-
12	Hot Air Oven	ของแข็งละลายน้ำทั้งหมด (Total Dissolved Solids) น้ำมันและไขมัน (Oil & Grease) ตะกอนหนัก	Memmert	UF55 / B216.1666	National Food Institute, Ministry of Industry, Thailand	2500116-001-01	8 Oct 24	7 Oct 25	-
13	BOD Incubator	บีโอดี (Biochemical Oxygen Demand)	Arco	UC4-1320	Technology Promotion Association (Thailand-Japan)	24TM1114	14 Jul 24	14 Jul 25	-
14	Water Bath	แบบคี่เรียกกลุ่มลิเจียนเนลา	Memmert	WNE 14 / L407.0756	Technology Promotion Association (Thailand-Japan)	24TM1016/1	5 Aug 24	4 Aug 25	-
15	Autoclave		ALP	CL-40L / 807298	National Food Institute, Ministry of Industry, Thailand	2403982-001-01	7 Aug 24	6 Aug 25	-
16	Distillation Unit (Kjeldahl Method)	Total Kjeldahl Nitrogen (TKN) Ammonia	FOSS	KT9 Distillater / 91905393	FOSS South East Asia, Thailand	12875	5 Jul 24	5 Jul 25	-
17	Incubator	โคลิฟอร์มแบบคี่เรียกทั้งหมด (Total Coliform Bacteria) ฟิคอลโคลิฟอร์มแบบคี่เรียก แบบคี่เรียกอินดิโอไล	BINDER	BD 53/ 13-07343	National Food Institute, Ministry of Industry, Thailand	2403982-003-01	7 Aug 24	6 Aug 25	-

## CERTIFICATE OF ANALYSIS

## Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE

(THAILAND) LTD

Part Number: E04N199E15A01D3

Cylinder Number: EB0159156

Laboratory: 124 - Durham (SAP) - NC

PGVP Number: 822023

Gas Code: CO,NO,NOX,SO2,BALN

Reference Number: 122-402880224-1

Cylinder Volume: 144.0 CF

Cylinder Pressure: 2015 PSIG

Valve Outlet: 550

Certification Date: Nov 06, 2023

Expiration Date: Nov 06, 2026

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 800R-12/51, using the assay procedure 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 mole/mole basis unless otherwise noted. The results relate only to the items tested. The report shall not be reproduced except in full without approval of the laboratory. Do Not Use This Cylinder below 100 psig, i.e. 6.7 megapascals.

ANALYTICAL RESULTS				
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
NOX	45.00 PPM	46.78 PPM	G1	+/- 1.3% NIST Traceable
NITRIC OXIDE	45.00 PPM	46.77 PPM	G1	+/- 1.3% NIST Traceable
SULFUR DIOXIDE	45.00 PPM	42.85 PPM	G1	+/- 1.0% NIST Traceable
CARBON MONOXIDE	1000 PPM	965.9 PPM	G1	+/- 0.3% NIST Traceable
NITROGEN	Balance			

CALIBRATION STANDARDS				
Type	Lot ID	Cylinder No	Concentration	Uncertainty
NTRM	21060703	CC707954	48.41 PPM NITRIC OXIDE/NITROGEN	+/- 1.2%
PRM	PRM	D913660	15.01 PPM NITROGEN DIOXIDE/AIR	+/- 1.5%
GMS	124206889	CC322689	4.573 PPM NITROGEN DIOXIDE/NITROGEN	+/- 1.6%
NTRM	16061005	CC473180	49.02 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%
NTRM	14060154	CC436951	960.9 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicoret 1550 AUP2010249 CO	FTIR	Oct 11, 2023
Nicoret 1550 AUP2010249 NO	FTIR	Oct 11, 2023
Nicoret 1550 AUP2010249 NO2	FTIR	Oct 11, 2023
Nicoret 1550 AUP2010249 SO2	FTIR	Oct 11, 2023

Triad Data Available Upon Request

NOTES: GROSS WEIGHT: 28.4 kg

NET WEIGHT: 4.7 kg

Signature on file

Approved for Release

Page 1 of 1

## CERTIFICATE OF ANALYSIS

## Grade of Product: EPA Protocol

Part Number: E03A199E15A006C

Cylinder Number: CC143232

Laboratory: 124 - Plumsteadville - PA

PGVP Number: A12020

Gas Code: CH4,PPN,BALA

Reference Number: 160-401908379-1

Cylinder Volume: 144.0 CF

Cylinder Pressure: 2016 PSIG

Valve Outlet: 550

Certification Date: Oct 16, 2020

Expiration Date: Oct 16, 2028

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 800R-12/51, using the assay procedure 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 mole/mole basis unless otherwise noted. Do Not Use This Cylinder below 100 psig, i.e. 6.7 megapascals.

ANALYTICAL RESULTS				
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
METHANE	4000 PPM	4019 PPM	G1	+/- 0.5% NIST Traceable
PROPANE	4000 PPM	4008 PPM	G1	+/- 0.7% NIST Traceable
AIR	Balance			

CALIBRATION STANDARDS				
Type	Lot ID	Cylinder No	Concentration	Uncertainty
NTRM	02010405	K010090	4876 PPM PROPANE/NITROGEN	+/- 0.6%
NTRM	170606	CC160290	0.997 % METHANE/NITROGEN	+/- 0.4%

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
MKS FTR - CH4 - 200928781	FTIR	Oct 14, 2020
Nicoret 6700 APW1100391 C3H8	FTIR	Sep 18, 2020

Triad Data Available Upon Request

NOTES: NET WEIGHTS: 4.865kg

GROSS WEIGHTS: 27.365kg

PO#: 5220003825



Approved for Release

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## United Analyst and Engineering Consultant Co., Ltd.

3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phraekhanong, Bangkok 10260

Tel. 0 2763 2828 Fax 0 2763 2800 www.uaeconsultant.com E-mail: uae@uaeconsultant.com

## MULTI-POINT GAS TEST REPORT

Test Date : Sep 20, 2024

Equipment : Gas Analyzer (NO<sub>2</sub>)

Model : 421

Manufacturer : Thermo Scientific

Serial Number : CM22387040

## Standard Gas Concentration

Sulphur Dioxide (SO<sub>2</sub>) 42.89 PPM

Nitric Oxide (NO) 46.77 PPM

Methane (CH<sub>4</sub>) - PPM

Carbon Monoxide (CO) 965.9 PPM

Cylinder No. : EB0159156

Expiration Date : Nov 6, 2026

## Dilutor Detail

Manufacturer : Thermo Scientific

Model : 146i

Serial Number : 1180540071

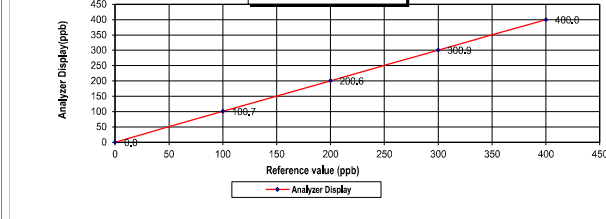
## Multi-point gas test data

Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1 Zero	0.0	0.00	0.00	0.00
Level 2 20.00%	100.0	100.7	0.70	0.70
Level 3 40.00%	200.0	200.6	0.30	0.30
Level 4 60.00%	300.0	300.9	0.30	0.30
Level 5 80.00%	400.0	400.0	0.00	0.00

Remark : Measuring Range 500.0 ppb

: Acceptable Limit  $\pm 5\%$ 

## Multi-Point Gas Test Chart



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20 9 2567

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20 Sep 2024

## United Analyst and Engineering Consultant Co., Ltd.

3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phraekhanong, Bangkok 10260

Tel. 0 2763 2828 Fax 0 2763 2800 www.uaeconsultant.com E-mail: uae@uaeconsultant.com

## MULTI-POINT GAS TEST REPORT

Test Date : Oct 4, 2024

Equipment : Gas Analyzer (NO<sub>2</sub>)

Model : 421

Manufacturer : Thermo Scientific

Serial Number : CM22387037

## Standard Gas Concentration

Sulphur Dioxide (SO<sub>2</sub>) 42.89 PPM

Nitric Oxide (NO) 46.77 PPM

Methane (CH<sub>4</sub>) - PPM

Carbon Monoxide (CO) 965.9 PPM

Cylinder No. : EB0159156

Expiration Date : Nov 6, 2026

## Dilutor Detail

Manufacturer : Thermo Scientific

Model : 146i

Serial Number : 1180540071

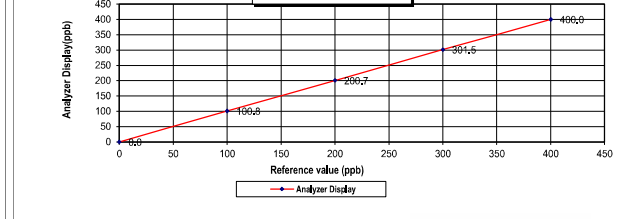
## Multi-point gas test data

Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1 Zero	0.0	0.00	0.00	0.00
Level 2 20.00%	100.0	100.8	0.80	0.79
Level 3 40.00%	200.0	200.7	0.35	0.35
Level 4 60.00%	300.0	301.5	0.50	0.50
Level 5 80.00%	400.0	400.0	0.00	0.00

Remark : Measuring Range 500.0 ppb

: Acceptable Limit  $\pm 5\%$ 

## Multi-Point Gas Test Chart



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11 Oct 2024

### MULTI-POINT GAS TEST REPORT

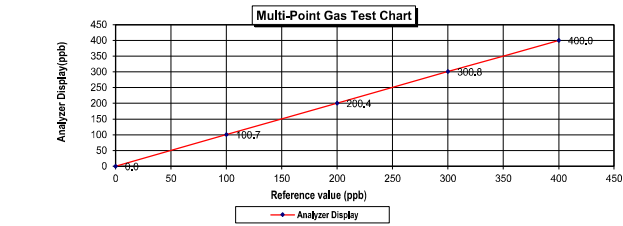
Test Date : Sep 4, 2024

Equipment : Gas Analyzer (SO<sub>2</sub>) Model : 43i  
Manufacturer : Thermo SCIENTIFIC Serial Number : 1180540065

