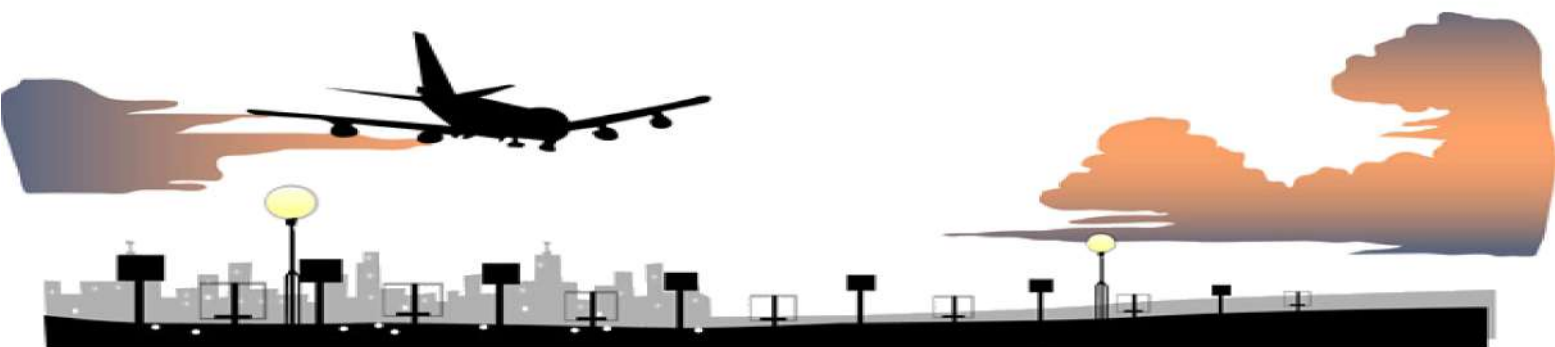


ภาคผนวก ข

สำเนาหนังสือขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์





ที่ อก ๐๓๑๐(๑)/ ๑๘๗ ๕

กรมโรงงานอุตสาหกรรม
ถนนพหลโยธิน ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๑๐๐

๐ ๕ กุมภาพันธ์ ๒๕๖๕

เรื่อง ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท ยูไนเต็ด แอนนาลิสต์ แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารเคมีของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๒๗ ธันวาคม ๒๕๖๔

- สิ่งที่ส่งมาด้วย ๑. รายชื่อผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๔๐ ราย
๒. รายชื่อเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๐๖ ราย
๓. ขอบข่ายสารเคมีที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม

ตามหนังสือที่อ้างถึง บริษัท ยูไนเต็ด แอนนาลิสต์ แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด
ขอต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ๖-๑๕๕ สดง.ที่ดังเลขที่ ๓
ขออายุคุมสุฯ ๔๑ ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท ยูไนเต็ด แอนนาลิสต์ แอนด์ เอ็นจิเนียริง
คอนซัลแตนท์ จำกัด ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน โดยมีองค์ประกอบดังนี้

- ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๔๐ ราย ตามสิ่งที่ส่งมาด้วย ๑
ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๐๖ ราย ตามสิ่งที่ส่งมาด้วย ๒
ค. ขอบข่ายสารเคมีที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย น้ำใต้ดิน อากาศเสีย สิ่งปฏิกูล
หรือวัสดุที่ไม่ใช้แล้ว และดิน ตามสิ่งที่ส่งมาด้วย ๓

หนังสือฉบับนี้จะหมดอายุในวันที่ ๒ กุมภาพันธ์ ๒๕๖๘ หากประสงค์จะต่ออายุหนังสือ
รับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอต่อ
กรมโรงงานอุตสาหกรรมภายใน ๓๐ วัน ก่อนวันสิ้นอายุของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
ทั้งนี้ สามารถยื่นคำขอผ่านระบบอิเล็กทรอนิกส์ได้ทั้งหน้าเว็บไซต์กรมโรงงานอุตสาหกรรม ตาม QR Code ท้าย
หนังสือฉบับนี้

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นางจินดา เศษศรีนทร์)

ผู้อำนวยการกองวิจัยและเฝ้าระวังมลพิษทางอากาศ
ปฎิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

เป็นคำขอผ่านระบบอิเล็กทรอนิกส์



กองวิจัยและเฝ้าระวังมลพิษทางอากาศ

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๔๓๐ ๖๓๒๒ ต่อ ๒๑๐๓-๕

โทรสาร ๐ ๒๔๓๐ ๖๓๒๒ ต่อ ๒๑๕๕

ไปรษณีย์อิเล็กทรอนิกส์ saraban@dlw.go.th

สิ่งที่ส่งมาด้วย ๑

เอกสารแนบท้ายหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท ยูไนเต็ด แอนนาลิสต์ แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด เลขทะเบียน ๖-๑๕๕

ที่ อก ๐๓๑๐(๑)/ ๑๘๗ ๕

ลงวันที่ ๐ ๕ กุมภาพันธ์ ๒๕๖๕

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๔๐ ราย

- ๑) นางสาวกฤษวรรณ ภักดิ์วิรุณกุล
- ๒) นายณรงค์ ชินพาสี
- ๓) นางสาวนันทิศา บุญไชย
- ๔) นางปิยะพัชร สุพรรณสิริวงษ์
- ๕) นามานิดา แฉ่มโย
- ๖) นางสาวเบญจวรรณ ตรีชัย
- ๗) นายพนรัตน์ วงศ์อนุรักษชัย
- ๘) นางสาววิวรรณ บุญลา
- ๙) นายสุวิทย์ จอดนอก
- ๑๐) นางสาวโชติศา สมบรณ์
- ๑๑) นางสาวบุษกร เลิศกาญจนา
- ๑๒) นางสาววิไลลักษณ์ ศรีสุข
- ๑๓) นางสาวปวีณา จรัสโชติพิพัฒน์
- ๑๔) นายศิลา บรรจงใจรักษ์
- ๑๕) นายปฏิกรณ์ คณะนา
- ๑๖) นายธีรวัฒน์ ชนมิ่ง
- ๑๗) นางสาวศิริพร ศรีประดิษฐ์
- ๑๘) นางสาวสิริวิริ วรวิง
- ๑๙) นางสาวนพวรรณ วรารักษ์
- ๒๐) นายภูษณ์ พานิชย์เลิศอาภา
- ๒๑) นายณัฐวัฒน์ แฉ่งสวัสดิ์
- ๒๒) นายอภิรัตน์ ปะคะนันท์
- ๒๓) นางสาวนิศากรรัตน์ ศรีสุภาสัทธิต
- ๒๔) นางสาวดวงจันทร์ ทาสะอาด
- ๒๕) นางสาวสุวรรณ คงทอง
- ๒๖) นางสาววรากร พัดทองชื่น
- ๒๗) นายวิรัช ไม้แก้ว
- ๒๘) นายวีรพงษ์ เทพอนันต์
- ๒๙) นายอนุศาสน์ สายดี
- ๓๐) นายกรวิทย์ เชื้อศิริกุล
- ๓๑) นางสาวอริกา รังสวัณ
- ๓๒) นางสาวนภัสสร คงคำ
- ๓๓) นายสุวิทย์ อนุจันทร์
- ๓๔) นางสาวทัศนีย์ อ่อนคำ
- ๓๕) นางสาวพริ้มพรรณ สมบูรณ์

- ทะเบียนเลขที่ ๖-๑๕๕-๕-๐๐๐๑
ทะเบียนเลขที่ ๖-๑๕๕-๕-๐๐๐๒
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(นางจินดา เศษศรีนทร์)

ผู้อำนวยการกองวิจัยและเฝ้าระวังมลพิษทางอากาศ
ปฎิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

๓๖) นายสุกัญ...

สิ่งที่ส่งมาด้วย ๒

เอกสารแนบท้ายหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท ยูไนเต็ด แอนนาลิสต์ แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด เลขทะเบียน ๖-๑๕๕

ที่ อก ๐๓๑๐(๑)/ ๑๘๗ ๕

ลงวันที่ ๐ ๕ กุมภาพันธ์ ๒๕๖๕

ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๐๖ ราย

- ๑) นายสุกัญ...
- ๒) นางสาว...
- ๓) นางสาว...
- ๔) นางสาว...
- ๕) นาย...
- ๖) นางสาว...
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- ๑๓) นาย...
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- ๑๕) นางสาว...
- ๑๖) นาย...
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- ๑๘) นาย...
- ๑๙) นาย...
- ๒๐) นางสาว...
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- ๓๔) นาย...
- ๓๕) นาย...

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(นางจินดา เศษศรีนทร์)

ผู้อำนวยการกองวิจัยและเฝ้าระวังมลพิษทางอากาศ
ปฎิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

๓๖) นายสนธิ...

๓๖) นายณาสลินธุ์ อู่ธรรมรัตน์
๓๗) นายกันนิกร ระโล
๓๘) นายจักรพันธ์ กุมารินทร์
๓๙) นายปริญญาก กลมเกลียว
๔๐) นายธีรวัจน์ มาตรโพธิ์ศรี
๔๑) นายธีรเมธ สุขศรี
๔๒) นายบุญญฤทธิ์ ก้อนสิน
๔๓) นายพรชภูมิ ไวกุล
๔๔) นายอชิตะ แสงจันทร์
๔๕) นายณัฐพงศ์ เมืองชัย
๔๖) นายธนัท เลิศประเสริฐ
๔๗) นางสาวนิภาพร จันทร์เขตต์
๔๘) นายพุทธพงษ์ อัสระสุข
๔๙) นายธนาภพ กุศลกุลพัฒนา
๕๐) นางสาวศิริวรรณ ขอนพา
๕๑) นายสมวงศ์ สกุลไทย
๕๒) นายสุวิทย์ นิธิจิตวงศ์
๕๓) นายธีรภาณุ ยืนศรี
๕๔) นายเอกภูมิ เสนอใจ
๕๕) นายสุสันต์ บุญเสียง
๕๖) นายอนเดช ทวามสนา
๕๗) นายพิพัฒน์ ดันธกุล
๕๘) นายอภิสิทธิ์ ศรีคงแก้ว
๕๙) นายภูวดล มงคลสูง
๖๐) นายอภัย แก้วรามูข
๖๑) นางสาววันวิมล สานนท์
๖๒) นายศุภกร ชินวงศ์
๖๓) นายศักดิ์สิทธิ์ เกติขัง
๖๔) นางสาวจิตพร อภิรัตน์
๖๕) นางสาวจิตกมล เปลี่ยนศรี
๖๖) นางสาวเนตรนภา กุลสุรัตน์
๖๗) นางสาวอารียา พรมรัมย์
๖๘) นายจิรวัฒน์ สุขเกษม
๖๙) นายกิตติพงษ์ สอนชัยภูมิ
๗๐) นายณพล สวันเพชร
๗๑) นางสาวพัชราภรณ์ แสงฟ้า
๗๒) นายรัตนชัย เหล่ามา

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(นางจินดา เดชะรินทร์)

ผู้อำนวยการทั่วไปและเลขาธิการสำนักงาน
ปฏิบัติการกรมส่งเสริมการเกษตร

๗๓) นายอิทธิพงษ์...

๗๓) นายอิทธิพงษ์ ศรีเดช
๗๔) นางสาวกรรณิการ์ ลำสีทา
๗๕) นายธนาพรณ์ คิมศิริ
๗๖) นายพรชัย คุ่มม่วง
๗๗) นางสาวพัชณีย์ ไชยหา
๗๘) นายอิทธิพงษ์ ศรีคำแหง
๗๙) นางสาวณัฐชา พรหมศิริ
๘๐) นางสาวลัดดาวัลย์ โพธิ์พันธ์
๘๑) นางสาวกมลวรรณ เจริญจันทร์
๘๒) นายณัฏฐ์ จันทร์คุณ
๘๓) นายปิยวัฒน์ ไหมชู
๘๔) นางสาวพนัสชา กลิ่นจุน
๘๕) นายณัฏฐ์ ศรีพิทักษ์
๘๖) นางสาวลลิตา จันทสุข
๘๗) นายสงกรานต์ มาลีทอง
๘๘) นางสาวสาลิดา แซ่เดียว
๘๙) นายศักดิ์ดนัย นุ่มน้อม
๙๐) นายวราพงษ์ นนทจันทร์
๙๑) นางสาวนภา มาคมมาตร
๙๒) นางสาววรรณศรี คุณาบุญมีชัย
๙๓) นายวิระยุทธ สารภักดิ์
๙๔) นางสาวอติยา วีระพันธ์วิวัฒน์
๙๕) นายอภินันท์ พงศ์สอาด
๙๖) นายณัฏฐ์ พรหมอารักษ์
๙๗) นายชินนท์ พานแก้ว
๙๘) นายปรีชาพล โสภ
๙๙) นายวิวัฒน์ แสนงาม
๑๐๐) นางสาวนภรณ์ ลาภม
๑๐๑) นายอาทิตย์ รุณผล
๑๐๒) นายปรกร บุญนา
๑๐๓) นายอิทธิพงษ์ ใจบุญ
๑๐๔) นายคณิน พงษ์ศิริกร
๑๐๕) นางสาวสุภาวรัตน์ จันทร์ประทีป
๑๐๖) นายเสกสรรค์ เอกกลิ่นบัว

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ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๗๒

(นางจินดา เดชะรินทร์)

ผู้อำนวยการทั่วไปและเลขาธิการสำนักงาน
ปฏิบัติการกรมส่งเสริมการเกษตร

เอกสารแนบท้ายหนังสือรับข้อหาผู้ขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท ยูนิค แอนาไลติกส์ แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด เลขทะเบียน ๖-๑๕๕-
ที่ ๑๐๓๑๐(๑)/ ๑๕๗ ๕ ลงวันที่ ๑๕ กุมภาพันธ์ ๒๕๖๕

ขอขยายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๓๕๗ รายการ

รายชื่อ จำนวน 46 รายการ

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

สิ่งที่ส่งมาด้วย ๓:

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

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
36	Oil & Grease	1) Liquid-Liquid, Partition-Gravimetric Method ⁽⁴⁾ 2) Soxhlet Extraction Method ⁽⁴⁾
37	pH	Electrometric Method ⁽⁴⁾
38	Phenols	1) Distillation, Chloroform Extraction Method ⁽⁴⁾ 2) Distillation, Direct Photometric Method ⁽⁴⁾
39	Selenium	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
40	Sulfide	1) Iodometric Method ⁽⁴⁾ 2) Methylene Blue Method ⁽⁴⁾
41	Temperature	Laboratory and Field Methods ⁽⁴⁾
42	Total Dissolved Solids	Dried at 180 °C ⁽⁴⁾
43	Total Kjeldahl Nitrogen	Semi-Micro-Kjeldahl Method ⁽⁴⁾
44	Total Suspended Solids	Dried at 103-105 °C ⁽⁴⁾
45	Trivalent Chromium	1) Digestion, Direct Air-Acetylene Flame Method; Colorimetric Method; Calculation ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation ⁽⁴⁾
46	Zinc	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾ 3) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾

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

4 Anthracene...

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

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

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

30 Chlorodibromomethane...

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

42 Dibenz(a,h)anthracene...

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

58 Diethyl phthalate...

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

70 Heptachlor epoxide...

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

82 Manganese...

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

96 Polychlorinated Biphenyls...

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

108 Toxaphene...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
108	Toxaphene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
109	TPH (C ₅ - C ₈)	1) Purge and Trap, Gas Chromatographic Method ^[11,21] 2) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[11,23]
110	TPH (C ₉ - C ₁₆)	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^[9,21]
111	TPH (C ₁₇ - C ₃₃)	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^[9,21]
112	1,2,4-Trichlorobenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[4]
113	1,1,1-Trichloroethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[4]
114	1,1,2-Trichloroethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[4]
115	Trichloroethylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[4]
116	2,4,5-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
117	2,4,6-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
118	1,3,5-Trimethylbenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[4]
119	Vanadium	Digestion, Inductively Coupled Plasma Method ^[4]
120	Vinyl acetate	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[4]
121	Vinyl chloride	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[4]
122	m-Xylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[4]
123	o-Xylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[4]

124 p-Xylene...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
124	p-Xylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[4]
125	Xylene (Total)	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[4]
126	Zinc	1) Digestion, Direct Air-Acetylene Flame Method ^[4] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^[4] 3) Digestion, Inductively Coupled Plasma Method ^[4]

จากภาคเสีย (ปล่องระบาย) จำนวน 25 รายการ

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

10 Dioxins/Furans...

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

สิ่งปนเปื้อน...

สิ่งปลูกหรือวัสดุที่ไม่ใช้แล้ว จำนวน 35 รายการ

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

3) Digestion,...

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

15 DDE,...

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

3) Digestion,...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
23	Methoxychlor	3) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽¹⁸⁾ 4) Digestion, Inductively Coupled Plasma Method ^(7,13) 5) Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method ⁽¹⁹⁾ 1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,9,22) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)
24	Molybdenum	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,13) 2) Digestion, Inductively Coupled Plasma Method ^(7,13)
25	Nickel	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(2,6,14) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,13) 3) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 4) Digestion, Inductively Coupled Plasma Method ^(7,13)
26	Polychlorinated Biphenyls - Aroclor 1016 - Aroclor 1221 - Aroclor 1232 - Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1260 - 2-Chlorobiphenyl - 2,3-Dichlorobiphenyl - 2,2',5-Trichlorobiphenyl - 2,4',5-Trichlorobiphenyl - 2,2',3,5'-Tetrachlorobiphenyl - 2,2',5,5'-Tetrachlorobiphenyl - 2,3',4,4'-Tetrachlorobiphenyl - 2,2',3,4,5'-Pentachlorobiphenyl	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,9,22) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)

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

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

30 Silver...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
30	Silver	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,13) 2) Digestion, Inductively Coupled Plasma Method ^(7,13)
31	Thallium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,13) 2) Digestion, Inductively Coupled Plasma Method ^(7,13)
32	Toxaphene	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,9,22) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)
33	Trichloroethylene	1) Waste Extraction, Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(2,12,25) 2) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
34	Vanadium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,13) 2) Digestion, Inductively Coupled Plasma Method ^(7,13)
35	Zinc	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(2,6,14) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,6,13) 3) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 4) Digestion, Inductively Coupled Plasma Method ^(7,13)

คืน จำนวน 125 รายการ

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,26) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
2	Acetone	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)

3 Aldrin...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
3	Aldrin	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
4	Anthracene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,26) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
5	Antimony	Digestion, Inductively Coupled Plasma Method ^(7,13)
6	Arsenic	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(7,15) 2) Digestion, Inductively Coupled Plasma Method ^(7,13)
7	Atrazine	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
8	Barium	Digestion, Inductively Coupled Plasma Method ^(7,13)
9	Benz(a)anthracene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,26) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
10	Benzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
11	Benzo(b)fluoranthene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,26) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
12	Benzo(k)fluoranthene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,26) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
13	Benzoic acid	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
14	Benzo(a)pyrene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,26) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)

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

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

31 Chloroform...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
31	Chloroform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
32	2-Chlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
33	Chromium	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 2) Digestion, Inductively Coupled Plasma Method ^(7,13)
34	Chromium (III)	1) Digestion, Flame Atomic Absorption Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation ^(7,8,15,16) 2) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation ^(7,8,13,16)
35	Chromium (VI)	Alkaline Digestion, Colorimetric Method ^(8,16)
36	Chrysene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,26) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
37	Cyanide	Extraction, Distillation, Colorimetric Method ^(28,29,30)
38	2,4-D	Ultrasonic Extraction, Gas Chromatographic Method ⁽²⁷⁾
39	DDD	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
40	DDE	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
41	DDT	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
42	Dibenz(a,h)anthracene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,24) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)

43 Di-n-butyl phthalate...

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

60 2,4-Dinitrophenol...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
60	2,4-Dinitrophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
61	2,4-Dinitrotoluene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
62	2,6-Dinitrotoluene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
63	Di-n-Octyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
64	Endosulfan	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
65	Endrin	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
66	Ethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
67	Fluoranthene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,24) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
68	Fluorene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,24) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
69	Heptachlor	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
70	Heptachlor epoxide	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)

71 Hexachlorobenzene...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
71	Hexachlorobenzene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
72	Hexachloro-1,3-butadiene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
73	n-Hexane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25)
74	α-HCH	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
75	β-HCH	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
76	γ-HCH	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
77	Hexachlorocyclopentadiene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
78	Hexachloroethane	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
79	Indeno(1,2,3-cd)pyrene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,24) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
80	Isophorone	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
81	Lead	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 2) Digestion, Inductively Coupled Plasma Method ^(7,13)
82	Manganese	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 2) Digestion, Inductively Coupled Plasma Method ^(7,13)

83 Mercury...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
83	Mercury	1) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽¹⁸⁾ 2) Digestion, Inductively Coupled Plasma Method ^(7,13) 3) Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method ⁽¹⁹⁾
84	Methanol	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,23)
85	Methoxychlor	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
86	Methyl bromide	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,23)
87	Methylene chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,23)
88	2-Methylphenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
89	2-Methylnaphthalene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
90	Methyl tert-butyl ether	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,23)
91	Naphthalene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,24) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
92	Nickel	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 2) Digestion, Inductively Coupled Plasma Method ^(7,13)
93	Nitrobenzene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
94	N-Nitrosodiphenylamine	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
95	N-Nitrosodi-n-propylamine	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)

96 Polychlorinated Biphenyls...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
96	Polychlorinated Biphenyls - Aroclor 1016 - Aroclor 1221 - Aroclor 1232 - Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1260 Polychlorinated Biphenyls - 2-Chlorobiphenyl - 2,3-Dichlorobiphenyl - 2,2',5'-Trichlorobiphenyl - 2,4',5'-Trichlorobiphenyl - 2,2',3,5'-Tetrachlorobiphenyl - 2,2',5,5'-Tetrachlorobiphenyl - 2,3',4,4'-Tetrachlorobiphenyl - 2,2',3,4,5'-Pentachlorobiphenyl - 2,2',4,5,5'-Pentachlorobiphenyl - 2,3,3',4',6-Pentachlorobiphenyl - 2,2',3,4,4',5'-Hexachlorobiphenyl - 2,2',3,4,5,5'-Hexachlorobiphenyl - 2,2',3,5,5',6'-Hexachlorobiphenyl - 2,2',4,4',5,5'-Hexachlorobiphenyl - 2,2',3,3',4,4',5-Heptachlorobiphenyl - 2,2',3,4,4',5,5'-Heptachlorobiphenyl - 2,2',3,4,4',5,6-Heptachlorobiphenyl	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26) Ultrasonic Extraction, Gas Chromatographic M...

- 2,2',3,4',5,5',6...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
	- 2,2',3,4',5,5',6-Heptachlorobiphenyl - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl Pentachlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
97	Phenanthrene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,24) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
99	Phenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
100	Pyrene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,24) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
101	Selenium	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(7,22) 2) Digestion, Inductively Coupled Plasma Method ^(7,13)
102	Silver	Digestion, Inductively Coupled Plasma Method ^(7,13)
103	Styrene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,23)
104	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,23)
105	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,23)
106	Toluene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,23)
107	Toxaphene	Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)
108	TPH (C ₅ -C ₆)	1) Purge and Trap, Gas Chromatographic Method ^(12,23) 2) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,23)
109	TPH (C ₁₈ -C ₁₆)	Ultrasonic Extraction, Gas Chromatographic Method ^(10,21)
110	TPH (C ₁₈ -C ₃₃)	Ultrasonic Extraction, Gas Chromatographic Method ^(10,21)
111	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,23)

112 1,1,1-Trichloroethane...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
112	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,23)
113	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,23)
114	Trichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,23)
115	2,4,5-Trichlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
116	2,4,6-Trichlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,26)
117	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,23)
118	Vanadium	Digestion, Inductively Coupled Plasma Method ^(7,13)
119	Vinyl acetate	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,23)
120	Vinyl chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,23)
121	m-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,23)
122	o-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,23)
123	p-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,23)
124	Xylene (Total)	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,23)
125	Zinc	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 2) Digestion, Inductively Coupled Plasma Method ^(7,13)

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15. United States Environmental Protection Agency, **Test Methods for Evaluation Solid Waste Physical/Chemical Methods: Arsenic (Atomic Absorption, Gaseous Hydride)**, SW-846 Method 7061A, 1992.

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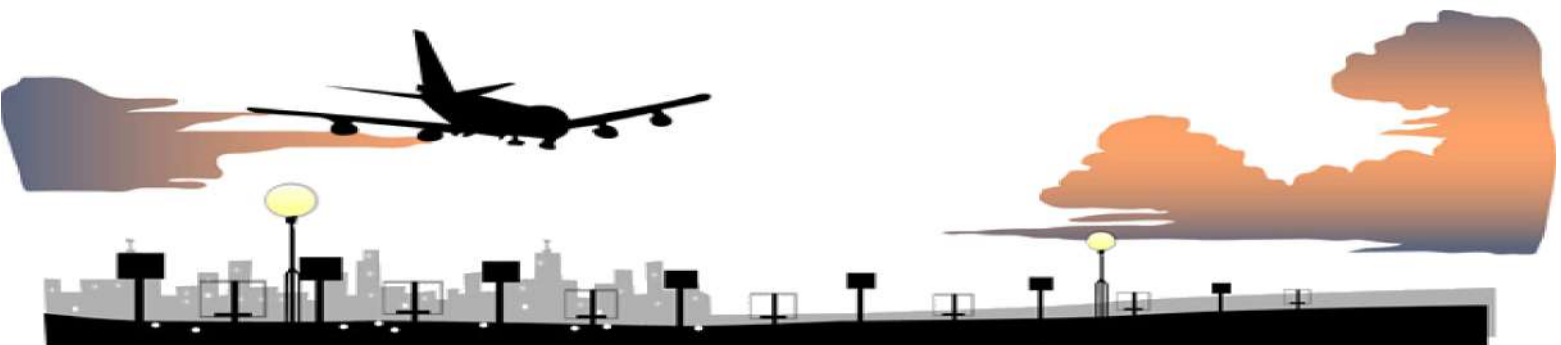
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19. United States Environmental Protection Agency, **Test Methods for Evaluation Solid Waste Physical/Chemical Methods: Mercury in Solids and Solutions by Thermal Decomposition, Amalgamation, and Atomic Absorption Spectrophotometry**, SW-846 Method 7473, 2007.
20. United States Environmental Protection Agency, **Test Methods for Evaluation Solid Waste Physical/Chemical Methods: Selenium (Atomic Absorption, Borohydride Reduction)**, SW-846 Method 7742, 1994.
21. United States Environmental Protection Agency, **Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Nonhalogenated Organics Using GC/FID**, SW-846 Method 8015D, 2003.
22. United States Environmental Protection Agency, **Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Organochlorine Pesticides by Gas Chromatography**, SW-846 Method 8081B, 2007.
23. United States Environmental Protection Agency, **Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Polychlorinated Biphenyls (PCBs) by Gas Chromatography**, SW-846 Method 8082A, 2007.
24. United States Environmental Protection Agency, **Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Polynuclear Aromatic Hydrocarbons**, SW-846 Method 8100, 1980.
25. 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.
26. 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.
27. United States Environmental Protection Agency, **Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Chlorinated Herbicides by GC Using Methylation or Pentafluorobenzoylation Derivatization**, SW-846 Method 8151A, 1994.

28. United States...

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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.
32. United States Environmental Protection Agency, **Test Methods for Evaluation Solid Waste Physical/Chemical Methods. Soil and Waste pH**, SW-846 Method 9045D, 2014.