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO <sub>2</sub> )	42.89	PPM	Manufacturer :	Thermo SCIENTIFIC
Nitric Oxide (NO)	46.77	PPM	Model :	146i
Methane (CH <sub>4</sub> )	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	965.9			
Cylinder No. :	EB01159156			
Expiration Date :	Nov 06, 2026			

#### Multi-point gas test data

Reference Value (ppb)			Analyzer Display (ppb)	Difference Error	Percent Error	[% Error ]
Level 1	Zero	0.0	0.0	0.00	0.00	0.00
Level 2	20.00%	100.0	100.7	0.70	0.70	0.70
Level 3	40.00%	200.0	200.4	0.40	0.20	0.20
Level 4	60.00%	300.0	300.8	0.80	0.27	0.27
Level 5	80.00%	400.0	400.0	0.00	0.00	0.00
Remark : Measuring Range			500.0 ppb	Average Difference (%)		0.23



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### MULTI-POINT GAS TEST REPORT

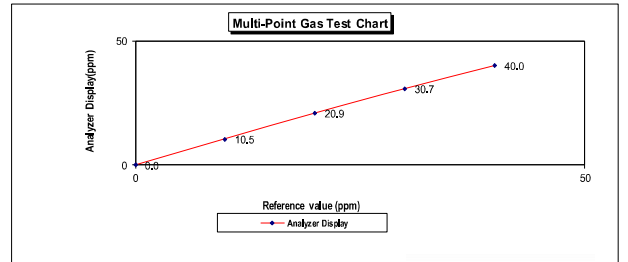
Test Date : Sep 3, 2024

Equipment : Gas Analyzer (CO) Model : 48i  
Manufacturer : Thermo Scientific Serial Number : CM08140004

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO <sub>2</sub> )	42.89	PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	46.77	PPM	Model :	146i
Methane (CH <sub>4</sub> )	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	965.9	PPM		
Cylinder No. :	EB01159156			
Expiration Date :	Nov 06, 2026			

#### Multi-point gas test data

Reference Value (ppm)			Analyzer Display (ppm)	Difference Error	Percent Error	[% Error ]
Level 1	Zero	0.0	0.0	0.0	0.0	0.0
Level 2	20.00%	10.0	10.5	0.5	4.8	4.8
Level 3	40.00%	20.0	20.9	0.9	4.3	4.3
Level 4	60.00%	30.0	30.7	0.7	2.3	2.3
Level 5	80.00%	40.0	40.0	0.0	0.0	0.0
Remark : Measuring Range			50.0 ppm	Average Difference (%)		2.27



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### MULTI-POINT GAS TEST REPORT

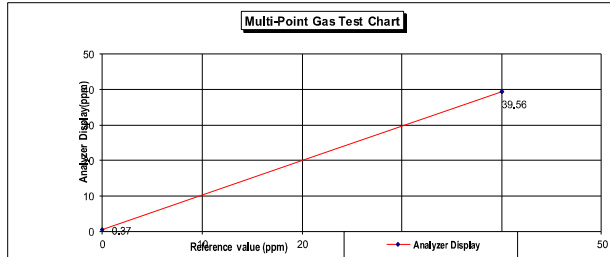
Test Date : Sep 2, 2024

Equipment : Hydrocarbon Analyzer Model : APHA-370  
Manufacturer : HORIBA Serial Number : 93JN1MN9

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO <sub>2</sub> )	-	PPM	Manufacturer :	
Nitric Oxide (NO)	-	PPM	Model :	
Methane (CH <sub>4</sub> )	39.8	PPM	Serial Number :	
Carbon Monoxide (CO)	-	PPM		
Cylinder No. :	D824432			
Expiration Date :	Aug 4, 2028			

#### Multi-point gas test data

Reference Value (ppm)			Analyzer Display (ppm)	Difference Error	Percent Error	[% Error ]
Level 1	Zero	0.00	0.37	0.37	0.37	0.37
Level 2	80.00%	40.00	39.56	-0.44	-1.11	1.11
Remark : Measuring Range			50.00 ppm	Average Difference (%)		0.74
:Acceptable Limit $\pm 5\%$						



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2/9/2567

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2/Sep./2024

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### Certificate of Calibration

Customer : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD. Certificate No : 23-SLM-329  
Address : 81 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10260 Request No : Req-2022-2021

#### Unit Under Calibration Details

Measurement item : Sound Level Meter Microphone Class : 1  
Manufacturer : SVANTEK Microphone Model : 7052E  
Model : SVAN 971 Microphone S/N : R2085  
Serial Number : 80290 Pre-amplifier Model : -  
ID : - Pre-amplifier S/N : -  
Resolution : 0.1 dB Instrument Status : Used

#### Calibration Environment and Details

Temperature : 23 °C  $\pm 2$  °C  
Humidity : 50 %RH  $\pm 20$  %RH  
Barometric Pressure : 1013 hPa  $\pm 10$  hPa  
Received Date : 21 September 2023  
Calibrated Date : 26 September 2023  
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3 : 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests  
Location of Calibration : Lab Acoustic

#### Reference Standard

Instrument	Brand	Model	S/N	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	6 October 2023	GRAS
Multifrequency Calibrator	Quest	Quest-cal	EFA060234	23 July 2024	TSI
Audio Generator	Svantek	Svan401	131	12 October 2023	WK Electric

#### Note

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

Calibrated By : Mr. Neppadon Lamsart  
Calibration Officer

Approved By : Mr. Pachi Mathavan  
Calibration Engineer Supervisor  
Issue Date : 26 September 2023

เอกสารไม่ควบคุม



Certificate No : 23-SLM-329  
Request No : Req-2022-2021

#### 1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		After Adjust		UNCERTAINTY	Acceptance
FAST / A / 28-126	Level	UUC	ERR	UUC	ERR	(± dB)	Limit
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)		
1000 Hz (114 dB)	113.78	113.6	-0.18	113.8	+0.02	0.2	0.3

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

#### 2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 28-126	(dB)	(± dB)
A	15.2	0.1

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

UUC Setting	Measured	UNCERTAINTY
FAST / 28-126	(dB)	(± dB)
A	15.2	0.1
C	15.2	0.1
Z	20.2	0.1

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

UUC Setting	Deviation from various Frequency			UNCERTAINTY	Acceptance
FAST / 28-126	Weighting Response curve			(± dB)	Limit
STD Setting	A	C	Z		
(dB)	(dB)	(dB)	(dB)	(± dB)	(± dB)
125 Hz	0.3	0.4	0.4	0.6	1.0
1000 Hz	0.0	0.0	0.0	0.6	0.7
4000 Hz	0.6	0.6	0.6	0.6	1.0
8000 Hz	1.0	1.1	1.0	0.7	+1.5, -2.5

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

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Certificate No : 23-SLM-329  
Request No : Req-2022-2021

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

UUC Setting	Deviation from various Frequency			UNCERTAINTY	Acceptance
FAST / 28-126	Weighting Response curve			(± dB)	Limit
STD Setting	A	C	Z		
(dB)	(dB)	(dB)	(dB)	(± dB)	(± dB)
63 Hz	0.1	0.2	0.2	0.2	1.0
125 Hz	0.1	0.2	0.2		1.0
250 Hz	0.1	0.2	0.2		1.0
500 Hz	0.1	0.2	0.1		1.0
1000 Hz	0.0	0.0	0.0		0.7
2000 Hz	-0.2	-0.2	-0.2		1.0
4000 Hz	0.0	0.0	0.0		1.0
8000 Hz	0.2	0.2	0.1		+1.5, -2.5
16000 Hz	0.0	0.0	0.1		+2.5, -16.0

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

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance
FAST / 28-126	REF	UUC	ERR	(± dB)	Limit
UUC Weighting	(dB)	(dB)	(dB)		
A	114.00	114.0	0.0	0.2	0.2
C	114.00	114.0	0.0		0.2
Z	114.00	114.0	0.0		0.2

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance
28-126 / A	REF	UUC	ERR	(± dB)	Limit
UUC Time Response	(dB)	(dB)	(dB)		
Fast	114.00	114.0	0.0	0.2	0.1
Slow	114.00	114.0	0.0		0.1
Log	114.00	114.0	0.0		0.1

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

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Certificate No : 23-SLM-329  
Request No : Req-2022-2021

#### 7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 28-126	UUC	(± dB)	Limit
STD Setting	(dB)		
Initial	114.0	0.1	0.1
Final	114.0		
Deviated	0.0		

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

UUC Setting	Anticipated	Deviation		UNCERTAINTY	Acceptance
FAST / A / 28-126	REF	UUC	ERR	(± dB)	Limit
STD dB	(dB)	(dB)	(dB)		
125.00	125	125.0	0.0	0.3	0.8
124.00	124	124.0	0.0		0.8
119.00	119	119.0	0.0		0.8
114.00	114	114.0	0.0		0.8
109.00	109	109.0	0.0		0.8
104.00	104	104.0	0.0		0.8
99.00	99	99.0	0.0		0.8
94.00	94	94.0	0.0		0.8
89.00	89	89.0	0.0		0.8
84.00	84	84.0	0.0		0.8
79.00	79	79.0	0.0		0.8
74.00	74	74.0	0.0		0.8
69.00	69	69.0	0.0		0.8
64.00	64	64.0	0.0		0.8
59.00	59	59.0	0.0		0.8
54.00	54	54.0	0.0		0.8
49.00	49	49.0	0.0		0.8
44.00	44	44.0	0.0		0.8
39.00	39	39.0	0.0		0.8
34.00	34	33.8	-0.1		0.8
29.00	29	28.6	-0.4		0.8
24.00	24	23.5	-0.5		0.8
19.00	19	18.4	-0.6		0.8

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

เอกสารไม่ควบคุม

Certificate No : 23-SLM-329  
Request No : Req-2022-2021

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

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance
FAST / A	REF	UUC	ERR	(± dB)	Limit
UUC Range	(dB)	(dB)	(dB)		
28-125	114	114.0	0.0	0.3	0.8

#### 10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY	Acceptance
A / 28-126	Toneburst	Ref	UUC	ERR	(± dB)	Limit
UUC Time Response	(ms)	(dB)	(dB)	(dB)		
Fast	200	122.0	122.0	0.0	0.2	0.5
	2	105.0	105.0	0.0		+1.0, -1.5
	0.25	96.0	95.8	-0.2		+1.0, -3.0
Slow	200	115.6	115.5	-0.1		0.5
	2	96.0	95.9	-0.1		+1.0, -3.0
	200	116.0	116.0	0.0		0.5
SEL	2	96.0	96.0	0.0		+1.0, -1.5
	0.25	87.0	86.8	-0.2		+1.0, -3.0

#### 11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY	Acceptance
FAST / C / 30-140	REF	UUC	ERR	(± dB)	Limit
STD Setting	(dB)	(dB)	(dB)		
Complete cycle	135.4	135.0	-0.40	0.2	2.0
Positive half cycle	134.4	134.4	0.00		1.0
Negative half cycle	134.4	134.4	0.00		1.0

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

เอกสารไม่ควบคุม

Certificate No.: 23-SLM-329  
Request No.: Req-2022-2021

#### 12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 38-140	UUC		Limit
STD Setting	(dB)	( $\pm$ dB)	( $\pm$ dB)
Positive one-half cycle	141.8		
Negative one-half cycle	141.7		
Deviated	0.1	0.2	1.5

#### 13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 38-140	UUC		Limit
STD Setting	(dB)	( $\pm$ dB)	( $\pm$ dB)
Initial	139.0		
Final	139.0		
Deviated	0.0	0.1	0.1

End of Certificate

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

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**ELECTRICAL AND ELECTRONICS INSTITUTE  
FOUNDATION FOR INDUSTRIAL DEVELOPMENT**  
975 Moo 4, Bangpoo Industrial Estate, Soi 8, Sukhumvit Road km 37,  
Phraek Sa, Mueang Samut Prakan, Samut Prakan 10280  
Tel: +66 2709 4860 Fax: +66 2324 0917



Certificate No.: CP20240321EA  
Operation No.: CP2024080292

### Certificate of Calibration

**Equipment:** Sound Level Meter  
**Manufacturer:** Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)  
**Model/Type:** LxT2 (Meter), 375A04 (Microphone), PRLxT2C (Preamplifier)  
**Serial No.:** 0006757 (Meter), 350420 (Microphone), 073886 (Preamplifier)  
**ID No.:** UAE.EFM.033/2566  
**Customer:** United Analyst and Engineering Consultant Co.,Ltd.  
**Address:** 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak  
Phrakhanong, Bangkok 10260  
**Received Date:** 9 August 2024  
**Calibrated Date:** 22 - 26 August 2024  
**Issued Date:** 28 August 2024  
**Calibrated by:** Ms. Juntaporn Kunhakom

Approved by:   
( Mr. Sittichai Swaksuriyawong )  
Group Manager

This report was prepared electronically using applicable electronic signature. Printing or copy of file are considered as a copy of the document.  
The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor (k) providing a level of confidence of approximately 95%. This certificate may not be reproduced other than in full except with the prior written approval of the Electrical and Electronics Institute, Foundation for Industrial Development.

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F-CAL-004 Ed.1



**ELECTRICAL AND ELECTRONICS INSTITUTE  
FOUNDATION FOR INDUSTRIAL DEVELOPMENT**

Certificate No.: CP20240321EA

#### Calibration Report

**Equipment:** Sound Level Meter  
**Manufacturer:** Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)  
**Model/Type:** LxT2 (Meter), 375A04 (Microphone), PRLxT2C (Preamplifier)  
**Serial No.:** 0006757 (Meter), 350420 (Microphone), 073886 (Preamplifier)  
**ID No.:** UAE.EFM.033/2566  
**Ambient Temperature:** ( $23 \pm 2$ ) °C  
**Relative Humidity:** ( $50 \pm 15$ ) %  
**Pressure:** ( $101.3 \pm 1.5$ ) kPa

**Method of Calibration :-**  
IEC 61672-3:2013.

#### Condition of this result of calibration

1. Reference standards instrument :-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Standard microphone	4180	2787490	AA-1012-23	12 November 2024
2) Arbitrary Function Generator	AFG2021	C010063	CK20240048EA	23 June 2025
3) Programmable Attenuator	PA5	2755	EF-0040-23	1 October 2024
4) 6.5 Digit precision multimeter	8846A	9610014	CB20230200EA	15 November 2024
5) Pressure humidity and Temperature Transmitter	PTU301	L3950483	CL1-P240023	24 March 2025
6) Pressure humidity and Temperature Transmitter	PTU301	L3950484	CD20240142EA	12 June 2025
			CL1-P240030	11 April 2025
			CD20240143EA	12 June 2025
7) Performance Audio Analyzer	U8903B	MY56510003	CB20240035EB	13 February 2025
			CK20230072EA	13 September 2024

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

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

Reference standards instrument for Acoustic function

- National Institute of Metrology (Thailand)

Reference standards instrument for Electrical function

- National Institute of Metrology (Thailand)

- Electrical and Electronics Institute; NSC Accredited Calibration No.01119

#### Result of Calibration:-

Function : 1. Indication at the calibration check frequency

Reference Acoustic Signal (dB)	Measured value (dB)	Deviation (dB)	Acceptance limits (dB)
-	-	-	-



**ELECTRICAL AND ELECTRONICS INSTITUTE  
FOUNDATION FOR INDUSTRIAL DEVELOPMENT**

Certificate No.: CP20240321EA

#### Calibration Report

**Function : 2. Self-generated Noise**  
**2.1 Microphone Installed**

Measured value (dB)
28.4

#### 2.2 Microphone replaced by the electrical input signal device

Frequency Weighting	Measured value (dB)
A-weighting	28.2
C-weighting	28.0
Z-weighting	33.3

#### Function : 3. Acoustical signal tests of frequency weightings (Without Windscreen)

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

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
125	0.1	0.0	0.1	$\pm 1.5$
1000	0.0	0.0	0.0	$\pm 1.0$
8000	-0.4	-0.3	-0.2	$\pm 5.0$

#### Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
63	0.0	0.0	0.0	$\pm 2.0$
125	0.0	-0.1	0.0	$\pm 1.5$
250	0.0	-0.1	0.0	$\pm 1.5$
500	0.0	-0.1	0.0	$\pm 1.5$
1000	0.0	0.0	0.0	$\pm 1.0$
2000	0.0	0.0	0.0	$\pm 2.0$
4000	0.0	0.0	0.0	$\pm 3.0$
8000	-0.1	0.0	0.1	$\pm 5.0$

#### Function : 5. Frequency and time weighting at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
C-weighting	94.0	0.0	$\pm 0.2$
A-weighting	94.0	0.0	$\pm 0.2$
Z-weighting	94.0	0.0	$\pm 0.2$

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Certificate No.: CP20240321EA

## Calibration Report

## 5.2 Time weighting at 1 kHz

Time Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	94.0	0.0	±0.1
Slow	94.0	0.0	±0.1
LAeq	94.0	0.0	±0.1

## Function : 6. Long-Term Stability

Long-term stability over 30 minutes, with steady 1 kHz signal at reference level.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
30	94.0	94.0	0.0	±0.3

## Function : 7. Level Linearity on the reference level range

## 7.1 Level Linearity on the reference level range, Upper

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±1.1
99.0	99.0	0.0	±1.1
104.0	104.0	0.0	±1.1
109.0	109.0	0.0	±1.1
114.0	114.0	0.0	±1.1
119.0	119.0	0.0	±1.1
124.0	124.0	0.0	±1.1
129.0	129.0	0.0	±1.1
134.0	134.1	0.1	±1.1
139.0	139.1	0.1	±1.1

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F-CAL-005 Ed.1

Certificate No.: CP20240321EA

## Calibration Report

## 7.2 Level Linearity on the reference level range, Lower

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.1	0.1	±1.1
43.0	43.1	0.1	±1.1
42.0	42.1	0.1	±1.1
41.0	41.1	0.1	±1.1
40.0	40.1	0.1	±1.1
39.0	39.3	0.3	±1.1

## Function : 8. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	200	136.0	0.0	±1.0
	2	118.8	-0.2	+1.0 ; -2.5
	0.25	109.8	-0.2	+1.5 ; -5.0
Slow	200	129.5	-0.1	±1.0
	2	109.9	-0.1	+1.0 ; -5.0
	0.25	110.0	0.0	+1.0 ; -2.5
LAE	200	130.0	0.0	±1.0
	2	110.0	0.0	+1.0 ; -2.5
	0.25	101.0	0.0	+1.5 ; -5.0

## Function : 9. Peak C sound level

Number of cycles in test signal	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Complete cycle	135.4	134.7	-0.7	±3.0
Positive half cycle	134.4	134.0	-0.4	±2.0
Negative half cycle	134.4	134.0	-0.4	±2.0

## Function : 10. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limits (dB)
Positive one-half cycle	Negative one-half cycle		
142.3	142.2	-0.1	

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F-CAL-005 Ed.1

Certificate No.: CP20240321EA

## Calibration Report

## Function : 11. High-Level Stability

High-level stability over 5 minutes, with steady 1 kHz signal, 1 dB below upper boundary.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
5	139.0	139.0	0.0	±0.3

## Uncertainty of measurement

Function	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1) Indication at the calibration check frequency	0.30	Not applicable
2) Self-generated Noise	0.10	Not applicable
3) Acoustical signal tests of frequency weightings - Free-field sound pressure response level	0.30	0.60 (10Hz to 4kHz) 0.70 (>4kHz to 10kHz)
4) Electrical signal tests of frequency weightings	0.20	0.20
5) Frequency and time weighting at 1 kHz	0.20	0.20
6) Long-Term Stability	0.10	0.10
7) Level Linearity on the reference level range	0.30	0.30
8) Tone burst response	0.20	0.30
9) Peak C sound level	0.20	0.35
10) Overload indication	0.20	0.25
11) High-Level Stability	0.10	0.10