ภาคผนวก ค

สำเนาใบรับรองการสอบเทียบเครื่องมือการตรวจวัด



รายการใบรับรองสอบเทียบเครื่องมือวัดหลักประจำห้องปฏิบัติการสำหรับวิเคราะห์คุณภาพสิ่งแวดล้อม

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Ambient									
1	Orifice Transfer Standard Calibrator	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Tisch Environmental, Inc.	TE-5025A 3393	Tisch Environmental, Inc.	27072020	27 Jul 20	26 Jul 22	-
2	U-Tube Manometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Dwyer	1221-36-W/M -	Technology Promotion Association (Thailand-Japan)	22P800	12 Mar 22	11 Mar 23	-
3	Flow Meter	Particulate Matter Less Than	Mesa Labs	- 159822	NIST Traceable Calibration Facility	21-AFM-095	31 Aug 21	30 Aug 22	-
5	Aneroid Barometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀) Particulate Matter Less Than	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	21P2499	21 Jul 21	20 Jul 22	-
6	Dial Thermo-Hygrometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀) Particulate Matter Less Than	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	21H803	8 Apr 21	7 Apr 22	-
7	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo	42C 42C-0508011076	UAE Consultant Co., Ltd.	2110/2021	21 Oct 21	20 Oct 22	-
8	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Environmental Instrument	42C 42C-76412-383	UAE Consultant Co., Ltd.	21102021	21 Oct 21	20 Oct 22	-
9	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42i 1180540062	UAE Consultant Co., Ltd.	19072021	19 Jul 21	18 Jul 22	-
10	Standard Gases (Mixture)	Nitrogen Dioxide	Airgas	CC159599 2015PSIG	Airgas an Air Liquide company	E04N099E15A01QC	30 Jul 19	30 Jul 22	-
11	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48i 1200636464	UAE Consultant Co., Ltd.	24112021	24 Nov 21	23 Nov 22	-

รายการใบรับรองสอบเทียบเครื่องมือวัดหลักประจำห้องปฏิบัติการสำหรับวิเคราะห์คุณภาพสิ่งแวดล้อม

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
12	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48i 1200636465	UAE Consultant Co.,Ltd.	24112021	24 Nov 21	23 Nov 22	-
13	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48i 1200636466	UAE Consultant Co.,Ltd.	24112021	24 Nov 21	23 Nov 22	-
14	Standard Gases (Mixture)	Carbon Monoxide	Airgas	CC159599 2015PSIG	Airgas an Air Liquide company	160-401526192-1	30 Jul 19	30 Jul 22	-
15	Total Hydrocarbons Analyzer	Total Hydrocarbons	HORIBA	APHA-370 VUPVTC21	UAE Consultant Co.,Ltd.	05062021	5 Jun 21	4 Jun 22	-
16	Total Hydrocarbons Analyzer	Total Hydrocarbons	HORIBA	APHA-370 PDXEGXF7	UAE Consultant Co.,Ltd.	05062021	5 Jun 21	4 Jun 22	-
17	Total Hydrocarbons Analyzer	Total Hydrocarbons	HORIBA	APHA-370 SSGEYBJ	UAE Consultant Co.,Ltd.	07072021	7 Jul 21	6 Jul 22	-
18	Standard Gas	Total Hydrocarbons	Linde	D824432	Linde	09042013	4 Aug 20	4 Aug 28	-
19	Wind Speed/Wind Direction	WS/WD	LSI LASTEM	E-LOG305 19040308	Thai Meteorological Department	385/21	16 Aug 21	15 Aug 22	-
20	Wind Speed/Wind Direction	WS/WD	Met One Instruments	580 / X23725 034B / X21189	Met One Instrument, Inc.	274/21	20 May 21	19 May 22	-
21	Wind Speed/Wind Direction	WS/WD	Met One Instruments	580 / X10448 034B / X10353	Thai Meteorological Department	273/21	20 May 21	19 May 22	-
22	Sound Level Calibrator (Acoustic Calibrator)	Calibrate Sound Level Meter	Larson Davis	CAL150 6171	Innovative Instrument Co.,Ltd.	21-ACT-327	24 Aug 21	23 Aug 22	-
23	Sound Level Meter	$L_{Aeq} 24\text{ hours}$, $L_{Aeq} 1\text{ hour}$, L_{Amax} , L_{Adn}	Larson Davis	LxT2 0005394	Innovative Instrument Co.,Ltd.	22-ACT-034	21 Jan 22	20 Jan 23	-
24	Sound Level Meter	$L_{Aeq} 24\text{ hours}$, $L_{Aeq} 1\text{ hour}$, L_{Amax} , L_{Adn}	Larson Davis	LxT2 0005396	Innovative Instrument Co.,Ltd.	22-ACT-105	11 Feb 22	10 Feb 23	-
25	Sound Level Meter	$L_{Aeq} 24\text{ hours}$, $L_{Aeq} 1\text{ hour}$, L_{Amax} , L_{Adn}	Larson Davis	LxT2 0005398	Innovative Instrument Co.,Ltd.	22-ACT-035	21 Jan 22	20 Jan 23	-

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No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Water									
26	pH Meter	ค่าความเป็นกรด-ด่าง (pH)	Hanna Instrument	HI2211 / 8165345	National Food Institute, Ministry of Industry, Thailand	2202097-001-01	16 Mar 22	15 Mar 23	-
27	pH Meter		Mettler-Toledo	Seven Easy S20 / 1231155210	National Food Institute, Ministry of Industry, Thailand	2103189-002-01	14 Jun 21	13 Jun 22	-
28	Conductivity Meter	การนำไฟฟ้า (Conductivity)	SI Analytics	Lab955 / 16300356	SPC Calibration Center Co.,Ltd.	C24220084	22 Mar 22	21 Mar 23	-
29	Conductivity Meter		SI Analytics	Lab955 / 16300356	SPC Calibration Center Co.,Ltd.	C24210091	29 Mar 21	28 Mar 22	-
30	Analytical Balance (Repeatability 0.1 mg)	Oil & Grease (น้ำมันและไขมัน)	Mettler-Toledo	AB-204S/FACT / 1129361010	National Food Institute, Ministry of Industry, Thailand	2203120-001-01	1 Jun 22	31 May 23	-
31	UV-VIS Spectrophotometer	ความขุ่น (Turbidity) ไนโตรเจน-ไนโตรเจน (Nitrate-Nitrogen : NO3-N)	Agilent Technologies	Cary60 G6860A / MY15410009	DQE Services Co.,Ltd.	SP21-015	29 May 21	28 May 22	-
32	UV-VIS Spectrophotometer	ฟอสเฟต-ฟอสฟอรัส (Phosphate-Phosphorus : P) ซัลเฟต(Sulfate :SO ₄ ²⁻), ไนเตรต(Nitrate: NO ₃ ⁻)	Hitachi	U-1900 / 2021-064	DQE Services Co.,Ltd.	SP22-007	20 Jan 22	19 Jan 23	-
33	UV-VIS Spectrophotometer	ซีโอดี (Chemical Oxygen Demand : COD)	Hitachi	U-2900 / 21E22-009	DQE Services Co.,Ltd.	SP22-008	20 Jan 22	19 Jan 23	-
34	Atomic Absorption Spectrometer (AAS)	เหล็ก (Iron: Fe) แมงกานีส (Manganese : Mn)	Agilent Technologies	System ID:G8432A AA240FS / MY13160001	Thailand Institute of Scientific and Technological Research (TISTR).	MTC.ACL. No. 335/64	4 Feb 21	3 Feb 22	-
35	Atomic Absorption Spectrometer (AAS)		Agilent Technologies	System ID:G8432A AA240FS / MY13160001	Thailand Institute Of Science And Technological Research (TISTR)	MTC.ACL. No. 486/65	7 Mar 22	6 Mar 23	-
36	Analytical Balance (Repeatability 0.01 mg)	ของแข็งที่ละลายน้ำได้ทั้งหมด (Total Dissolved Solids : TDS)	Mettler-Toledo	AB-204S/FACT / 1129361010	National Food Institute, Ministry of Industry, Thailand	2103270-001-01	11 Jun 21	10 Jun 22	-
37	Hot Air Oven	ของแข็งแขวนลอย (Suspended Solids : SS)	Memmert	UF55 / B216.1666	Technology Promotion Association (Thailand-Japan)	21TM1876	29 Oct 21	28 Oct 22	-

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No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
38	BOD Incubator	ความต้องการออกซิเจนทางชีวภาพ (Biochemical Oxygen Demand : BOD)	Arco	UC4-1320 / (UAE.WAO.002/2550)	Technology Promotion Association (Thailand-Japan)	21TM1405	17 Aug 21	16 Aug 22	-
39	BOD Incubator		Arco	UC4-1320 / (UAE.WAO.018/2559)	Technology Promotion Association (Thailand-Japan)	21TM1406	17 Aug 21	16 Aug 22	-
40	COD Reactor (Heating Block)	ซีโอดี (Chemical Oxygen Demand : COD)	Hanna	H1839800-02 / 4500052101	Hanna Instruments (Thailand) Ltd.	HIT-2121-0516	17 May 21	16 May 22	-
41	Digester Unit	ทีเคเอ็น (Total Kjeldahl Nitrogen : TKN)	Velp	DKL20 / 213517	National Food Institute, Ministry of Industry, Thailand	2103014-001-02	7 Jun 21	6 Jun 22	-
42	Incubator (Cooled Incubator)	แบคทีเรียกลุ่มโคลิฟอร์มทั้งหมด (Total Coliform Bacteria)	Memmert	IPP 260 / V615.0187	Technology Promotion Association (Thailand-Japan)	21TM706	21 Apr 21	20 Apr 22	-
43	Incubator (Cooled Incubator)	แบคทีเรียกลุ่มฟิโคไลต์ฟอร์ม (Fecal Coliform Bacteria)	Memmert	IPP 260 / V615.0187	Technology Promotion Association (Thailand-Japan)	22TM563	7 Apr 22	6 Apr 23	-
44	Water Bath	<i>E.Coli</i>	Memmert	WB 14 / 1401.0569	Technology Promotion Association (Thailand-Japan)	21TM1355/1	14 Jul 21	13 Jul 22	-
45	Analytical Balance		Mettler-Toledo	AX105DR / 1122100406	National Food Institute, Ministry of Industry, Thailand	2200708-001-01	24 Nov 21	23 Nov 22	-
46	Auto Clave		ALP	CL-40L / 807298	Technology Promotion Association (Thailand-Japan)	21TM831	7 May 21	6 May 22	-

Certificate of Calibration

Calibration Certification Information			
Cal. Date: July 27, 2020	Rootmeter S/N: 438320	Ta: 298	°K
Operator: Jim Tisch		Pa: 749.3	mm Hg
Calibration Model #: TE-5025A	Calibrator S/N: 3393		

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.3980	3.2	2.00
2	3	4	1	0.9960	6.3	4.00
3	5	6	1	0.8860	7.8	5.00
4	7	8	1	0.8430	8.7	5.50
5	9	10	1	0.7000	12.7	8.00

Data Tabulation				
Vstd (m3)	Qstd (x-axis)	$\sqrt{\Delta H \left(\frac{Pa}{Pstd} \times \frac{Vstd}{Ta} \right)}$ (y-axis)	Va	Qa
0.9817	0.7022	1.4042	0.9957	0.7123
0.9776	0.9816	1.9859	0.9916	0.9956
0.9757	1.1012	2.2203	0.9896	1.1169
0.9745	1.1560	2.3286	0.9884	1.1725
0.9692	1.3846	2.8084	0.9831	1.4044
m= 2.05151			m= 1.28462	
b= -0.03558			b= -0.02260	
r= 0.99994			r= 0.99994	

Calculations	
$V_{std} = \Delta Vol((Pa - \Delta P) / P_{std})(T_{std} / T_a)$	$V_a = \Delta Vol((Pa - \Delta P) / P_a)$
$Q_{std} = V_{std} / \Delta Time$	$Q_a = V_a / \Delta Time$
For subsequent flow rate calculations:	
$Q_{std} = 1/m \left(\sqrt{\Delta H \left(\frac{Pa}{P_{std}} \times \frac{T_{std}}{T_a} \right)} - b \right)$	$Q_a = 1/m \left(\sqrt{\Delta H (T_a / P_a)} - b \right)$

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

RECALIBRATION	
US EPA recommends annual recalibration per 1998 40 Code of Federal Regulations Part 50 to 51, Appendix B to Part 50, Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere, 9.2.17, page 30	

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

www.tisch-env.com
TOLL FREE: (877)263-7610
FAX: (513)467-9009

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
53/4 PATANAKARN ROAD SOI 18, SIAMLIANG, SIAMLIANG, BANGKOK 10250
TEL: 0-2717-3080-24 FAX: 0-2719-9484

Certificate of Calibration

Certificate No.: 22P800
Page: 1 of 2

Equipment: U-Tube Manometer
Manufacturer: Dwyer
Model: 1221-36-WM
Serial No.: -
ID No.: UAE.EFM.022/2560

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

Condition As-Received: Used Item
Received Date: 03 March 2022
Calibration Date: 12 March 2022

Reference: 2203-0131WSC
Submitted by: United Analyst and Engineering Consultant Co., Ltd.
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Atmospheric Pressure: 1010 mbar
81 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10260

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

Condition of this result of calibration

1. Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Pressure Calibrator	PC106P	1189	MP-0110-21	09 Aug 2022
2. This result of calibration was made on requested at the point specified by customer.				
3. Scale and conversion factor is 1 kPa = 4.0146293 inHg				
4. This instrument was used clean air as pressure media.				
5. This instrument was calibrated by applied pressure to high-port (+) side and low-port (-) side open to atmospheric pressure.				
6. This instrument was installed in vertical orientation and top of the pressure port was used as the reference level.				
7. The certificate is valid only to the item calibrated on date and place of calibration.				
8. This Certification is traceable to the International System of Unit maintained at:- National Institute of Metrology Thailand (NIMT)				

Calibrated by: Suwit Aussarnoo
Issue Date: 14 March 2022

Approved Signatory: [Signature]
[] Phalinee Pratsapal
[] Sura Suwananasi
[x] Atitapal Panurach

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B 0282413



Cert.No.: 22P800
Page: 2 of 2

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

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

UUC Indication				
Applied Pressure (inH ₂ O)	High-port side (inH ₂ O)	Low-port side (inH ₂ O)	ΔP (inH ₂ O)	Error (inH ₂ O)
0.00	0.00	0.00	0.00	0.00
2.00	1.00	-1.00	2.00	0.00
4.00	2.00	-2.00	4.00	0.00
6.00	3.00	-3.00	6.00	0.00
8.00	4.00	-4.00	8.00	0.00
10.00	5.00	-5.00	10.00	0.02
12.00	6.00	-6.00	12.00	0.02
14.00	7.00	-7.00	14.00	0.04
16.00	8.00	-8.00	16.00	0.04
18.00	9.00	-9.00	18.00	0.04
20.00	10.00	-10.00	20.00	0.04
22.00	11.00	-11.00	22.00	0.02
24.00	12.00	-12.00	24.00	0.02
26.00	13.00	-13.00	26.00	0.02
28.00	14.00	-14.00	28.00	0.04
30.00	15.00	-15.00	30.00	0.04
32.00	16.00	-16.00	32.00	0.04
34.00	16.98	-17.06	34.04	0.04
36.00	17.98	-18.00	35.98	0.18

The uncertainty of measurement was ± 0.11 inH₂O
* UUC = Unit Under Calibration

* ΔP = High-port side - Low-port side
The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95 %.

-000-

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8 1099526

INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
719 MOO 13, SOI SUTSAKARN 11 TAMBON BANG KAO,
AMPHOE BANG PHI KAMUT, PRACHIN PROVINCE 32000 THAILAND
TEL: 0900-2119-7100 FAX: 0900-2119-7100



Page 1/2

Certificate of Calibration

Customer

Certificate No: 21-AFM-095

Name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Request No: Req-2021-0908

Address: 81 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10260

Unit Under Calibration Details

Measurement Item: Air Flow Meter
Manufacturer: BGI
Model: deltaCal DC1
Serial Number: 159822
ID: UAE.EFM.A39/2561
Location of Calibration: LAB 4 AIR VELOCITY METER

Calibration Environment and Details

Temperature: 23 °C ± 3 °C
Humidity: 55 %RH ± 20 %RH
Barometric Pressure: 1013 hPa ± 10 hPa
Received Date: 22 July 2021
Calibration Date: 31 August 2021

Calibration Procedure: In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Air Flow Meter	Gillibrator 3 High flow	18391012012	Sensidyne	21 May 2022

Traceability

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

Note

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

Calibration By: [Signature]
Mr. Noppadon Luangtham
Service Calibration Engineer

Approved By: [Signature]
Mr. Pichit Matthevorn
Calibration Engineer Supervisor
Issue Date: 1 September 2021

The results extend only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.
FM-708-AFM-01 Rev.00 issue date 05/07/19

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Certificate No : 21-AFM-093

Request No : Req-2021-0938

Result of Calibration :

Flow Setting	STD Flow Reading	UUC Flow Reading	Correction Flow	Uncertainty
LPM	LPM	LPM	LPM	LPM
14.5	14.508	14.54	-0.032	0.21
15.0	15.009	15.05	-0.041	0.22
15.8	15.807	15.88	-0.073	0.23
16.6	16.606	16.70	-0.094	0.24
18.3	18.308	18.41	-0.102	0.26

Note

STD : Standard

UUC : Unit Under Calibration

* Indicates non accredited

End of Certificate

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

FM-708-AFM-01 Rev.02 Issue date 13/07/19

เอกสารไม่ควบคุม

Certificate of Calibration

Certificate No : 21-DPM-101

Request No : Req-2021-0938

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

Unit Under Calibration Details

Calibration Parameter : Barometric Pressure
Instrument Name : Air Flow Meter
Manufacturer : BGI
Model : deltaCal DC1
Serial Number : 159822
ID : UAEEFM019-2541

Calibration Result : Without Adjustment

Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 33 %RH ± 15 %RH
Barometric Pressure : 1013 mPa ± 10 hPa
Received Date : 22 July 2021
Calibration Date : 31 August 2021
Calibration By : Mr. Satchok Jirapukdeesakin
Location of Calibration : LAB 4 Air Velocity

Calibration Procedure : In-house method CP-DPM-03 by Comparison With Standard Barometric Pressure

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Barometric Pressure	CPG 2400	4100KDA 65182	NIMT	2 November 2021
Thermo Hygrometer	SD700	Q97552	NIMT	5 October 2021

Traceability : This certificate provide traceability of measurement to recognized national standard, and to the realization of the International System of Units (SI), National Institute of Metrology (NIST)

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 :
Service Calibration Engineer

Approved By :
Mr. Pait Muthavorn
Calibration Engineer Supervisor
Issue Date : 1 September 2021

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

FM-708-AFM-01 Rev.02 Issue date 13/07/19

เอกสารไม่ควบคุม

Certificate No : 21-DPM-101

Request No : Req-2021-0938

Measurement results : Barometric Pressure

Calibration Range	Barometric Pressure			
	STD Reading	UUC Reading	Correction	Uncertainty
(mmHg)	(mmHg)	(mmHg)	(mmHg)	(mmHg)
745	745.02	744.2	-0.82	± 2.0
750	750.04	749.2	-0.84	± 2.0
755	755.06	754.2	-0.86	± 2.0
760	760.08	759.2	-0.88	± 2.0
765	765.10	764.2	-0.90	± 2.0

Calibration Procedure : In-house method CP-DPM-03 by Comparison With Standard Barometric Pressure

End of Certificate

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

FM-708-AFM-01 Rev.02 Issue date 13/07/19

เอกสารไม่ควบคุม

Certificate of Calibration

Certificate No : 21-RHM-064

Request No : Req-2021-0938

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

Unit Under Calibration Details

Measurement Item : Air Flow Meter
Manufacturer : BGI
Model : deltaCal DC1
Serial Number : 159822
ID : UAEEFM-039-2561

Resolution : 0.1 (°C)
Sensor Model : 2182 (TD)
Sensor SN : MRG-024084-001
Sensor ID : UAEEFM-039-2561
Instrument Status : Used

Calibration Environment and Details

Temperature : 25 °C ± 5 °C
Humidity : 55 %RH ± 20 %RH
Received Date : 22 July 2021
Calibration Date : 31 August 2021

Calibration By : Mr. Satchok Jirapukdeesakin

Location of Calibration : LAB 2 Temperature

Calibration Method : In-house method CP-TDM-01 by Comparison With Standard Relative Humidity Meter and Standard Thermometer with RTD Probe in Humidity / Temperature Chamber

Reference Standard

Standard Thermometer Model: GT11, S/N: 12000077, Which was calibration on 30 March 2021, Calibration of Certificate No. : QR21-0719 and Relative Humidity Meter, Model: HP23-A, S/N: 61629979, Which was calibration on 28 September 2020, Calibration of Certificate No. : QR20-1651

Traceability

This Certificate is traceable to SI Unit through Quality Reborn Co., Ltd., NRC-ONSC Accreditation No. Calibration 0293

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 :
Service Calibration Engineer

Approved By :
Mr. Pait Muthavorn
Calibration Engineer Supervisor
Issue Date : 1 September 2021

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

FM-708-AFM-01 Rev.02 Issue date 13/07/19

เอกสารไม่ควบคุม

Certificate No : 21-RHM-064
Request No : Req-2021-0988

Calibration Results : Without Adjustment

Temperature Calibration : Filter Temperature (Tf)

Temperature Range (°C)	Without Adjustment (°C)			Uncertainty (°C)
	STD Reading (°C)	UUC Reading (°C)	Correction (°C)	
20	19.999	20.1	-0.101	0.10
25	24.997	25.1	-0.103	0.10
30	30.000	30.2	-0.200	0.10
35	35.003	35.2	-0.197	0.10
40	40.004	40.2	-0.196	0.10

Temperature Calibration : Ambient Temperature (Ta)

Temperature Range (°C)	Without Adjustment (°C)			Uncertainty (°C)
	STD Reading (°C)	UUC Reading (°C)	Correction (°C)	
20	19.999	20.1	-0.101	0.10
25	24.997	25.1	-0.103	0.10
30	30.000	30.2	-0.200	0.10
35	35.003	35.2	-0.197	0.10
40	40.004	40.3	-0.296	0.10

End of Certificate

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

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

เอกสารไม่ควบคุม

Certificate No : 21-AFM-076
Request No : Req-2021-1014

Result of Calibration :

Flow Setting	STD Flow Reading	UUC Flow Reading	Correction Flow	Uncertainty
LPM	LPM	LPM	LPM	LPM
0.003	0.003016	0.003118	-0.000122	0.00012
0.005	0.005084	0.005254	-0.000170	0.00020

Note

STD : Standard

UUC : Unit Under Calibration

End of Certificate

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

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

เอกสารไม่ควบคุม

Certificate of Calibration

Certificate No : 21-AFM-076
Request No : Req-2021-1014

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

Unit Under Calibration Details

Measurement Item : Air flow meter
Manufacturer : ALICAT SCIENTIFIC
Model : MB-59CCM-D-5M
Serial Number : 57730
ID : UAEJMA2.169/2553
Location of Calibration : LAB 4 AIR VELOCITY METER

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 30 July 2021
Calibration Date : 3 August 2021
Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	18501010006	Sensulyne	21 May 2022

Traceability :

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

Note :

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

Calibration By : Mr. Noppratan Luangat
Service Calibration Engineer

Approved By : Mr. Paek Mahavorn
Calibration Engineer Supervisor
Issue Date : 3 August 2021

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

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

เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
5344 PATTANAKARN ROAD SOI 18, SUANLIANG, SUANLIANG, BANGKOK 10250
TEL: 0-2717-3000-24 FAX: 0-2719-9484



Certificate of Calibration

Certificate No. : 21P2499
Page : 1 of 2

Equipment : Aneroid Barometer
Manufacturer : Baigo
Model : -
Serial No. : -
ID No. : UAE ANV.122/2550
Condition As-Received: Used Item
Received Date : 20 July 2021
Calibration Date : 21 July 2021
Reference : 2107-0570WSC
Ambient Temperature : (23 ± 2) °C
Relative Humidity : (50 ± 15) %
Atmospheric Pressure : 1009 mbar

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

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

81 Soi Udomsak 41, Sukhumvit Road, Bangkok, Prakhong, Bangkok 10260

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to In-house calibration procedure CP-P10, using " DKD-R 6-1 ; Calibration of Pressure Gauges, Edition 03/2014 " as a guidelines.

Condition of this result of calibration

1.Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard Barometer	DPI142	1422050046	MP-0053-21	08 Apr 2022

2.This instrument was installed in vertical orientation and center of the dial was used as the reference level.

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

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

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

6.This Certification is traceable to the International System of Unit maintained at:-
-National Institute of Metrology Thailand (NIMT)

Calibrated by : Suwit Aussarree
Issue Date : 22 July 2021

Approved Signatory :
[] Phalinee Prabpaijai
[] Sura Suwannasri
[x] Attapol Panurach

เอกสารไม่ควบคุม

B 0264462



Cert.No.: 21P2499
Page: 2 of 2

Result of calibration: Without adjustment
Function: Absolute Pressure Measurement

Range: 960 hPa to 1030 hPa
Scale Interval: 1 hPa (The Fifth Estimate)

Increasing Pressure								
Applied Pressure (hPa)	967.66	969.27	980.15	990.48	1000.09	1010.75	1020.58	1029.49
UUC* Indication (hPa)	960.0	970.0	980.0	990.0	1000.0	1010.0	1020.0	1030.0
Error (hPa)	2.34	0.73	-0.15	-0.48	-0.69	-0.75	-0.58	0.51

Decreasing Pressure								
Applied Pressure (hPa)	1029.61	1020.69	1010.80	1000.75	990.59	980.30	969.41	967.79
UUC* Indication (hPa)	1030.0	1020.0	1010.0	1000.0	990.0	980.0	970.0	960.0
Error (hPa)	0.38	-0.69	-0.80	-0.75	-0.59	-0.30	0.59	2.21

The uncertainty of measurement was ± 0.30 hPa
* UUC = Unit Under Calibration

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

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a 1062243



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
5344 PATTANAKARN ROAD SOI 18, SUANLIANG, SUANLIANG, BANGKOK 10250
TEL. 0-2717-3000-34 FAX. 0-2719-9484



Certificate of Calibration

Certificate No.: 21H803
Page: 1 of 2

Equipment: Dial Thermo-Hygrometer

Manufacturer: Barigo

Model: -

Serial No.: -

ID No.: UAE.ANV.128/2550

Condition As-Received: Used Item

Received Date: 29 March 2021

Calibration Date: 31 March 2021

Reference: 2103-1189WSC

Ambient Temperature: $(25 \pm 3) ^\circ\text{C}$

Relative Humidity: $(50 \pm 20) \%$

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

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

Procedure used: Calibration was conducted using in-house calibration procedure CP-H02 according to comparison with standard chilled mirror sensor for humidity measurement function and comparison with standard temperature probe for temperature measurement function into humidity / temperature chamber.

Condition of this result of calibration

1. Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard Chilled Mirror Hygrometer Sensor	Dew Prime II	31863	18540	28 Jul 2021
2) Handheld Thermometer With Sensor	1521	ASA339	20968	10 Aug 2021

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

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

-National Institute of Standards and Technology (NIST), The United States of America

-National Institute of Metrology Thailand (NIMT)

Calibrated by: Kralpop Onrat

Issue Date: 20 April 2021

Approved Signatory:

[] Chakrit Waowanjan
[] Ponthipha Tameyakul
[] Pitak Srimongkol

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B 0258330



Cert. No.: 21H803
Page: 2 of 2

Result of Calibration: Without Adjustment

Function: Humidity measurement.

Reference Temperature ($^{\circ}\text{C}$)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Error (%R.H.)	Uncertainty of Measurement (%R.H.)
25.0	40.1	43	2.9	1.6
25.0	60.0	60	0.0	1.6
25.0	80.0	79	-1.0	1.9

Result of Calibration: Without Adjustment

Function: Temperature measurement.