- Remarks:
1. Indication at the calibration check frequency can not measured because customer does not provide a sound calibrator.
  2. The acceptance limit is for the deviated value.
  3. Acceptance limits was IEC61672-3:2013 Class 2.
  4. The coverage factor  $k = 2.00$

-- End of Report --

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F-CAL-005 Ed.1

## Calibration Certificate

Certificate No.: 2404042-001-01  
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.  
Address: 3 Soi Udumsk 41, Sukhumvit Road,  
Bangchack, Prakhnong, Bangkok 10260

Page 1 of 5

Equipment: pH Meter  
Manufacturer: HANNA instruments  
Model: HI2020-02  
Serial No.: C0051107  
ID No.: UAE.WAO.005/2557  
Order No.: 2404042  
Operation No.: 2404042-001  
Date of Receipt: 14 August 2024  
Date of Calibration: 21 August 2024

Calibrated by Mr.Manas Somsak Specialist  
Approved by ( Mr.Pheraphat Tuanjit )  
Manager, Division of Calibration Laboratory  
Responsible for the Technical Management Team  
Date of Issue: 21 August 2024

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

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

F-CS-009 Revision: 01 Date: 20-04-65



## Calibration Report

**Certificate No.:** 2404042-001-01  
**Equipment:** pH Meter  
**Resolution:** 0.001 pH ; 0.1 mV  
**Manufacturer:** HANNA Instruments  
**Model:** HI2020-02  
**Serial No.:** C0051107  
**Type:** Bench top  
**ID No.:** UAE WAO.005/2557

**Date of Calibration:** 21 August 2024 Page 2 of 5

**Location:** Chemical Calibration Laboratory, National Food Institute  
**Environment Condition:** Ambient Temperature: ( 23.1 ± 1.5 ) °C Relative Humidity: ( 55 ± 3 ) %  
**Condition of Equipment:** Good Condition

### Condition of this Results of Calibration

1. Calibration Method: W-CC-002: In house method based on direct measurement by using standard voltage calibrator and certified reference material (CRM)

2. Reference Standards / Certified Reference Material

Instruments	Serial / ID No.	Manufacturer	Certificate No.	Due Date
2.1 DC Voltage Calibrator	2709007	Fluke	24E1732	30 May 2025
2.2 Digital Thermometer	2709007	Fluke	CC 865679-01	30 October 2024
2.3 Thermo-Hygro Meter	NFI BTH 019/23	testo	QR24-0492	4 March 2025
Certified Reference Material	List No.	Manufacturer	Ref N	Expire Date
2.4 pH buffer 4.008 (Primary pH buffer Solution)	873608	CPAchem	PH216.L5	16 February 2025
2.5 pH buffer 6.865 (Primary pH buffer Solution)	873609	CPAchem	PH217.L5	16 February 2025
2.6 pH buffer 10.01 (Primary pH buffer Solution)	940189	CPAchem	PH220.L5	30 November 2024
2.7 pH buffer 7.00 (Standard pH buffer Solution)	C03109	HACH-LANGE GmbH	S11M064	16 October 2025

3. This certification is traceable to The International System of Unit (SI Unit)

- 3.1 Instruments Np.2.1 through NSC-TSI-TIS 17025 Laboratory Accreditation of Calibration No.0008  
3.2 Instruments Np.2.2 through NSC-TSI-TIS 17025 Laboratory Accreditation of Calibration No.0061  
3.3 Instruments Np.2.3 through NSC-TSI-TIS 17025 Laboratory Accreditation of Calibration No.0292  
3.4 Certified Reference Material Np.2.4 to 2.6 traceable to Primary measurement method- Harned cell using calibrated thermometer, bathometer, and nanovoltmeter The Standard Solution preparation and certified by CPAchem Ltd is accredited to ISO 17034 and ISO/IEC 17025  
3.5 Certified Reference Material Np.2.7 traceable to PTB Certificate Nr. PTB-PH04-563/00504023 and Certificate Nr. PTB-PH08-555/0062022 (PTB: Physikalisch-Technische Bundesanstalt, Braunschweig, Germany)

4. This certificate was certified only for the instrument we calibrated.

5. This result of calibration was found accurate as shown on date and place of calibration only

F-CS-012 Revision: 01 Date: 20-04-65

## Calibration Report

**Certificate No.:** 2404042-001-01  
**Equipment:** Digital Thermometer with RTD (pH Meter)  
**Resolution:** 0.1 °C  
**Model:** HI2020-02  
**Serial No.:** C0051107  
**ID No.:** UAE WAO.005/2557  
**Manufacturer:** HANNA Instruments

**Date of Calibration:** 21 August 2024 Page 4 of 5

**Location:** Chemical Calibration Laboratory, National Food Institute

**Environment Condition:** Ambient Temperature: 23 °C ± 1 °C  
Relative Humidity: 55 % ± 3 %

### Condition of this results of Calibration

1. Calibration Method:  
- In house method: W-TE-025 by comparison with standard thermometer.  
- The Calibration is determined by comparing with a known temperature from a standard resistance thermometer.  
- The temperature scale in use at this laboratory is the International Temperature scale of 1990 (ITS-90).

2. Reference Standard Instrument:

Instrument	Model	Serial No.	Certificate No.	Due Date	Through
HANDHELD THERMOMETER	1521	A85997	TE 670101-01	16-Dec-24	NATIONAL FOOD INSTITUTE
Platinum Resistance Thermometer (PRT)	385	555201			

Support Equipment: - Low Temperature Bath (AMETEC RTC-187, Model: RTC-187C, SN: 670830-00018)

3. This certificate is traceable to International System of Units (SI Units).

4. This certificate was certified only for the instrument we calibrated.

5. This result of calibration was found accurate as shown on date and place of calibration only.

6. Condition of Calibrated Item:

7. Result of Calibration: ☒ Good ☐ Without adjustment ☐ After adjustment

F-CS-012 Revision: 01 Date: 20-04-65

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## Calibration Report

**Certificate No.:** 2404042-001-01  
**Equipment:** pH Meter  
**Resolution:** 0.001 pH ; 0.1 mV  
**Manufacturer:** HANNA Instruments  
**Model:** HI2020-02  
**Serial No.:** C0051107  
**Type:** Bench top  
**ID No.:** UAE WAO.005/2557

**Date of Calibration:** 21 August 2024 Page 3 of 5

**Calibration Results:** ( Manual Temperature Compensation at 25 °C )

1. Calibration of pH Meter

Nominal pH	DC Voltage Standard (mV)	Average Indicator Reading		Uncertainty (±mV)	Coverage Factor (k)
		mV	pH		
8	-414.122	-421.0	-6.061	0.063	2.00
2	-295.815	-302.7	-1.999	0.063	2.00
4	-177.463	-184.3	-4.000	0.063	2.00
6	-59.180	-66.0	-6.000	0.063	2.00
7	0.001	6.8	7.001	0.063	2.00
8	-59.158	-62.3	-8.090	0.063	2.00
10	-177.462	-170.6	-10.000	0.063	2.00
12	-295.813	-289.0	-12.002	0.063	2.00
14	-414.121	-407.3	-14.002	0.063	2.00

2. Calibration of pH Meter with Electrode ( Manual Temperature Compensation at 25 °C )

**Equipment:** pH Electrode **Type:** Combined Electrode

**Manufacturer:** HANNA Instruments **Model:** HI11310

**Serial No.:** 330960 **ID No.:** N/A

**Performance of Electrode system** (Three-Point Calibration at pH 4, 7 and 10)

Certified Value (25 °C (pH))	Average Indicator Reading		Relative Slope (%)	Uncertainty (± pH)	Coverage Factor (k)
	pH	mV			
4.008	4.011	173.4	-	0.0043	2.00
7.001	7.004	-1.6	98.8	0.0073	2.00
9.997	10.011	-175.9	96.0	0.0073	2.00
6.865	6.870	6.4	-	0.0049	2.00

F-CS-012 Revision: 01 Date: 20-04-65

## Calibration Report

**Certificate No.:** 2404042-001-01  
**Equipment:** Digital Thermometer with RTD (pH Meter)  
**Resolution:** 0.1 °C  
**Model:** HI2020-02  
**Serial No.:** C0051107  
**ID No.:** UAE WAO.005/2557  
**Manufacturer:** HANNA Instruments

**Date of Calibration:** 21 August 2024 Page 5 of 5

**Calibration point:** 15.0, 20.0 and 25.0 °C

**Calibration result:**

- The probe was immersed in liquid bath or dry bath to a minimum depth of 120 mm.  
- Description of probe, model: HI11310, SN: 539960  
Dimension of probe: Diameter: 12 mm., Length: 120 mm.,  
Sheath material: Glass

UUC* Reading (°C)	Standard Temperature (°C)	Correction Value (°C)	Uncertainty ± (°C)
15.0	14.998	0.0	0.099
20.0	19.999	0.0	0.099
25.0	24.999	0.0	0.099

Note

\* UUC\*: Unit Under Calibration

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

F-CS-012 Revision: 01 Date: 20-04-65

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Mettler-Toledo (Thailand) Ltd.  
84/84 - 84/85 Lavoie Rd., Bangna Tai Sub-District  
Bangna District, Bangkok 10260  
+662 723 0382  
MT-TH.ServiceSupport@mt.com



## Accuracy Calibration Certificate

### Customer

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

### Weighing Device

Manufacturer: Mettler Toledo Instrument Type: Weighing Instrument  
Model: XPE205 Asset Number: UAE.CAL.004/2561  
Serial No.: B748058497 Terminal Model: PEAT  
Building: N/A Terminal Serial No.: B748058497  
Floor: 4 Terminal Asset No.: N/A  
Room: Calibration Laboratory

Range	Max. Capacity	Readability (d)
1	220 g	0.00001 g

### Procedure

Calibration Guideline: EURAMET cg-18 v. 4.0 (11/2015)  
Mettler Toledo Work Instruction: CPW002/20  
This calibration certificate contains measurements for As Found and As Left calibrations.  
The sensitivity/span of the weighing instrument was adjusted before As Found and As Left calibrations with a built-in weight.  
In accordance with EURAMET cg-18 (11/2015), the test loads were selected to reflect the specific use of the weighing device or to accommodate specific calibration conditions.