Reference Temperature ($^{\circ}\text{C}$)	Standard Reading ($^{\circ}\text{C}$)	UUC* Reading ($^{\circ}\text{C}$)	Error ($^{\circ}\text{C}$)	Uncertainty of Measurement ($^{\circ}\text{C}$)
20.011	20.0	20.0	-0.011	0.72
30.019	30.0	30.0	-0.019	0.72
34.989	35.0	35.0	0.011	0.72
40.006	40.0	40.0	-0.006	0.72

UUC* : Unit Under Calibration

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

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a 1051239



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.uaecconsultant.com E-mail: uaec@uaecconsultant.com

MULTI-POINT GAS TEST REPORT

Test Date: Oct 21, 2021

Equipment: Gas Analyzer (NO₂)
Manufacturer: Thermo Electron Corporation
Model: 42C
Serial Number: 42C-0508011076

Standard Gas Concentration

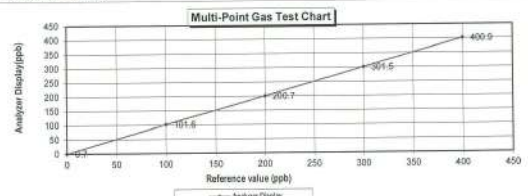
Sulphur Dioxide (SO ₂)	45.75	PPM
Nitric Oxide (NO)	45.35	PPM
Methane (CH ₄)	-	PPM
Carbon Monoxide (CO)	1007	PPM
Cylinder No.:	CC1595999	
Expiration Date:	Jul 30, 2022	

Dilutor Detail

Manufacturer:	Thermo Scientific
Model:	1461
Serial Number:	1180540071

Multi-point gas test data

Level	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.7	0.70	0.70	0.70
Level 2	20.00%	101.6	1.60	1.57	1.57
Level 3	40.00%	200.7	0.70	0.35	0.35
Level 4	60.00%	301.5	1.58	0.50	0.50
Level 5	80.00%	400.9	0.90	0.22	0.22
Remark	Measuring Range	500.0 ppb	Average Difference (%)		0.67
	Acceptable Limit $\pm 5\%$				



เอกสารไม่ควบคุม

MULTI-POINT GAS TEST REPORT

Test Date : Oct 21, 2021

Equipment : Gas Analyzer (NO₂) Model : 42C
Manufacturer : Thermo Environmental Instruments Serial Number : 42C-76412-383

Standard Gas Concentration

Sulphur Dioxide (SO₂) 44.75 PPM
Nitric Oxide (NO) 45.35 PPM
Methane (CH₄) - PPM
Carbon Monoxide (CO) 1007 PPM
Cylinder No. : CC159599
Expiration Date : Jul 30, 2022

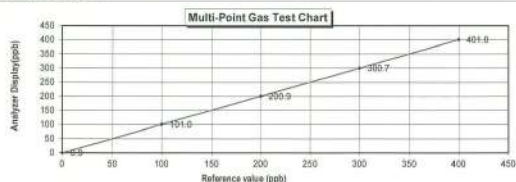
Dilutor Detail

Manufacturer : Thermo Scientific
Model : 1461
Serial Number : 1180540071

Multi-point gas test data

Level	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.90	0.90	0.90
Level 2	20.00%	100.0	1.00	0.99	0.99
Level 3	40.00%	200.0	0.90	0.45	0.45
Level 4	60.00%	300.0	0.70	0.23	0.23
Level 5	80.00%	400.0	1.00	0.25	0.25
Remark : Measuring Range	500.0 ppb		Average Difference (%)		0.56

Acceptable Limit $\pm 5\%$



21/10/2021

21 Oct 2021

เอกสารไม่ควบคุม

MULTI-POINT GAS TEST REPORT

Test Date : July 19, 2021

Equipment : Gas Analyzer (NO₂) Model : 42i
Manufacturer : Thermo Scientific Serial Number : 1180540062

Standard Gas Concentration

Sulphur Dioxide (SO₂) 44.75 PPM
Nitric Oxide (NO) 45.35 PPM
Methane (CH₄) - PPM
Carbon Monoxide (CO) 1007 PPM
Cylinder No. : CC159599
Expiration Date : Jul 30, 2022

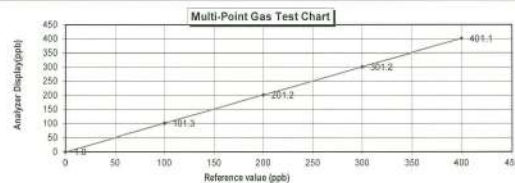
Dilutor Detail

Manufacturer : Thermo Scientific
Model : 1461
Serial Number : 1180540071

Multi-point gas test data

Level	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	1.00	1.00	1.00
Level 2	20.00%	100.0	1.30	1.28	1.28
Level 3	40.00%	200.0	1.20	0.60	0.60
Level 4	60.00%	300.0	1.20	0.40	0.40
Level 5	80.00%	400.0	1.10	0.27	0.27
Remark : Measuring Range	500.0 ppb		Average Difference (%)		0.71

Acceptable Limit $\pm 5\%$



19/07/2021

19 Jul 2021

เอกสารไม่ควบคุม



CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Part Number: E04N199E15A01QC Reference Number: 160-401526192-1
Cylinder Number: CC159599 Airgas USA, LLC
Laboratory: 124 - Plumsteadville - PA (64) Easton Road
PGVP Number: A12019 Bill 1
Gas Code: CO, NO, NOX, SO₂, BALN
Expiration Date: Jul 30, 2022 Certification Date: Jul 30, 2019

Airgas Specialty Gases
Airgas USA, LLC
644 Easton Road
Bill 1
Plumsteadville, PA 19949
Airgas.com

Certification performed in accordance with EPA Traceability Protocol for Analysis and Certification of Gaseous Calibration Standards (May 2012) document EPA-820-R-12-021, using the assay procedures listed. Analytical methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.
Do Not Use This Cylinder Below 100 psig, i.e. 0.7 megapascals

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NO _x	45.00 PPM	44.75 PPM	G1	$\pm 0.8\%$ NIST Traceable	07/23/2019, 07/30/2019
NITRIC OXIDE	45.00 PPM	44.75 PPM	G1	$\pm 0.8\%$ NIST Traceable	07/23/2019, 07/30/2019
SULFUR DIOXIDE	45.00 PPM	45.35 PPM	G1	$\pm 1\%$ NIST Traceable	07/23/2019, 07/30/2019
CARBON MONOXIDE	1000 PPM	1007 PPM	G1	$\pm 0.4\%$ NIST Traceable	07/23/2019
NITROGEN	Balance				

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	18060121	KAL0404215	240.0 PPM NITRIC OXIDE/NITROGEN	$\pm 0.4\%$	Nov 08, 2023
NTRM	052411	KAL0404307	50.00 PPM NITRIC OXIDE/NITROGEN	$\pm 0.80\%$	Mar 12, 2024
NTRM	18060121	KAL0404215	250.0 PPM NOx/NITROGEN	$\pm 0.4\%$	Nov 08, 2023
NTRM	052411	KAL040307-NOX	50.00 PPM NOx/NITROGEN	$\pm 0.80\%$	Mar 12, 2024
NTRM	0141709	KAL0031190	49.67 PPM SULFUR DIOXIDE/NITROGEN	$\pm 1.0\%$	Jun 20, 2022
NTRM	072508	KAL0045870	970.0 PPM CARBON MONOXIDE/NITROGEN	$\pm 0.4\%$	May 14, 2021

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
CO MKS FTIR 00022062	FTIR	Jul 19, 2019
NO MKS FTIR 00022062	FTIR	Jul 22, 2019
NO MKS FTIR 00022062	FTIR	Jul 22, 2019
SO ₂ MKS FTIR 00022062	FTIR	Jul 22, 2019

Triad Data Available Upon Request

NOTES: RANW 51319-CM03
PO# 5216002210
GROSS WEIGHT: 28.8 KG
NET WEIGHT: 4.1 KG



Signature on file
Approved for Release

เอกสารไม่ควบคุม



MULTI-POINT GAS TEST REPORT

Test Date : Nov 24, 2021

Equipment : Gas Analyzer (CO) Model : 48i
Manufacturer : Thermo Scientific Serial Number : 1200636464

Standard Gas Concentration

Sulphur Dioxide (SO₂) 44.75 PPM
Nitric Oxide (NO) 45.35 PPM
Methane (CH₄) - PPM
Carbon Monoxide (CO) 1007 PPM
Cylinder No. : CC159599
Expiration Date : Jul 30, 2022

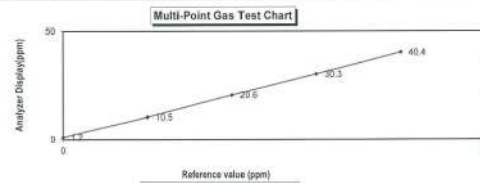
Dilutor Detail

Manufacturer : Thermo Scientific
Model : 1461
Serial Number : 1180540071

Multi-point gas test data

Level	Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	1.2	1.2	1.2
Level 2	20.00%	10.0	0.5	4.8	4.8
Level 3	40.00%	20.0	0.6	2.9	2.9
Level 4	60.00%	30.0	0.3	1.0	1.0
Level 5	80.00%	40.0	0.4	1.0	1.0
Remark : Measuring Range	50.0 ppm		Average Difference (%)		2.17

Acceptable Limit $\pm 5\%$



24/11/2021

24 Nov 2021

เอกสารไม่ควบคุม

MULTI-POINT GAS TEST REPORT

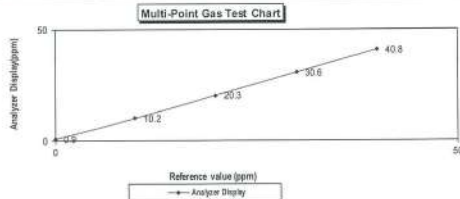
Test Date : Nov 24, 2021

Equipment : Gas Analyzer (CO) Model : 48i
Manufacturer : Thermo Scientific Serial Number : 1200636465

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	44.75	PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	45.35	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	1007	PPM		
Cylinder No. :	CC159599			
Expiration Date :	Jul 30, 2022			

Multi-point gas test data

Reference Value (ppm)			Analyzer Display (ppm)	Difference Error	Percent Error	% Error
Level 1	Zero	0.0	0.9	0.9	0.9	0.9
Level 2	20.00%	10.8	10.2	0.2	2.0	2.0
Level 3	40.00%	20.0	20.3	0.3	1.5	1.5
Level 4	60.00%	30.6	30.6	0.6	2.0	2.0
Level 5	80.00%	40.0	40.8	0.8	2.0	2.0
Remark : Measuring Range		50.0 ppm	Average Difference (%)			1.65



24, 11/24

24, 11/24

Page 1 of 1

เอกสารไม่ควบคุม

MULTI-POINT GAS TEST REPORT

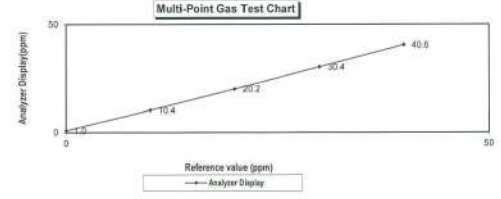
Test Date : Nov 24, 2021

Equipment : Gas Analyzer (CO) Model : 48i
Manufacturer : Thermo Scientific Serial Number : 1200636466

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	44.75	PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	45.35	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	1007	PPM		
Cylinder No. :	CC159599			
Expiration Date :	Jul 30, 2022			

Multi-point gas test data

Reference Value (ppm)			Analyzer Display (ppm)	Difference Error	Percent Error	% Error
Level 1	Zero	0.0	1.0	1.0	1.0	1.0
Level 2	20.00%	10.0	10.4	0.4	3.8	3.8
Level 3	40.00%	20.0	20.2	0.2	1.0	1.0
Level 4	60.00%	30.0	30.4	0.4	1.3	1.3
Level 5	80.00%	40.0	40.6	0.6	1.5	1.5
Remark : Measuring Range			50.0 ppm	Average Difference (%) 1.73		



24, 11/24

24, 11/24

Page 1 of 1

เอกสารไม่ควบคุม



CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: E04N199E15A01QC Reference Number: 160-401526192-1
Cylinder Number: CC159599 Cylinder Volume: 144.4 CF
Laboratory: 124 - Plumsteadville - PA Cylinder Pressure: 2015 PSIG
PGVP Number: A12019 Valve Outlet: 660
Gas Code: CO, NO, NOX, SO₂, BALN Certification Date: Jul 30, 2019
Expiration Date: Jul 30, 2022

Certification performed in accordance with "EPA Traceability Protocol for Analytical and Calibration of Gaseous Calibration Standards (May 2012)" document EPA-8206B-12-021, using the assay procedures listed. Analytical methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.
Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	45.35 PPM	44.75 PPM	G1	$\pm 0.8\%$ NIST Traceable	07/23/2019, 07/30/2019
NITRIC OXIDE	45.35 PPM	44.75 PPM	G1	$\pm 0.8\%$ NIST Traceable	07/23/2019, 07/30/2019
SULFUR DIOXIDE	45.35 PPM	45.35 PPM	G1	$\pm 1\%$ NIST Traceable	07/23/2019, 07/30/2019
CARBON MONOXIDE	1000 PPM	1007 PPM	G1	$\pm 0.4\%$ NIST Traceable	07/23/2019
NITROGEN	Balance				

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	18060121	KAL0404215	240.0 PPM NITRIC OXIDE/NITROGEN	$\pm 0.4\%$	Nov 08, 2023
NTRM	052411	KAL0404307	50.00 PPM NITRIC OXIDE/NITROGEN	$\pm 0.80\%$	Mar 12, 2024
NTRM	18060121	KAL0404215	250.0 PPM NOx/NITROGEN	$\pm 0.4\%$	Nov 08, 2023
NTRM	052411	KAL0404307-NOX	50.00 PPM NOx/NITROGEN	$\pm 0.80\%$	Mar 12, 2024
NTRM	0141709	KAL003190	49.67 PPM SULFUR DIOXIDE/NITROGEN	$\pm 1.0\%$	Jun 20, 2022
NTRM	072508	KAL004570	970.0 PPM CARBON MONOXIDE/NITROGEN	$\pm 0.4\%$	May 14, 2021

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
CO MKS FTIR 000220682	FTIR	Jul 19, 2019
NO MKS FTIR 000220682	FTIR	Jul 22, 2019
NO MKS FTIR 000220682	FTIR	Jul 22, 2019
SO ₂ MKS FTIR 000220682	FTIR	Jul 22, 2019

Triad Data Available Upon Request
NOTES:RANW 51319-CM03
PO# 5216002210
GROSS WEIGHT: 28.8 KG
NET WEIGHT: 4.1 KG



Signature on file
Approved for Release

Page 1 of 160-401526192-1

เอกสารไม่ควบคุม



MULTI-POINT GAS TEST REPORT

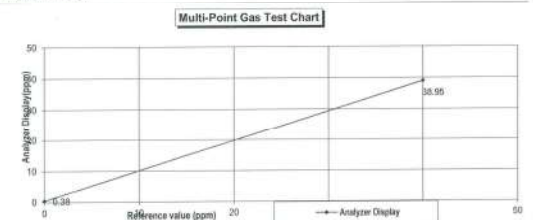
Test Date : Sep 16, 2020

Equipment : Hydrocarbon Analyzer Model : APHA-370
Manufacturer : HORIBA Serial Number : PDXEGXF7

Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO ₂)	-	PPM	Manufacturer :
Nitric Oxide (NO)	-	PPM	Model :
Methane (CH ₄)	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	0.38	0.38	0.38	0.38
Level 2	80.00%	40.00	38.95	-1.05	-2.70	2.70
Remark : Measuring Range		50.00 ppm	Average Difference (%) 1.54			