	Temperature	Humidity
As Found	Start: 22.1 °C End: 22.0 °C	Start: 45.6 % End: 43.4 %
As Left	Start: 21.7 °C End: 22.3 °C	Start: 42.8 % End: 45.8 %

As Found Calibration Date: 20-Sep-2024  
As Left Calibration Date: 20-Sep-2024  
Issue Date: 21-Sep-2024  
Calibrator:   
Thanasong Insawang  
Approved Signatory:   
Surachai P.  
Technical Manager / Head of Calibration Center

### Error of Indication

#### As Found

	Tare Load	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	N/A	0.00000 g	0.00000 g	0.00000 g	0.029 mg	2
2	N/A	10.00001 g	10.00002 g	0.00001 g	0.065 mg	2
3	N/A	29.99998 g	30.00002 g	0.00004 g	0.14 mg	2
4 *	N/A	50.00000 g	50.00010 g	0.00010 g	0.12 mg	2
5 *	50 g	50.00000 g	50.00008 g	0.00008 g	0.12 mg	2
6 *	100 g	50.00000 g	50.00007 g	0.00007 g	0.12 mg	2
7 *	150 g	50.00000 g	50.00013 g	0.00013 g	0.12 mg	2
8 *	N/A	69.99997 g	70.00008 g	0.00011 g	0.20 mg	2
9	N/A	89.99999 g	90.00013 g	0.00014 g	0.27 mg	2
10 *	N/A	100.00006 g	100.00056 g	0.00050 g	0.20 mg	2
11 *	N/A	120.00003 g	120.00054 g	0.00051 g	0.31 mg	2
12 *	N/A	150.00006 g	150.00060 g	0.00054 g	0.31 mg	2
13	N/A	170.00003 g	170.00061 g	0.00058 g	0.38 mg	2
14 *	N/A	200.00025 g	200.00039 g	0.00014 g	0.35 mg	2

#### As Left

	Tare Load	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	N/A	0.00000 g	0.00000 g	0.00000 g	0.017 mg	2
2	N/A	10.00001 g	10.00002 g	0.00001 g	0.061 mg	2
3	N/A	29.99998 g	29.99997 g	-0.00001 g	0.14 mg	2
4 *	N/A	50.00000 g	50.00002 g	0.00002 g	0.12 mg	2
5 *	50 g	50.00000 g	50.00004 g	0.00004 g	0.12 mg	2
6 *	100 g	50.00000 g	50.00005 g	0.00005 g	0.12 mg	2
7 *	150 g	50.00000 g	50.00006 g	0.00006 g	0.12 mg	2
8 *	N/A	69.99997 g	69.99999 g	0.00002 g	0.20 mg	2
9	N/A	89.99999 g	90.00002 g	0.00003 g	0.27 mg	2
10 *	N/A	100.00006 g	100.00006 g	0.00000 g	0.20 mg	2
11 *	N/A	120.00003 g	120.00000 g	-0.00003 g	0.31 mg	2
12 *	N/A	150.00006 g	150.00001 g	-0.00005 g	0.31 mg	2
13	N/A	170.00003 g	170.00002 g	-0.00001 g	0.38 mg	2
14 *	N/A	200.00025 g	200.00027 g	0.00002 g	0.35 mg	2

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

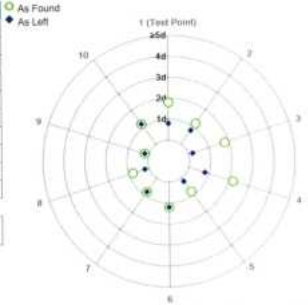
## Measurement Results

### Repeatability

Test Load: 200 g

	As Found	As Left
1	200.00039 g	200.00023 g
2	200.00042 g	200.00023 g
3	200.00039 g	200.00022 g
4	200.00043 g	200.00023 g
5	200.00040 g	200.00022 g
6	200.00042 g	200.00021 g
7	200.00040 g	200.00023 g
8	200.00040 g	200.00022 g
9	200.00041 g	200.00022 g
10	200.00042 g	200.00021 g

Standard Deviation	0.000014 g	0.000008 g
--------------------	------------	------------



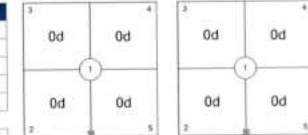
The "n" in the graph represents the repeatability of the range/interval in which the test was performed.  
The results of this graph are based upon the absolute values of the differences from the mean value.

### Eccentricity

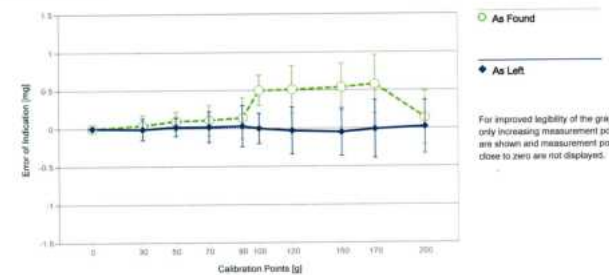
Test Load: 100 g

Position	As Found	As Left
1	0.00000 g	0.00000 g
2	0.00000 g	0.00000 g
3	0.00000 g	0.00000 g
4	0.00000 g	0.00000 g
5	0.00000 g	0.00000 g

Maximum Deviation	0.00000 g	0.00000 g
-------------------	-----------	-----------



The "n" in the graph represents the repeatability of the range/interval in which the test was performed.



The expanded measurement uncertainty is reported as the standard measurement uncertainty multiplied by the coverage factor k such that the coverage probability corresponds to approximately 95 %.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated.  
The results of this calibration relate only to the calibrated item.

### Test Equipment

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

#### Weight Set 1: OIML E2

Weight Set No.: WS01 Date of Issue: 31-May-2024  
Certificate Number: 192393 Calibration Due Date: 30-Nov-2025

#### Weight Set 2: OIML E2

Weight Set No.: WS01-1 Date of Issue: 18-Jun-2024  
Certificate Number: C428425034 Calibration Due Date: 17-Dec-2025

#### Weight Set 3: OIML E2

Weight Set No.: WS01-2 Date of Issue: 12-Feb-2024  
Certificate Number: C408636201 Calibration Due Date: 11-Aug-2025

#### Thermo Hygrometer

Equipment No.: IN278 Date of Issue: 11-Apr-2024  
Certificate Number: SG-H-00410/67 Calibration Due Date: 09-Apr-2025

Remarks

FACT adjustment functionality activated.  
Equipment condition: Good  
Next calibration according to customer's procedure  
Calibration data not decide by calibration laboratory  
Calibration point in order 5, 6, and 7 page 3 of 6 out of accredited Section.

End of Accredited Section

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

Software Version: 1.24.0.306  
Report Version: 2.15.18  
Form Number: F103C

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Attachment to Calibration Certificate:  
TH2084-013-092024-ACC-TH  
GWP® Certificate

METTLER TOLEDO Service

GWP®  
Certificate



As  
Found



As  
Left



The weighing device meets the given  
process requirements.

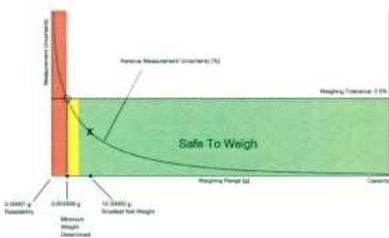
The weighing device meets the given  
process requirements.

Tests Performed: ☒ As Found ☒ As Left

Process Requirements

Weighing Tolerance: 0.5% | Smallest Net Weight: 10.00000 g | Safety Factor: 2

Safe Weighing Range



While the values in this graph reflect the actual calibration results, the measurement uncertainty curves are simply a visual representation. This graph reflects As Left testing, unless only As Found was performed.

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Report Version: 2.15.18  
Form Number: F103C

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Measurement Uncertainty of the Weighing Instrument in Use

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

Temperature coefficient for the evaluation of the measurement uncertainty in use:  $1.0 \cdot 10^{-6} / K$   
Temperature range on site for the evaluation of the measurement uncertainty in use: 3 K

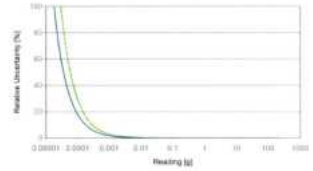
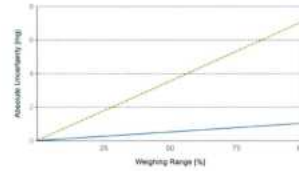
Linearization of Uncertainty Equation

Range			As Found	As Left
	d	Max		
1	0.00001 g	220 g	$U_1 = 0.029 \text{ mg} + 0.0322 \text{ mg/g} \cdot R$	$U_1 = 0.018 \text{ mg} + 0.00469 \text{ mg/g} \cdot R$

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

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

Net Indication	As Found		As Left	
0.00220 g	0.029 mg	1.3%	0.018 mg	0.82%
0.02200 g	0.030 mg	0.14%	0.018 mg	0.082%
0.22000 g	0.036 mg	0.016%	0.019 mg	0.0087%
2.20000 g	0.100 mg	0.0045%	0.028 mg	0.0013%
220.00000 g	7.1 mg	0.0032%	1.0 mg	0.00048%



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Form Number: F103C

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Attachment to Calibration Certificate:  
TH2084-013-092024-ACC-TH  
GWP® Certificate

METTLER TOLEDO Service

Minimum Weight

As Found Minimum Weight Table

Minimum weights for different weighing tolerances and safety factors					
Tolerance	Safety Factor				
	1	2	3	5	10
0.1%	0.030104 g	0.062276 g	0.098738 g	0.173584 g	0.429425 g
0.2%	0.014806 g	0.030104 g	0.045918 g	0.079206 g	0.173584 g
0.5%	0.005865 g	0.011806 g	0.017825 g	0.030104 g	0.062276 g
1%	0.002923 g	0.005865 g	0.008826 g	0.014806 g	0.030104 g
2%	0.001459 g	0.002923 g	0.004392 g	0.007343 g	0.014806 g
5%	0.000583 g	0.001167 g	0.001752 g	0.002923 g	0.005865 g

✓ Pass: The determined minimum weight meets the requirement for the smallest net weight.