16, Sep 2020

16, Sep 2020

Page 1 of 1

เอกสารไม่ควบคุม

MULTI-POINT GAS TEST REPORT

Test Date : Sep 29, 2020

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

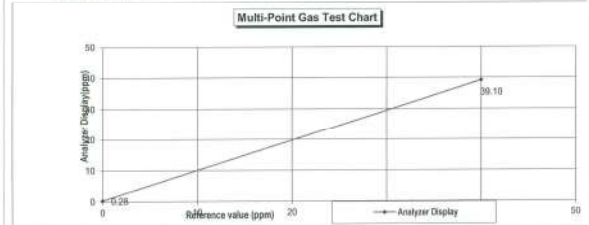
Standard Gas Concentration
Sulphur Dioxide (SO₂) : - PPM
Nitric Oxide (NO) : - PPM
Methane (CH₄) : 39.8 PPM
Carbon Monoxide (CO) : - PPM
Cylinder No. : D824432
Expiration Date : Aug 4, 2028

Dilutor Detail
Manufacturer :
Model :
Serial Number :

Multi-point gas test data

	Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.28	0.28	0.28	0.28
Level 2	80.00%	40.00	-39.10	-2.30	2.30
Remark : Measuring Range	50.00 ppm			Average Difference (%)	1.29

Acceptable Limit $\pm 5\%$



30 Sep 2020

30 Sep 2020

เอกสารไม่ควบคุม

MULTI-POINT GAS TEST REPORT

Test Date : Sep 9, 2020

Equipment : Hydrocarbon Analyzer Model : APHA-370
Manufacturer : HORIBA Serial Number : VUPVTC21

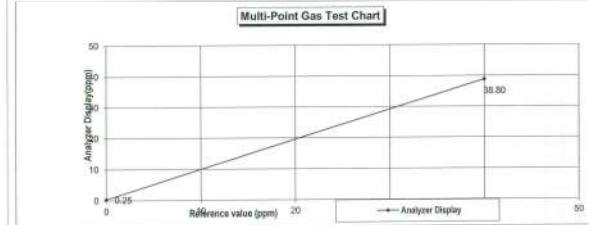
Standard Gas Concentration
Sulphur Dioxide (SO₂) : - PPM
Nitric Oxide (NO) : - PPM
Methane (CH₄) : 39.8 PPM
Carbon Monoxide (CO) : - PPM
Cylinder No. : D824432
Expiration Date : Aug 4, 2028

Dilutor Detail
Manufacturer :
Model :
Serial Number :

Multi-point gas test data

	Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.25	0.25	0.25	0.25
Level 2	80.00%	40.00	-38.80	-3.09	3.09
Remark : Measuring Range	50.00 ppm			Average Difference (%)	1.67

Acceptable Limit $\pm 5\%$



09 Sep 2020

10 Sep 2020

เอกสารไม่ควบคุม

THE LINDE GROUP

Certificate of Analysis
Special Gases Mixture

Customer Details
Name: United Analyst & Engineering Co., Ltd.
Address: 3 Soi Udomsuk 41, Sukhumvit Rd., Bang Chak, Khet Phrakhanong, Bangkok 10260
Customer Tag No.:

Certificate Details
Number: 3384/20
Date of Issue: 4-Aug-2020
Expiry date: 4-Aug-2028
Material Details: 90.161442
Production Order: 6.60 M³
Gas content: 137.0 bar
Cylinder (Owner): LINDOR
Cylinder Material: Aluminum
Filling pressure: 137.0 bar
Cylinder Size: 50 L

Analytical Result

Component	Nominal Concentration	Analytical Result ¹	Uncertainty ²	Method of analysis ³	Assay Date
Methane	40.0 ppm	39.8 ppm	$\pm 1\%$ relative	(6) FID 11.2	4-Aug-2020

Reference Standard used in Assay

Reference Standard	Cylinder number	Concentration	Expiry date
Methane in Nitrogen	21000956	40.29 \pm 0.39 ppm	4-Aug-2020

Analytical Instruments used in Assay

Instrument / Make / Model	Analytical Principle	Last Multi-point Calibration
FIR Spectrometers Nicolet 550	FIR-CHE	4-Aug-2020

Recommend usage condition
Minimum utilization: 5% of actual content or before expiry date whichever comes first.
Storage condition: Keep in well ventilation and secure area.
Comments: When reordering, please quote the material number.

Notes:
1. All results reported in this report are on a dry basis, unless otherwise specified. The assay of the standard has been performed in accordance with the ISO 9104/12/13 for the assay and the function of the standard is to be used as a reference gas.
2. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor of 2, providing a level of confidence of approximately 95%.
3. The measurement of the material is traceable to the reference gas standard which is traceable to the National Standard in the UK.
4. (1) Gas Chromatography, (2) Gravimetric Oxygen Analysis, (3) Electrochemical Oxygen Analysis, (4) Electrochemical Methane Analysis, (5) Total Hydrocarbon Analysis, (6) Other (specified).

Sukanya Panyasootorn
Signature for and on behalf of Linde (Thailand) Co., Ltd.

Linde (Thailand) Public Company Limited
157 Thong, Bangkok 10110, Thailand
Bangkok, Thailand 10110, Thailand
Tel: 02-2555-5555
Fax: 02-2555-5555
Email: info@linde.co.th
Website: www.linde.co.th

THAI METEOROLOGICAL DEPARTMENT

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

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau
Date of Issue : 16 August, 2021
Certification No. : 385/21
Page : 1 of 7

Object : เครื่องมือวัดความเร็วลมและทิศทาง

Manufacturer : LSI

Type : Data Logger E-LOG 305 wind speed and wind direction DNA 827
Thermogigrometers DMA875 Barometer DQA 801

Mfg Code : Data Logger 19040308 wind speed and wind direction 19020211
Thermogigrometers 19010187 Barometer 19040219

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

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1011.2 hPa

NATIONAL STANDARD WIND TUNNEL : Thermal Anemometer 642 S/N 91563
: HOOK GAGE NO 1425 : Wind Aloft Plotting Board
N.I.S.T. Test Reference Number 731/241460
: Ultrasonic Anemometer Model CA-650-3TV (sensor TR-90AH)
Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION
STANDARD THERMOMETER : Theodor Friedrich : Dry No. 8390/94 Wet No. 8389/94
: tests, testo 645 Serial No. 02848067 : ThermoSchneider No. 918802

STANDARD BAROMETER : Digital Barometer Vaisala Type PTB330 No. 1200015
: meter Vaisala Type PTB330 No. 1200015

Calibrated by :
Mr. Watchanaporn
Mechanical

(Authorized Signatory)
For the Calibration Department
เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Wind Speed And Wind Direction

Certification No. 385/21

16 August, 2021 Model DNAR21 S/N 19020211

Page : 2 of 7

Standard	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure	Vacuum	Pressure	Velocity	Correction
Ultrasonic Anemometer	m/sec	inches	inches	hPa	m/sec
1.00	-	-	-	1.0	0.00
3.02	-	-	-	2.7	0.32
5.00	-	-	-	5.0	0.00
7.04	-	-	-	6.7	0.34
9.02	-	-	-	9.0	0.02
11.02	-	-	-	10.7	0.32
13.01	-	-	-	13.0	0.01
15.01	-	-	-	14.7	0.31
17.02	-	-	-	17.0	0.02
20.02	-	-	-	19.7	0.32

Wind Aloft Plotting Board.

U.S. DEPARTMENT OF COMMERCE WEATHER BUREAU

WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	90
180	180
270	270

Calibrated by :

Mr. Watchapol Subwai
Mechanical Engineer

Calibration & Test Section
Meteorological Instruments Bureau

เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

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

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 20 May, 2021

Certification No. 274/21

Page : 1 of 2

Object : Weather Station

Manufacturer : Met One Instruments

Mode No. : Data Logger 580 Wind Sensor 034B

Mfg Code : Data Logger X23725 Wind Sensor X21189

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

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1009.2 hPa

NATIONAL STANDARD WIND TUNNEL : Thermal Anemometer 642 S/N 91563

: HOOK GAGE NO 1425 : Wind Aloft Plotting Board

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

: Ultrasonic Anemometer Model DA-850-3TV (sensor TR-90AH)

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION

Calibrated by :

Mr. Watchapol Subwai
Mechanical Engineer

Authorized Signatory

for the Unit
Sub-Standard Instrument

เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 274/21

20 May, 2021

Page : 2 of 2

Standard	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure	Vacuum	Pressure	Velocity	Correction
Ultrasonic Anemometer	m/sec	inches	inches	hPa	m/sec
1.00	-	-	-	1.0	0.00
3.02	-	-	-	3.0	0.02
5.00	-	-	-	5.0	0.00
7.00	-	-	-	7.0	0.00
9.02	-	-	-	9.0	0.02
11.01	-	-	-	11.0	0.01
13.01	-	-	-	13.0	0.01
15.01	-	-	-	16.0	-0.99
17.02	-	-	-	18.0	-0.98
20.02	-	-	-	21.0	-0.98

Wind Aloft Plotting Board.

U.S. DEPARTMENT OF COMMERCE WEATHER BUREAU

WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	90
180	180
270	270

Calibrated by :

Mr. Watchapol Subwai
Mechanical Engineer

Calibration & Test Section
Meteorological Instruments Bureau

เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

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

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 20 May, 2021

Certification No. 273/21

Page : 1 of 2

Object : Weather Station

Manufacturer : Met One Instruments

Mode No. : Data Logger 580 Wind Sensor 034B

Mfg Code : Data Logger X1044B Wind Sensor X10353

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

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1009.6 hPa

NATIONAL STANDARD WIND TUNNEL : Thermal Anemometer 642 S/N 91563

: HOOK GAGE NO 1425 : Wind Aloft Plotting Board

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

: Ultrasonic Anemometer Model DA-850-3TV (sensor TR-90AH)

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION

Calibrated by :

Mr. Watchapol Subwai
Mechanical Engineer

Authorized Signatory

for the Unit
Sub-Standard Instrument

เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 273/21

29 May, 2021

Page : 2 of 2

Standard	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure	Vacuum	Pressure	Velocity	Correction
Ultrasonic Anemometer	m/sec	inches	inches	m/sec	m/sec
1.00	-	-	-	1.0	0.00
3.02	-	-	-	3.0	0.02
5.00	-	-	-	5.0	0.00
7.00	-	-	-	7.0	0.00
9.02	-	-	-	9.0	0.02
11.01	-	-	-	11.0	0.01
13.01	-	-	-	13.0	0.01
15.01	-	-	-	15.0	0.01
17.02	-	-	-	17.0	0.02
20.02	-	-	-	20.0	0.02

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

Calibrated by :
Mr. Watcharapol Subwat
Mechanical Engineer

Calibration & Test Section
Meteorological Instruments Bureau

เอกสารไม่ควบคุม

INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
7/139 MOO 11, SOI SUTINAKORN 11 TAMBON BANG KAEU,
AMPHOE BANG PHU SAMUT PRAKARN PROVINCE 10540 THAILAND
TEL: 0800-2116-5800-1 FAX: 0800-2116-7140



Page 1 of 2

Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD. Certificate No : 21-ACT-327
Address : 81 Soi Udomrak 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok 10260 Request No : Req-2021-0995

Unit Under Calibration Details

Measurement item : Acoustic Calibrator Class : 2
Manufacturer : LARSON DAVIS Range : 94 , 114 dB / 1000 Hz
Model : CAL150 Instrument Status : Used
Serial Number : 6171
ID : UAE.EFM.I17/2562

Calibration Environment and Details

Temperature : (23 ± 2 °C)
Humidity : (50 ± 20 %RH)
Barometric Pressure : (1013 ± 10.0 hPa)
Received Date : 22 July 2021
Calibration Date : 24 August 2021
Location of Calibration : LAB 1 Acoustic
Calibration Procedure : In-house method CP-ACT-02 based on IEC 60942:2017 Electroacoustics - Sound calibrators

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Sound Calibrator	SV 35A	58079	EEL	14 May 2022
THD Multimeter	2015	1047765	NIMT	21 January 2022

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

Note

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

Calibrated By :

Mr. Noppadol Luangart
Service Calibration Engineer

Approved By :

Mr. Pacit Mathavorn
Calibration Engineer Supervisor
Issue Date : 24 August 2021

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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INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
7/139 MOO 11, SOI SUTINAKORN 11 TAMBON BANG KAEU,
AMPHOE BANG PHU SAMUT PRAKARN PROVINCE 10540 THAILAND
TEL: 0800-2116-5800-1 FAX: 0800-2116-7140



Page 2 of 2

Certificate No : 21-ACT-327

Request No : Req-2021-0995

Sound pressure level

Calibration Results : Without Adjustment

Calibration Range (dB)	Without Adjustment (dB)		Adjustment (dB)		Uncertainty (± dB)	Acceptance limit Class 2 (± dB)
	Measured	Error	Measured	Error		
94 dB / 1000 Hz	94.10	0.10	-	-	0.12	0.40
114 dB / 1000 Hz	114.12	0.12	-	-	0.11	0.40

Frequency of Sound pressure level

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

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

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (± %)	Acceptance limit Class 2 (± %)
	Measured (%)	Error (%)	Measured (%)	Error (%)		
94 dB / 1000 Hz	0.04	-	-	-	0.40	3.0
114 dB / 1000 Hz	0.21	-	-	-	0.40	3.0

Note :

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

End of Calibration

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

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INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
7/139 MOO 11, SOI SUTINAKORN 11 TAMBON BANG KAEU,
AMPHOE BANG PHU SAMUT PRAKARN PROVINCE 10540 THAILAND
TEL: 0800-2116-5800-1 FAX: 0800-2116-7140



Page : 1/4

Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD. Certificate No : 22-ACT-034
Address : 81 Soi Udomrak 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok 10260 Request No : Req-2022-0092

Unit Under Calibration Details

Measurement item : Sound Level Meter Microphone Class : 2
Manufacturer : LARSON DAVIS Microphone Model : 375A04
Model : LxT2 Microphone S/N : 329361
Serial Number : 000394 Preamplifier Model : PRMLA72C
ID : UAE.EFM.B31/2564 Preamplifier S/N : 073810
Resolution : 0.1 dB Instrument Status : Used

Calibration Environment and Details

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

Reference Standard

Instrument	Brand	Model	S/N	Due calibration	Traceability
Standard Microphone	GRAS	40AN	183273	15 September 2022	GRAS
Multifrequency Calibrator	Quest	Quest-cal	EFA000234	14 June 2022	TSI
Audio Generator	Scans	Scans401	131	18 October 2022	WK Electric

Note

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

Calibrated By :

Mr. Noppadol Luangart
Calibration Officer

Approved By :

Mr. Pacit Mathavorn
Calibration Engineer Supervisor
Issue Date : 21 January 2022

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

เอกสารไม่ควบคุม

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

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust	Adjust	UNCERTAINTY	Acceptance Limit
FAST / A / 37-139	Level	UUC	ERR	UUC	ERR
Calibrator Setting	(dB)	(dB)	(dB)	(± dB)	(± dB)
1000 Hz 114.00 dB	113.85	113.9	+0.05	113.9	0.20
					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 / 37-139		
UUC Weighting	(dB)	(± dB)
A	27.8	0.10

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

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	(± dB)
A	27.5	0.10
C	27.0	0.10
Z	31.8	0.10

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

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

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

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

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

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

6. Frequency and time weightings at 1 kHz

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

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

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

7. Long Term Stability

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

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation	UNCERTAINTY	Acceptance Limit
FAST / A / 37-139	REF	UUC	ERR	(± dB)
STD dB	(dB)	(dB)	(dB)	(± dB)
120.00	120	120.0	0.0	3.3
124.00	124	124.0	0.0	3.3
128.00	128	128.0	0.0	3.3
132.00	132	132.0	0.0	3.3
136.00	136	136.0	0.0	3.3
140.00	140	140.0	0.0	3.3
144.00	144	144.0	0.0	3.3
148.00	148	148.0	0.0	3.3
152.00	152	152.0	0.0	3.3
156.00	156	156.0	0.0	3.3
160.00	160	160.0	0.0	3.3
164.00	164	164.0	0.0	3.3
168.00	168	168.0	0.0	3.3
172.00	172	172.0	0.0	3.3
176.00	176	176.0	0.0	3.3
180.00	180	180.0	0.0	3.3
184.00	184	184.0	0.0	3.3
188.00	188	188.0	0.0	3.3
192.00	192	192.0	0.0	3.3
196.00	196	196.0	0.0	3.3
200.00	200	200.0	0.0	3.3
204.00	204	204.0	0.0	3.3
208.00	208	208.0	0.0	3.3
212.00	212	212.0	0.0	3.3
216.00	216	216.0	0.0	3.3
220.00	220	220.0	0.0	3.3
224.00	224	224.0	0.0	3.3
228.00	228	228.0	0.0	3.3
232.00	232	232.0	0.0	3.3
236.00	236	236.0	0.0	3.3
240.00	240	240.0	0.0	3.3
244.00	244	244.0	0.0	3.3
248.00	248	248.0	0.0	3.3
252.00	252	252.0	0.0	3.3
256.00	256	256.0	0.0	3.3
260.00	260	260.0	0.0	3.3
264.00	264	264.0	0.0	3.3
268.00	268	268.0	0.0	3.3
272.00	272	272.0	0.0	3.3
276.00	276	276.0	0.0	3.3
280.00	280	280.0	0.0	3.3
284.00	284	284.0	0.0	3.3
288.00	288	288.0	0.0	3.3
292.00	292	292.0	0.0	3.3
296.00	296	296.0	0.0	3.3
300.00	300	300.0	0.0	3.3
304.00	304	304.0	0.0	3.3
308.00	308	308.0	0.0	3.3
312.00	312	312.0	0.0	3.3
316.00	316	316.0	0.0	3.3
320.00	320	320.0	0.0	3.3
324.00	324	324.0	0.0	3.3
328.00	328	328.0	0.0	3.3
332.00	332	332.0	0.0	3.3
336.00	336	336.0	0.0	3.3
340.00	340	340.0	0.0	3.3
344.00	344	344.0	0.0	3.3
348.00	348	348.0	0.0	3.3
352.00	352	352.0	0.0	3.3
356.00	356	356.0	0.0	3.3
360.00	360	360.0	0.0	3.3
364.00	364	364.0	0.0	3.3
368.00	368	368.0	0.0	3.3
372.00	372	372.0	0.0	3.3
376.00	376	376.0	0.0	3.3
380.00	380	380.0	0.0	3.3
384.00	384	384.0	0.0	3.3
388.00	388	388.0	0.0	3.3
392.00	392	392.0	0.0	3.3
396.00	396	396.0	0.0	3.3
400.00	400	400.0	0.0	3.3
404.00	404	404.0	0.0	3.3
408.00	408	408.0	0.0	3.3
412.00	412	412.0	0.0	3.3
416.00	416	416.0	0.0	3.3
420.00	420	420.0	0.0	3.3
424.00	424	424.0	0.0	3.3
428.00	428	428.0	0.0	3.3
432.00	432	432.0	0.0	3.3
436.00	436	436.0	0.0	3.3
440.00	440	440.0	0.0	3.3
444.00	444	444.0	0.0	3.3
448.00	448	448.0	0.0	3.3
452.00	452	452.0	0.0	3.3
456.00	456	456.0	0.0	3.3
460.00	460	460.0	0.0	3.3
464.00	464	464.0	0.0	3.3
468.00	468	468.0	0.0	3.3
472.00	472	472.0	0.0	3.3
476.00	476	476.0	0.0	3.3
480.00	480	480.0	0.0	3.3
484.00	484	484.0	0.0	3.3
488.00	488	488.0	0.0	3.3
492.00	492	492.0	0.0	3.3
496.00	496	496.0	0.0	3.3
500.00	500	500.0	0.0	3.3
504.00	504	504.0	0.0	3.3
508.00	508	508.0	0.0	3.3
512.00	512	512.0	0.0	3.3
516.00	516	516.0	0.0	3.3
520.00	520	520.0	0.0	3.3
524.00	524	524.0	0.0	3.3
528.00	528	528.0	0.0	3.3
532.00	532	532.0	0.0	3.3
536.00	536	536.0	0.0	3.3
540.00	540	540.0	0.0	3.3
544.00	544	544.0	0.0	3.3
548.00	548	548.0	0.0	3.3
552.00	552	552.0	0.0	3.3
556.00	556	556.0	0.0	3.3
560.00	560	560.0	0.0	3.3
564.00	564	564.0	0.0	3.3
568.00	568	568.0	0.0	3.3
572.00	572	572.0	0.0	3.3
576.00	576	576.0	0.0	3.3
580.00	580	580.0	0.0	3.3
584.00	584	584.0	0.0	3.3
588.00	588	588.0	0.0	3.3
592.00	592	592.0	0.0	3.3
596.00	596	596.0	0.0	3.3
600.00	600	600.0	0.0	3.3
604.00	604	604.0	0.0	3.3
608.00	608	608.0	0.0	3.3
612.00	612	612.0	0.0	3.3
616.00	616	616.0	0.0	3.3
620.00	620	620.0	0.0	3.3
624.00	624	624.0	0.0	3.3
628.00	628	628.0	0.0	3.3
632.00	632	632.0	0.0	3.3
636.00	636	636.0	0.0	3.3
640.00	640	640.0	0.0	3.3
644.00	644	644.0	0.0	3.3
648.00	648	648.0	0.0	3.3
652.00	652	652.0	0.0	3.3
656.00	656	656.0	0.0	3.3
660.00	660	660.0	0.0	3.3
664.00	664	664.0	0.0	3.3
668.00	668	668.0	0.0	3.3
672.00	672	672.0	0.0	3.3
676.00	676	676.0	0.0	3.3
680.00	680	680.0	0.0	3.3
684.00	684	684.0	0.0	3.3
688.00	688	688.0	0.0	3.3
692.00	692	692.0	0.0	3.3
696.00	696	696.0	0.0	3.3
700.00	700	700.0	0.0	3.3
704.00	704	704.0	0.0	3.3
708.00	708	708.0	0.0	3.3
712.00	712	712.0	0.0	3.3
716.00	716	716.0	0.0	3.3
720.00	720	720.0	0.0	3.3
724.00	724	724.0	0.0	3.3
728.00	728	728.0	0.0	3.3
732.00	732	732.0	0.0	3.3
736.00	736	736.0	0.0	3.3
740.00	740	740.0	0.0	3.3
744.00	744	744.0	0.0	3.3
748.00	748	748.0	0.0	3.3
752.00	752	752.0	0.0	3.3

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

12. Overload indication

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

13. High Level Stability

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

End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.
PM-308-SLM-01 Rev.0 base date 01/07/21

เอกสารไม่ควบคุม

Certificate of Calibration

Customer

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

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

Unit Under Calibration Details

Measurement item : Sound Level Meter
Microphone Class : 2
Manufacturer : LARSON DAVIS
Microphone Model : 375A04
Model : LxT2
Microphone S/N : 329350
Serial Number : 0005396
Preamplifier Model : PRMLAT2C
ID : UAE.FSM.033/2564
Preamplifier S/N : 073812
Resolution : 0.1 dB
Instrument Status : Used

Calibration Environment and Details


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

Reference Standard

Instrument	Brand	Model	SN	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188373	15 September 2022	GRAS
Multifrequency Calibrator	Quest	Quest-cal	EFA000234	14 June 2022	TSI
Audio Generator	Svanick	Svan401	131	18 October 2022	WK Electric

Note

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

Calibrated By : 
Mr. Nopphon Luangtan
Calibration Officer

Approved By : 
Mr. Panch Matthevorn
Calibration Engineer Supervisor
Issue Date : 11 February 2022

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

PM-308-SLM-01 Rev.0 base date 01/07/21

เอกสารไม่ควบคุม

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

1. Indication at the calibration check frequency

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

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

2. Self-generated noise, Microphone installed

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

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

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

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

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

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

PM-308-SLM-01 Rev.0 base date 01/07/21

เอกสารไม่ควบคุม

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

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

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

6. Frequency and time weightings at 1 kHz

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

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

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PM-308-SLM-01 Rev.0 base date 01/07/21

เอกสารไม่ควบคุม

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

7. Long Term Stability

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

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation	UNCERTAINTY	Acceptance
FAST / A / 37-139	REF	UUC ERR		Limit
STD dB	(dB)	(dB) (dB)	(± dB)	(± dB)
139.00	139	139.0 -0.0		1.1
134.00	134	134.0 -0.0		1.1
129.00	129	129.0 -0.0		1.1
124.00	124	124.0 -0.0		1.1
119.00	119	119.0 -0.0		1.1
114.00	114	114.0 -0.0		1.1
109.00	109	109.0 -0.0		1.1
104.00	104	104.0 -0.0		1.1
99.00	99	99.0 -0.0		1.1
94.00	94	93.9 -0.1		1.1
89.00	89	88.9 -0.1		1.1
84.00	84	83.9 -0.1		1.1
79.00	79	78.9 -0.1		1.1
74.00	74	73.9 -0.1		1.1
69.00	69	68.9 -0.1		1.1
64.00	64	63.9 -0.1		1.1
59.00	59	58.9 -0.1		1.1
54.00	54	53.9 -0.1		1.1
49.00	49	48.9 -0.1		1.1
44.00	44	44.0 -0.0		1.1
39.00	39	39.2 -0.2		1.1
34.00	34	34.3 -0.3		1.1

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FSM-709-SLM-01 Rev.0 Issue date 01/07/19

เอกสารไม่ควบคุม

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

9. Level linearity including the level range control

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

10. Tone burst response

UUC Setting	STD	Anticipated	Measured	UNCERTAINTY	Acceptance
A / 37-139	Toneburst	Ref	UUC ERR		Limit
UUC Time Response	(ms)	(dB) (dB)	(dB) (dB)	(± dB)	(± dB)
Fast	200	135.0	134.9 -0.1		1.0
	2	118.0	117.6 -0.4		+1.0, -2.5
	0.25	109.6	108.7 -0.9		+1.5, -5.0
Slow	200	128.6	128.5 -0.1		1.0
	2	109.0	108.9 -0.1		+1.0, -5.0
SEL	200	129.0	129.0 0.0		1.0
	2	109.0	108.9 -0.1		+1.0, -2.5
	0.25	100.0	100.0 0.0		+1.5, -5.0

11. Peak C Sound level

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

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

FSM-709-SLM-01 Rev.0 Issue date 01/07/19

เอกสารไม่ควบคุม

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

12. Overload indication

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

13. High Level Stability

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

End of Certificate

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

FSM-709-SLM-01 Rev.0 Issue date 01/07/19

เอกสารไม่ควบคุม

Certificate of Calibration

Customer
Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address : 81 Soi Udomrak 41, Sukhumvit Road, Bangrak, Prakanong, Bangkok 10260
Certificate No : 22-ACT-035
Request No : Req-2022-0094

Unit Under Calibration Details

Measurement Item : Sound Level Meter
Manufacturer : LARSON DAVIS
Model : LxT2
Serial Number : 0000398
ID : UAE.EFM.0352564
Resolution : 0.1 dB
Microphone Class : 2
Microphone Model : 375A04
Microphone S/N : 328675
Preamplifier Model : PRMLxT2C
Preamplifier S/N : 973792
Instrument Status : Used

Calibration Environment and Details

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

Reference Standard

Instrument	Brand	Model	SN	Date calibration	Traceability
Standard Microphone	GRAS	40AN	188273	15 September 2022	GRAS
Multi-frequency Calibrator	Quest	Quest-cal	EFA000234	14 June 2022	TSI
Audio Generator	Swanick	Svap401	131	18 October 2022	WK Electric

Note

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

Calibrated By :
Mr. Noppadol Luangrat
Calibration Officer

Approved By :
Mr. Paitit Mathavon
Calibration Engineer Supervisor
Issue Date : 21 January 2022

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

เอกสารไม่ควบคุม

FSM-709-SLM-01 Rev.0 Issue date 01/07/19

Certificate No : 22-ACT-033
Request No : Req-2022-0094

1. Indication at the calibration check frequency

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

Note: Absolute sensitivity was established by the use of Sound Calibrator Broad SVANTEK, Model SV 35A, SN:38079

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139	(dB)	(\pm dB)
UUC Weighting		
A	28.1	0.10

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

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139	(dB)	(\pm dB)
UUC Weighting		
A	27.9	0.10
C	27.3	0.10
Z	31.9	0.10