As Left Minimum Weight Table

Minimum weights for different weighing tolerances and safety factors					
Tolerance	Safety Factor				
	1	2	3	5	10
0.1%	0.017848 g	0.035684 g	0.054052 g	0.090953 g	0.186382 g
0.2%	0.008903 g	0.017848 g	0.026835 g	0.044937 g	0.090953 g
0.5%	0.003556 g	0.007119 g	0.010688 g	0.017848 g	0.035684 g
1%	0.001777 g	0.003556 g	0.005337 g	0.008903 g	0.017848 g
2%	0.000888 g	0.001777 g	0.002666 g	0.004444 g	0.008903 g
5%	0.000355 g	0.000711 g	0.001066 g	0.001777 g	0.003556 g

✓ Pass: The determined minimum weight meets the requirement for the smallest net weight.

At these net minimum weight values, the measurement uncertainty of the weighing device is equal to or less than 1/1 (no safety factor), 1/2, 1/3, 1/5, or 1/10 of the required tolerance. The values are calculated with  $k=2$  and based on the linear formula of the measurement uncertainty of the weighing device in use.

The safety factor for As Found is always 1. This implies no safety factor. As Found testing looks at the behavior of the instrument from the past until test occurred. For the past, it is necessary to know that the tolerance was met, but not the safety factor. The safety factor is a proactive measure to apply for future measurements.

Notes on minimum weight values in above table:

- If "NA" is shown above, no appropriate value could be calculated.
- METTLER TOLEDO is not responsible for the definition of the process requirements.

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Report Version: 2.15.18  
Form Number: F103C

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## Measurement Results

### Results Summary

	Repeatability	Eccentricity	Error of Indication
As Found	✓	✓	✓
As Left	✓	✓	✓

✓ = Passed  
✗ = Failed  
⚠ = Safety Factor not met

### Repeatability

Test Load: 200 g

Tolerance	Control Limit	As Found		As Left	
		Std. Deviation	Result	Std. Deviation	Result
0.1%	0.005000 g	0.000014 g	✓	0.000008 g	✓
0.2%	0.010000 g		✓		✓
0.5%	0.025000 g		✓		✓
1%	0.050000 g		✓		✓
2%	0.100000 g		✓		✓
5%	0.250000 g		✓		✓

The weighing tolerance is met if the standard deviation is less than or equal to the corresponding control limit.

### Eccentricity

Test Load: 100 g

Tolerance	Control Limit	As Found		As Left	
		Deviation	Result	Deviation	Result
0.1%	0.05000 g	0.00000 g	✓	0.00000 g	✓
0.2%	0.10000 g		✓		✓
0.5%	0.25000 g		✓		✓
1%	0.50000 g		✓		✓
2%	1.00000 g		✓		✓
5%	2.50000 g		✓		✓

The weighing tolerance is met if the deviation is less than or equal to the corresponding control limit.

## Manufacturer Tolerance Assessment

Assessment done without considering measurement uncertainty.

The measurements from the attached calibration certificate were assessed against METTLER TOLEDO tolerances defined in SOP Test and Measurement Procedures for METTLER TOLEDO balances, Document: 10000018502.

	As Found	As Left
Overall	✓	✓
Repeatability	✓	✓
Eccentricity	✓	✓
Linearity	✓	✓
Sensitivity	✓	✓

## Measurement Results

### Repeatability

Test Load: 200 g

	As Found	As Left
1	200.00039 g	200.00023 g
2	200.00042 g	200.00023 g
3	200.00039 g	200.00022 g
4	200.00043 g	200.00023 g
5	200.00040 g	200.00022 g
6	200.00042 g	200.00021 g
7	200.00040 g	200.00023 g
8	200.00040 g	200.00022 g
9	200.00041 g	200.00022 g
10	200.00042 g	200.00021 g
Standard Deviation	0.000014 g	0.000008 g
Tolerance	0.000030 g ✓	0.000030 g ✓

### Error of Indication

As Found

Tare	Reference Value	Error	Control limits for various weighing tolerances					
			0.1%	0.2%	0.5%	1%	2%	5%
N/A	0.00000 g	0.00000 g	N/A	N/A	N/A	N/A	N/A	N/A
N/A	29.99998 g	0.00004 g	0.01500 g	0.03000 g	0.07500 g	0.15000 g	0.30000 g	0.75000 g
N/A	50.00000 g	0.00010 g	0.02500 g	0.05000 g	0.12500 g	0.25000 g	0.50000 g	1.25000 g
50 g	50.00000 g	0.00006 g	0.02500 g	0.05000 g	0.12500 g	0.25000 g	0.50000 g	1.25000 g
100 g	50.00000 g	0.00007 g	0.02500 g	0.05000 g	0.12500 g	0.25000 g	0.50000 g	1.25000 g
150 g	50.00000 g	0.00012 g	0.02500 g	0.05000 g	0.12500 g	0.25000 g	0.50000 g	1.25000 g
N/A	69.99997 g	0.00011 g	0.03500 g	0.07000 g	0.17500 g	0.35000 g	0.70000 g	1.75000 g
N/A	89.99999 g	0.00014 g	0.04500 g	0.09000 g	0.22500 g	0.45000 g	0.90000 g	2.25000 g
N/A	100.00006 g	0.00050 g	0.05000 g	0.10000 g	0.25000 g	0.50000 g	1.00000 g	2.50000 g
N/A	120.00003 g	0.00051 g	0.06000 g	0.12000 g	0.30000 g	0.60000 g	1.20000 g	3.00000 g
N/A	150.00006 g	0.00054 g	0.07500 g	0.15000 g	0.37500 g	0.75000 g	1.50000 g	3.75000 g
N/A	170.00003 g	0.00058 g	0.08500 g	0.17000 g	0.42500 g	0.85000 g	1.70000 g	4.25000 g
N/A	200.00025 g	0.00014 g	0.10000 g	0.20000 g	0.50000 g	1.00000 g	2.00000 g	5.00000 g
Result			✓	✓	✓	✓	✓	✓

As Left

Tare	Reference Value	Error	Control limits for various weighing tolerances					
			0.1%	0.2%	0.5%	1%	2%	5%
N/A	0.00000 g	0.00000 g	N/A	N/A	N/A	N/A	N/A	N/A
N/A	29.99998 g	-0.00001 g	0.01500 g	0.03000 g	0.07500 g	0.15000 g	0.30000 g	0.75000 g
N/A	50.00000 g	0.00002 g	0.02500 g	0.05000 g	0.12500 g	0.25000 g	0.50000 g	1.25000 g
50 g	50.00000 g	0.00004 g	0.02500 g	0.05000 g	0.12500 g	0.25000 g	0.50000 g	1.25000 g
100 g	50.00000 g	0.00005 g	0.02500 g	0.05000 g	0.12500 g	0.25000 g	0.50000 g	1.25000 g
150 g	50.00000 g	0.00006 g	0.02500 g	0.05000 g	0.12500 g	0.25000 g	0.50000 g	1.25000 g
N/A	69.99997 g	0.00002 g	0.03500 g	0.07000 g	0.17500 g	0.35000 g	0.70000 g	1.75000 g
N/A	89.99999 g	0.00003 g	0.04500 g	0.09000 g	0.22500 g	0.45000 g	0.90000 g	2.25000 g
N/A	100.00006 g	0.00000 g	0.05000 g	0.10000 g	0.25000 g	0.50000 g	1.00000 g	2.50000 g
N/A	120.00003 g	-0.00003 g	0.06000 g	0.12000 g	0.30000 g	0.60000 g	1.20000 g	3.00000 g
N/A	150.00006 g	-0.00005 g	0.07500 g	0.15000 g	0.37500 g	0.75000 g	1.50000 g	3.75000 g
N/A	170.00003 g	-0.00001 g	0.08500 g	0.17000 g	0.42500 g	0.85000 g	1.70000 g	4.25000 g
N/A	200.00025 g	0.00002 g	0.10000 g	0.20000 g	0.50000 g	1.00000 g	2.00000 g	5.00000 g
Result			✓	✓	✓	✓	✓	✓

The weighing tolerance is met if the error (of indication) for each test point is less than or equal to the corresponding control limit for that particular weighing tolerance. Results at or close to the zero point cannot be assessed.

### Eccentricity

Test Load: 100 g

Position	As Found	As Left
1	0.00000 g	0.00000 g
2	0.00000 g	0.00000 g
3	0.00000 g	0.00000 g
4	0.00000 g	0.00000 g
5	0.00000 g	0.00000 g
Maximum Deviation	0.00000 g	0.00000 g
Tolerance	0.000200 g ✓	0.000200 g ✓

The maximum deviation is determined as the absolute value of the largest deviation from the center.

### Linearity - Differential Method

As Found

	Preload	Reference Value	Indication	Deviation
4	N/A	50.00000 g	50.00010 g	0.000006 g
5	50 g	50.00000 g	50.00008 g	-0.000005 g
6	100 g	50.00000 g	50.00007 g	-0.000028 g
7	150 g	50.00000 g	50.00012 g	0.000060 g
14*	N/A	200.00025 g	200.00039 g	N/A

Linearity Deviation	0.000028 g
Linearity Tolerance	0.0001 g ✓

Sensitivity Deviation	0.00014 g
Sensitivity Tolerance	0.0005 g ✓

The As Found Sensitivity Tolerance is only valid if the device has been adjusted before the test.

As Left

	Preload	Reference Value	Indication	Deviation
4	N/A	50.00000 g	50.00002 g	-0.000023 g
5	50 g	50.00000 g	50.00004 g	-0.000025 g
6	100 g	50.00000 g	50.00005 g	-0.000018 g
7	150 g	50.00000 g	50.00006 g	0.000000 g
14*	N/A	200.00025 g	200.00027 g	N/A

Linearity Deviation	0.000025 g
Linearity Tolerance	0.0001 g ✓

Sensitivity Deviation	0.00002 g
Sensitivity Tolerance	0.0005 g ✓

The values in column "Deviation" and the "Linearity Deviation" are zero point offset and sensitivity error compensated.

\* This point was used to satisfy the sensitivity requirement.

Preventive Maintenance for Laboratory Balances and  
Halogen Moisture Analyzers

## Customer Identification

Customer Name:	United Analyst and Engineering Consultant Co.,Ltd.		
Address:	3 Soi Udom Suk 41, Sukhumvit Rd., Bang Chak		
City:	Phra Khanong	State/Province:	Bangkok
Zip/Postal:	10260	Contact:	Suwit Chotirok

## Instrument Details

Manufacturer:	Mettler Toledo	Asset No.:	UAE.CAL.004/2981
Model:	XPE205	Alternate Asset No.:	N/A
Serial No.:	B748058497	Terminal Model:	PEAT
Building:	N/A	Terminal Serial No.:	B748058497
Floor:	4	Terminal Asset No.:	N/A
Room:	Calibration Laboratory	Customer Equip No.:	N/A
Instrument Type:	Single Range		

## Procedure

Preventive Maintenance on this device is performed following the corresponding METTLER TOLEDO Work instruction.

Service Date:	20-Sep-2024	Service Technician:	Thanyong Insaewang
Next Service Date:	20-Sep-2025		
Date of Report Creation:	20-Sep-2024		

## Instrument Settings

## Software Version

Software	Version
System SW Version	1.10 / 2.21

## Adjustment Settings

Parameters	Setting
Adjustment Strategy	Internal
Trigger	Temp & Time
Schedule	Daily

## Weighing Influencing Factors

Parameters	Level of Influence (High/Low/None)
Static Electricity	Low
Magnetism	None
Air Drafts	Low
Vibrations	Low
Heating Sources (e.g. Direct Sunlight)	None
Temperature Fluctuations	None

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มูลนิธิสถาบันพัฒนาอุตสาหกรรมอาหาร  
ศูนย์บริการห้องปฏิบัติการอุตสาหกรรมอาหาร  
Foundation for Industrial Development National Food Institute  
Food Industrial Laboratory Service Center

## Calibration Certificate

Certificate No.: 2500116-001-01  
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.  
Address: 3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchack, Prakhonong, Bangkok 10260

Page 1 of 3

Equipment: CHAMBER (Hot Air Oven)

Manufacturer: MEMMERT

Model: UF55

Serial No.: 8216.1666

ID No.: UAE.WAO.027/2559

Order No.: 2500116

Operation No.: 2500116-001

Date of Receipt: 8 October 2024

Date of Calibration: 8 October 2024

Calibrated by Mr.Yothin Charoensuk  
ScientistApproved by ( Mr.Pheraphat Tuanjit )  
Manager, Division of Calibration Laboratory  
Responsible for the Technical Management Team

Date of Issue: 15 October 2024

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

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

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## Cleaning

Task	Result
The instrument has been cleaned	Done

## Visual Checks

Test	Result
Check housing	Pass
Check display	Pass
Check draft shield (if existing)	Pass
Check draft shield doors (if existing)	Pass
Check weighing pan	Pass
Check leveling	Pass
Check protective cover	Pass
Check AC power adapter	Pass
Check connectors and data cables	Pass
Check for correct fit and connection of accessories	Pass
Internal inspection (if required)	N/A

## Functional Tests

Test	Result
Perform startup of instrument	Pass
Perform touch screen test	Pass
Perform display test	Pass
Test draft shield motor movement (if existing)	Pass
Perform internal adjustment	Pass
Perform sensitivity test	Pass
Perform peripheral connectivity and function test	Pass
Perform SmartCal Test (only for Moisture Analyzers)	N/A
Perform Temperature Test (only for Moisture Analyzers)	N/A
Perform lid movement test (only for Moisture Analyzers)	N/A
Battery check	Pass
Check Date and Time	Pass

This document is issued to record completion of the work performed by METTLER TOLEDO on the subject device in accordance with agreed standards. It does not guarantee the continued performance of the subject device. Any measurements recorded are based on the subject device's performance at a given time as tested by METTLER TOLEDO and, except where explicitly stated otherwise, do not express an opinion as to the sufficiency of any customer designed procedures used to test the device. This document is not a warranty, either implied or express. METTLER TOLEDO expressly disclaims any liability arising from the use of the information in this document for any purpose other than as specified herein.

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มูลนิธิสถาบันพัฒนาอุตสาหกรรมอาหาร  
ศูนย์บริการห้องปฏิบัติการอุตสาหกรรมอาหาร  
Foundation for Industrial Development National Food Institute  
Food Industrial Laboratory Service Center

## Calibration Report

Certificate No.: 2500116-001-01  
Equipment: CHAMBER (Hot Air Oven)  
Model: UF55 Serial No.: 8216.1666  
Resolution: 0.1 °C ID No.: UAE.WAO.027/2559  
Manufacturer: MEMMERT

Date of Calibration: 8 October 2024

Page 2 of 3

Location: Laboratory, UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.  
Environment Condition: Ambient Temperature ( 30.3 ± 1 ) °C  
Relative Humidity ( 55 ± 1 ) %  
Line Voltage ( 230 ± 3 ) Volt

## Condition of this results of Calibration:

- This instrument was calibrated by insert 9 standard thermometer into its chamber and calibration according to W-TE-014 Based on TLAS G-20-1/02-08 (E): Guidelines for Calibration and Checks of Temperature Controlled Enclosures.
  - The temperature scale used was based on ITS - 90.
  - All data show below were final values and the initial data may be obtained upon request.
- Reference Standard Instrument :

Instrument	Model	Serial No./ID No.	Certificate No.	Due Date	Through
Digital Thermometer with sensor	34972A	MY57003188	TE 670486-01	8 June 2025	NATIONAL FOOD INSTITUTE
	RTD	CH#201-209/ RTD#201-209			

- This certificate is traceable to International System of Units (SI Units).
- This certificate was certified only for the instrument we calibrated.
- This result of calibration was found accurate as shown on date and place of calibration only.
- Condition of Calibrated item : Good

## UUC Description :

Time of Record	1 Hour	9 Minute	At	104.0, 140.0 and 180.0 °C
Fresh air Damper	Open	Position	-	
	X Close	Fan	40%	
	-	Not Available		

- Result of Calibration : ☒ Without adjustment ☐ After adjustment

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## Calibration Report

**Certificate No.:** 2500116-001-01  
**Equipment:** CHAMBER (Hot Air Oven)  
**Model:** UF55 **Serial No.:** B216.1666  
**Resolution:** 0.1 °C **ID No.:** UAE.WAO.027/2559  
**Manufacturer:** MEMMERT

**Date of Calibration:** 8 October 2024  
**Calibration point:** 104.0, 140.0 and 180.0 °C

Calibration Condition	Temperature (°C)	Relative Humidity (%)	Line Voltage (Volt)
MIN	29.3	54	227.0
MAX	31.2	56	232.0

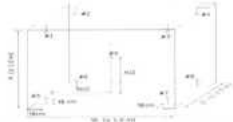


Table 1 : Reporting of Temperature

Calibration point (°C)	Measured Temperature (°C) @ Sensor No. (Sensor No.9 is REF)									Uncertainty ± (°C)
	# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	# 9	
104.0	103.89	103.66	103.88	103.89	104.40	103.98	103.70	104.10	104.15	0.53
140.0	139.85	139.53	139.87	139.88	140.67	140.00	139.60	140.25	140.23	0.73
180.0	179.63	179.22	179.71	179.76	181.03	180.06	179.41	180.87	180.39	0.90

Table 2 : Reporting of Characterization Result

UUC* Setting (°C)	UUC* Reading (°C)			Stability ± (°C)	Uniformity (°C)	Overall Variation (°C)
	MIN	MAX	Average			
104.0	104.0	104.0	104.0	0.15	0.49	0.88
140.0	140.0	140.0	140.0	0.13	0.71	1.2
180.0	180.0	180.0	180.0	0.13	1.2	1.9

**Note:** The quoted uncertainty include " Stability " and " Loading effect (20% of Temp Uniformity) "

UUC\* = Unit Under Calibration

Stability = One-half of the greatest maximum difference of measured temperatures at any one sensors, for at least half an hour after reaching steady state.

Uniformity = The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time.

Overall Variation = The difference of the maximum and minimum measured temperatures throughout observation time.

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

----- End -----

FC-5012 Revision: 01 Date: 20-04-63

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## Certificate of Calibration

**Cert. No.:** 24TM1113  
**Page:** 1 of 3

**Equipment:** BOD Incubator  
**Manufacturer:** ARCO  
**Model:** UC4-1320  
**Serial No.:** -  
**ID No.:** UAE.WAO.002/2550  
**Submitted by:** United Analyst and Engineering Consultant Co.,Ltd.  
3 Sol Udomsuk 41, Sukhumvit Road,  
Bangchak, Phrakhanong,  
Bangkok 10260  
**Location:** Lab Floor 2  
**Received Order:** 11 July 2024  
**Calibration Date:** 11 July 2024  
**Ambient Temperature:** ( 26 ± 10 ) °C  
**Relative Humidity:** ( 50 ± 30 ) %  
**Calibrated by:** Tawatchai Pama  
**Approved by:**   
( ) Ponpan Palpim  
(✓) Suwit Imjai  
( ) Kunchit Promprat

**Issue Date:** 14 July 2024

The Uncertainties are for a confidence probability of approximately 95%

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**Equipment:** BOD Incubator  
**Condition As-Received:** Used Item  
**Reference:** 2407-0243OC-1

**Cert. No.:** 24TM1113  
**Page:** 2 of 3

### Procedure Used :-

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

### Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1 ) Data Acquisition	MY49023932	23LM122	TPA	26 Jul 2024

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

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

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

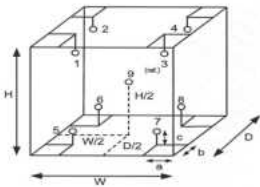
**Result of Calibration :-** ( \* ) Without Adjustment

**Function of UUC\* :** Temperature Source

**Fresh air setting :** Not Available

Environment during calibration	
	Beginning
Temp. ( °C )	29
REL.Humid. ( % )	78
AC Supply ( Volt )	233

Position :	Ref. Std. ID No.:
1	19-16RTD-01
2	19-16RTD-02
3	19-16RTD-03
4	19-16RTD-04
5	19-16RTD-05
6	19-16RTD-06
7	21-16RTD-07
8	19-16RTD-08
9 (ref.)	19-16RTD-09



### Probe Installation Details :

**Dimension of Chamber :**  
a = 10 cm  
b = 10 cm  
c = 10 cm  
D = 0.62 m  
W = 1.2 m  
H = 1.2 m  
Capacity = 0.89 m³



**Equipment:** BOD Incubator  
**Condition As-Received:** Used Item  
**Reference:** 2407-0243OC-1  
**Result of Calibration :-** ( \* ) Without Adjustment  
**Function of UUC\* :** Temperature Source  
**Fresh air setting :** Not Available

**Cert. No.:** 24TM1113  
**Page:** 3 of 3

Calibration Point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Temperature stability ( ± °C )	Temperature uniformity ( °C )	Overall Variation ( °C )	Coverage Factor k
20.0	20.0	19.8	0.55	0.66	1.5	2

Calibration Point ( °C )	Measured Temperature ( °C )									Uncertainty ( ± °C )
	Position									
20.0	1	2	3	4	5	6	7	8	9 (ref.)	
	20.210	20.331	20.162	19.645	20.287	20.070	19.838	19.781	19.954	0.79

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

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

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

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

**UUC\* :** Unit Under Calibration

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

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

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เอกสารไม่ควบคุม





## Certificate of Calibration

Cert. No.: 24TM1016/1  
Page : 1 of 3

This Certificate was issued to replace to the Certificate No. 24TM1016

Equipment : Water Bath

Manufacturer : Memmert

Model : WNB 14

Serial No. : L407.0756

ID No. : UAE.MIC.024/2550

Submitted by : United Analyst and Engineering Consultant Co.,Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Phrakhanong,  
Bangkok 10260

Location : Microbiology Laboratory

Received Order : 09 July 2024

Calibration Date : 09 - 10 July 2024

Ambient Temperature : ( 26 ± 10 ) °C

Relative Humidity : ( 50 ± 30 ) %

Calibrated by : Preecha Hlahib

Approved by :

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

Issue Date : 5 August 2024

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

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Equipment : Water Bath  
Condition As-Received : Used Item  
Reference : 2407-0153OC-6  
Procedure Used :-

Cert. No.: 24TM1016/1  
Page : 2 of 3

Calibration were conducted using in-house calibration procedure CP-OT04 Based on ASTM E715 according to direct measurement method with Data Acquisition which connected with Industrial Platinum Resistance Thermometer ( IPRT ).

The temperature scale used was based on ITS-90.

### Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1 ) Data Acquisition	MY59003411	23LM208	TPA	27 Dec 2024

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

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

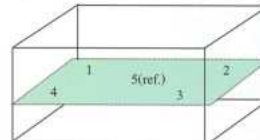
Remark : TPA : Technology Promotion Association ( Thailand - Japan )

Result of Calibration :- ( \* ) Without Adjustment

Function of UUC\* : Temperature Source

Heat transfer medium used : Water

	Environmental		AC Voltage Supply
	( °C )	( %R.H. )	( Volt )
Beginning of Calibration	26	67	221
Finished of Calibration	27	66	222



Front

Position :	Ref. Std. ID No.:
1	4804539-001
2	4804539-002
3	4804539-003
4	4804539-004
5(ref.)	4804539-005

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Equipment : Water Bath  
Condition As-Received : Used Item  
Reference : 2407-0153OC-6  
Result of Calibration :- ( \* ) Without Adjustment  
Function of UUC\* : Temperature Source

Cert. No.: 24TM1016/1  
Page : 3 of 3

Calibration point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Average* Standard Reading ( °C )					Uncertainty ( ± °C )
			1	2	3	4	5 (ref.)	
41.0	41.8	41.8	41.004	40.968	41.027	40.988	41.000	0.15
44.5	45.2	45.2	44.498	44.461	44.468	44.449	44.496	0.15
45.0	45.7	45.7	44.909	44.927	44.931	44.914	44.980	0.15

Calibration point ( °C )	Uniformity ( °C )	Stability ( ± °C )	Coverage Factor k
41.0	0.085	0.041	2
44.5	0.089	0.038	2
45.0	0.095	0.036	2

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

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

Stability : One-half of the greatest maximum difference of measured temperature at any one probe.

UUC\* : Unit Under Calibration

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

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

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ศูนย์บริการและพัฒนาคุณภาพอาหาร  
ศูนย์บริการและพัฒนาคุณภาพอาหาร  
Foundation for Industrial Development National Food Institute  
Food Industrial Laboratory Service Center



## Calibration Certificate

Certificate No.: 2403982-001-01  
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.  
Address: 3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Prakhnong, Bangkok 10260

Page 1 of 3

Equipment: Autoclave  
Manufacturer: ALP  
Model: CL-40L  
Serial No.: 807298  
ID No.: UAE.MIC.019/2560  
Order No.: 2403982  
Operation No.: 2403982-001  
Date of Receipt: 7 August 2024  
Date of Calibration: 7 August 2024

Calibrated by

Mr.Manas Somsak  
Specialist

Approved by

( Miss Preeyaporn Jaengarnkit )

Vice President, Department of Laboratory Services  
Responsible for the Technical Management Team

Date of Issue: 14 August 2024

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

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

F-CS-009 Revision: 01 Date: 20-04-65

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## Calibration Report

**Certificate No.:** 2403982-003-01  
**Equipment:** CHAMBER (Incubator)  
Model: BD 53 Serial No.: 13-07343  
Resolution: 0.1 °C ID No.: UAE.MIC.005/2558  
Manufacturer: BINDER  
**Date of Calibration:** 7 August 2024

Page 2 of 3

**Location:** MICROBIOLOGY LABORATORY (302), UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.  
**Environment Condition:** Ambient Temperature ( 24.8 ± 1 ) °C  
Relative Humidity ( 55 ± 5 ) %  
Line Voltage ( 230 ± 3 ) Volt

### Condition of this results of Calibration:

- This instrument was calibrated by insert 9 standard thermometer into its chamber and calibration according to W-TE-014 Based on TLAS G-20-1/02-08 (E); Guidelines for Calibration and Checks of Temperature Controlled Enclosures.
  - The temperature scale used was based on ITS - 90.
  - All data show below were final values and the initial data may be obtained upon request.

### 2. Reference Standard Instrument :

Instrument	Model	Serial No./ID No.	Certificate No.	Due Date	Through
Digital Thermometer with sensor	34972A	MY59002902	TE 670478-01	4 May 2025	NATIONAL FOOD INSTITUTE
	RTD	CHP201-209/ RTD#201-209			

- This certificate is traceable to International System of Units (SI Units).
- This certificate was certified only for the instrument we calibrated.
- This result of calibration was found accurate as shown on date and place of calibration only.
- Condition of Calibrated item : Good

### UUC Description :

Time of Record 1 Hour 9 Minute At 44.0 °C  
Fresh air Damper - Open Position -  
X Close Fan -  
- Not Available

- Result of Calibration : ☐ Without adjustment ☒ After adjustment

F-CS-012 Revision: 01 Date: 20-04-65

2008 ถนนพหลโยธิน แขวงสามยุค เขตปทุมธานี กรุงเทพมหานคร 10700  
2008 Soi 36, Asoh Asoh Road, Bang Yi Khan Subdistrict, Bang Phut District, Bangkok 10700, Thailand  
Tel: +66(0) 2460 6666 Fax: +66(0) 2460 6666

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nfi.com

## Calibration Report

**Certificate No.:** 2403982-003-01  
**Equipment:** CHAMBER (Incubator)  
Model: BD 53 Serial No.: 13-07343  
Resolution: 0.1 °C ID No.: UAE.MIC.005/2558  
Manufacturer: BINDER  
**Date of Calibration:** 7 August 2024

Page 3 of 3

**Calibration point:** 44.0 °C

### Calibration result:

Calibration Condition	Temperature (°C)	Relative Humidity (%)	Line Voltage (Volt)
MIN	24.8	50	227.0
MAX	24.9	60	232.0

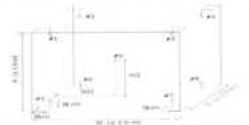


Table1 : Reporting of Temperature

Calibration point (°C)	Measured Temperature (°C) @ Sensor No. (Sensor No.9 is REF)									Uncertainty ± (°C)
	# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	# 9	
44.0	44.24	44.33	44.30	44.46	43.42	43.51	43.40	43.53	43.97	0.30

Table 2 : Reporting of Characterization Result

UUC* Setting (°C)	UUC* Reading (°C)			Stability ± (°C)	Uniformity (°C)	Overall Variation (°C)
	MIN	MAX	Average			
44.0	44.0	44.0	44.0	0.083	0.57	1.2

**Note** The quoted uncertainty include " Stability " and " Loading effect (20% of Temp Uniformity) "

UUC\* = Unit Under Calibration

Stability = One-half of the greatest maximum difference of measured temperatures at any one sensors, for at least half an hour after reaching steady state.

Uniformity = The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time.

Overall Variation = The difference of the maximum and minimum measured temperatures throughout observation time.

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

----- End -----

F-CS-012 Revision: 01 Date: 20-04-65

2008 ถนนพหลโยธิน แขวงสามยุค เขตปทุมธานี กรุงเทพมหานคร 10700  
2008 Soi 36, Asoh Asoh Road, Bang Yi Khan Subdistrict, Bang Phut District, Bangkok 10700, Thailand  
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