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

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

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Calibration Lab. 01/07/19

เอกสารไม่ควบคุม

Certificate No : 22-ACT-033
Request No : Req-2022-0094

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

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

6. Frequency and time weightings at 1 kHz

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

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

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Calibration Lab. 01/07/19

เอกสารไม่ควบคุม

Certificate No : 22-ACT-033
Request No : Req-2022-0094

7. Long Term Stability

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

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation	UNCERTAINTY	Acceptance
FAST / A / 37-139	REF	UUC	ERR	Limit
STD dB	(dB)	(dB)	(dB)	(\pm dB)
130.00	130	130.0	0.0	1.1
134.00	134	134.0	0.0	1.1
128.00	128	128.0	0.0	1.1
124.00	124	124.0	0.0	1.1
119.00	119	119.0	0.0	1.1
114.00	114	114.0	0.0	1.1
109.00	109	109.0	0.0	1.1
104.00	104	104.0	0.0	1.1
99.00	99	99.0	0.0	1.1
94.00	94	93.9	-0.1	1.1
89.00	89	88.9	-0.1	1.1
84.00	84	83.9	-0.1	1.1
79.00	79	78.9	-0.1	1.1
74.00	74	73.9	-0.1	1.1
69.00	69	69.0	0.0	1.1
64.00	64	63.8	-0.2	1.1
59.00	59	59.0	0.0	1.1
54.00	54	54.0	0.0	1.1
49.00	49	49.0	0.0	0.8
44.00	44	44.1	0.1	1.1
39.00	39	39.3	0.3	1.1
34.00	34	34.3	0.3	1.1
29.00	29	29.3	0.3	1.1

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Calibration Lab. 01/07/19

เอกสารไม่ควบคุม

Certificate No : 22-ACT-033
Request No : Req-2022-0094

9. Level linearity including the level range control

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

10. Tone burst response

UUC Setting	STD	Anticipated	Measured	UNCERTAINTY	Acceptance
A / 37-139	Toneburst	Ref	UUC	ERR	Limit
UUC Time Response	(ms)	(dB)	(dB)	(dB)	(\pm dB)
Fast	200	135.0	135.0	0.0	1
	2	118.0	117.9	-0.1	+1.0, -2.5
	0.25	109.0	108.7	-0.3	+1.5, -5.0
Slow	200	128.6	128.3	-0.3	1
	2	109.0	108.9	-0.1	+1.0, -5.0
	200	129.0	129.0	0.0	1
SEL	2	109.0	109.1	+0.1	+1.0, -2.5
	0.25	100.0	99.9	-0.1	+1.5, -5.0

11. Peak C sound level

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

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Calibration Lab. 01/07/19

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2202097-001-01
Equipment: Digital Thermometer with RTD (pH Meter)
Resolution: 0.1 °C Model: HI 2211
Serial No.: 08165345 ID No.: UAE.WAT.004/2556
Manufacturer: HANNA INSTRUMENTS
Date of Calibration: 16 March 2022 Page 4 of 5

Location: Chemical Calibration Laboratory, National Food Institute
Environment Condition: Ambient Temperature { 23.0 ± 1.0 } °C
Relative Humidity { 50 ± 4 } %

Condition of this results of Calibration:

- 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
HANDELD THERMOMETER	1523	2118154	PSLT-085164	24-Jun-22	TISTR
Platinum Resistance Thermometer (PRT)	5827A	877332			

Support Equipment: Low Temperature Bath (SOCAL-6), Model: Europe-6 Plus Basic, S/N: 341592/2

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:

Good

7. Result of Calibration:

☒ Without adjustment

☐ After adjustment

F-CS-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2202097-001-01
Equipment: Digital Thermometer with RTD (pH Meter)
Resolution: 0.1 °C Model: HI 2211
Serial No.: 08165345 ID No.: UAE.WAT.004/2556
Manufacturer: HANNA INSTRUMENTS
Date of Calibration: 16 March 2022 Page 5 of 5

Calibration point: 15.0, 25.0 and 35.0 °C

Calibration result:

- The probe was immersed in liquid bath or dry bath to a minimum depth of 100 mm.
- Description of probe, model: N/A S/N: N/A
- Dimension of probe: Diameter 3.0 mm, Length 100 mm.
- Sheath material: Stainless Steel

UUC* Reading (°C)	Standard Temperature (°C)	Correction Value (°C)	Uncertainty ± (°C)
15.0	15.001	0.0	0.099
25.0	25.002	0.0	0.099
35.0	35.002	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 minimum approximately 95 %.

----- End -----

F-CS-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

Calibration Certificate

Certificate No.: 2103189-002-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakanong, Bangkok 10260

Page 1 of 5

Equipment: pH Meter

Manufacturer: METTLER TOLEDO

Model: SevenEasy pH

Serial No.: 1231155210

ID No.: UAE.WAT.010/2553

Order No.: 2103189

Operation No.: 2103189-002

Date of Receipt: 9 June 2021

Date of Calibration: 14 June 2021

Calibrated by Mr.Manas Somsak Expert
Approved by [Signature]
Manager, Division of Calibration Laboratory

Date of Issue: 15 June 2021 Responsible for the Technical Management Team

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: 00 Date: 14-12-61

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2103189-002-01
Equipment: pH Meter
Resolution: 0.01 pH : 1 mV
Manufacturer: METTLER TOLEDO
Serial No.: 1231155210
ID No.: UAE.WAT.010/2553
Model: SevenEasy pH
Type: Bench top

Date of Calibration: 14 June 2021 Page 2 of 5

Location: Chemical Calibration Laboratory, National Food Institute
Environment Condition: Ambient Temperature: { 23.7 ± 1.5 } °C Relative Humidity: { 53.8 ± 5 } %
Condition of Equipment: Good Condition

Condition of this Results of Calibration

1. Calibration Method: In house method: W-CO-002 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	2195007	Fluke	SIC-20F-0682	17 June 2021
2.2 Digital Thermometer	2195007	Fluke	CC-830608-01	30 October 2021
2.3 Thermo-Hygro Meter	NFLBTH00317	PONPE	GR20-1578	21 September 2021

Certified Reference Material	Lot No.	Manufacturer	Ref N	Expiry Date
2.4 pH buffer 4.008 (Primary pH buffer Solution)	710048	CPAchem	PH218.L5	2 October 2022
2.5 pH buffer 6.860 (Primary pH buffer Solution)	710048	CPAchem	PH217.L5	2 October 2022
2.6 pH buffer 10.01 (Primary pH buffer Solution)	710080	CPAchem	PH220.L5	2 October 2021
2.7 pH buffer 7.00 (Standard pH buffer Solution)	710051	CPAchem	PH107.L5	2 October 2021

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

- Instruments No.2.1 through NBO-TISI-TIS 17025 Laboratory Accreditation of Calibration No.0076
- Instruments No.2.2 through NBO-TISI-TIS 17025 Laboratory Accreditation of Calibration No.0081
- Instruments No.2.3 through NBO-TISI-TIS 17025 Laboratory Accreditation of Calibration No.0092
- Certified Reference Material No. 2.4 to 2.6 traceable to Primary measurement method: Homed cell using calibrated thermometer, ionometer, and reagent-grade Standard Solution preparation and certified by CPAchem Ltd is accredited to ISO 17034 and ISO/IEC 17025
- Certified Reference Material No. 2.7 traceable to BM RefN H-7 LotN 30.04.2020; BM RefN H-8 LotN 26.05.2020; BM RefN H-9 LotN 30.04.2020; BM RefN H-10 LotN 26.05.2020. The Standard Solution preparation and certified by CPAchem Ltd is accredited to ISO 17034 and ISO/IEC 17025

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: 00 Date: 14-12-61

เอกสารไม่ควบคุม



Calibration Report

Certificate No.: 2103189-002-01

Equipment:

pH Meter

Resolution: 0.01 pH : 1 mV

Manufacturer: METTLER TOLEDO

Model: SevenEasy pH

Serial No.: 1231155210

Type: Bench top

ID No.: UAE.WAT.0102553

Date of Calibration: 14 June 2021

Page 3 of 5

Calibration Results:

1. Calibration of pH Meter

(Manual Temperature Compensation at 25 °C)

Nominal pH	DC Voltage Standard (mV)	Average Indicator Reading		Uncertainty (± mV)	Coverage Factor (k)
		mV	pH		
0.00	414.118	414	0.00	0.58	2.00
2.00	290.811	290	2.00	0.58	2.00
4.00	177.481	178	4.00	0.58	2.00
6.00	58.160	59	6.00	0.58	2.00
7.00	0.000	0	7.00	0.58	2.00
8.00	-59.158	-59	8.00	0.58	2.00
10.00	-177.481	-177	10.00	0.58	2.00
12.00	-295.812	-296	12.00	0.58	2.00
14.00	-414.118	-414	14.00	0.58	2.00

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

Equipment: pH Electrode

Type: Combined Electrode

Manufacturer: METTLER TOLEDO

Model: InLab Solids

Serial No.: 115882

ID No.: N/A

Performance of Electrode system

(Three-Point Calibration at pH4, pH7 and pH10)

Certified Value (25 °C pH)	Average Indicator Reading		Relative Slope (%)	Uncertainty (± pH)	Coverage Factor (k)
	pH	mV			
4.008	4.01	125	99.9	0.0071	2.00
6.866	6.87	16		0.0072	2.00
8.866	8.87	16	99.0	0.0075	2.00
10.008	10.01	-166		0.0093	2.00
6.865	6.86	9	-	0.0093	2.00

F-CS-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม



Calibration Report

Certificate No.: 2103189-002-01

Equipment:

Digital Thermometer with RTD (pH Meter)

Resolution: 0.1 °C

Model: SevenEasy pH

Serial No.: 1231155210

ID No.: UAE.WAT.0102553

Manufacturer: METTLER TOLEDO

Date of Calibration: 14 June 2021

Page 4 of 5

Location:

Chemical Calibration Laboratory, National Food Institute

Environment Condition:

Ambient Temperature 24 °C ± 1 °C

Relative Humidity 54 % ± 2 %

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 640028-01	12-Dec-21	NATIONAL FOOD INSTITUTE
Platinum Resistance Thermometer (PRT)	385	509201			

Support Equipment: - Low Temperature Bath (SDCAL-6), Model: Europa-6 Plus Basic, S/N: 3415822

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:

Good

7. Result of Calibration:

☒ X

Without adjustment

☐

After adjustment

F-CS-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม



Calibration Report

Certificate No.: 2103189-002-01

Equipment:

Digital Thermometer with RTD (pH Meter)

Resolution: 0.1 °C

Model: SevenEasy pH

Serial No.: 1231155210

ID No.: UAE.WAT.0102553

Manufacturer: METTLER TOLEDO

Date of Calibration: 14 June 2021

Page 5 of 5

Calibration point: 15.0, 25.0 and 35.0 °C

Calibration result:

- The probe was immersed in liquid bath or dry bath to a minimum depth of 25 mm.

- Description of probe, model: InLab Solids S/N: 115882

Dimension of probe: Diameter 6 mm, Length 29 mm.

Sheath material: Glass

UUC* Reading (°C)	Standard Temperature (°C)	Correction Value (°C)	Uncertainty ± (°C)
15.1	15.001	-0.1	0.13
25.1	24.999	-0.1	0.13
35.1	34.999	-0.1	0.13

Note

- UUC*: Unit Under Calibration

This 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: 00 Date: 14-12-61

เอกสารไม่ควบคุม



Certificate of Calibration

Equipment:

CONDUCTIVITY METER

Certificate No.: C24220084

Model:

Lab955

Issued Date: 22 March 2022

Serial No. (or ID.):

16300356

Job No.: KSPR2203267

Manufacturer:

SI Analytics

Page: 1 of 2

Electrode Serial No.

16070067

Model: LF413T

Brand: SI Analytics

Condition:

In Condition

Customer:

United Analyst and Engineering Consultant Company Limited
3 Soi Udomsuk 41 Sukhumvit Road,
Bangkok, Prakanong, Bangkok 10260 Thailand

Environment Condition:

Temperature 23 °C ± 2 °C
Humidity 50 %RH ± 15 %RH

Calibration Place:

Environment Laboratory, SPC RT Co., Ltd.
1194 Soi Wachirathamsohit 57, Sukhumvit 101/1 Rd.,
Bangchak, Prakanong, Bangkok 10260 Thailand

Calibration By:

Mr. Wasan Nuchnabee

Calibration Date:

22 March 2022

The Method used:

In house method, SPCC-WI-49, base on ASTM D 1125-14 and D 5391-14

Traceability:

This certificate is traceable to the SI Units maintained by CRM of NIST(SRM) through
CPA chem Co., Ltd. (ISO/IEC 17034) Certificate No. 794135, 794136, 772624

(Mr. Wasan Nuchnabee)

Person in charge

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

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

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

บริษัท เอสพีอาร์ที จำกัด
SPC RT CO., LTD.
เลขที่ 0003 1194 โซ่ Wachirathamsohit 57 Sukhumvit 101/1 Road, Bangkok, Prakanong, Bangkok, 10260 Thailand
Tel: 0 289 4339 Ext. 250-328 Fax: 0 289 4434 E-mail: info@spcrt.com Website: www.spcrt.com

(Mr. Dumrong Boonsopon)

Authorized signatory

เอกสารไม่ควบคุม

SPCC-FM-C24-06, 23 Nov 2020

Calibration Results:

Before Adjustment

Standard	Unit Under Calibration	Correction	Coverage Factor	Uncertainty (±)
Conductivity Solution	Reading		(k)	
25.000 µS/cm	25.9 µS/cm	-0.900 µS/cm	2.00	0.22 µS/cm
1413.0 µS/cm	1444 µS/cm	-31.0 µS/cm	2.00	8.9 µS/cm
111.3 mS/cm	107.9 mS/cm	3.40 mS/cm	2.00	0.66 mS/cm

After Adjustment: at 1413 µS/cm

Standard	Unit Under Calibration	Correction	Coverage Factor	Uncertainty (±)
Conductivity Solution	Reading		(k)	
25.000 µS/cm	25.0 µS/cm	0.000 µS/cm	2.00	0.22 µS/cm
1413.0 µS/cm	1413 µS/cm	0.0 µS/cm	2.00	8.9 µS/cm
111.3 mS/cm	107.2 mS/cm	4.10 mS/cm	2.00	0.66 mS/cm

The End of Certificate

ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: KSPR2203267

หมายเลขเครื่อง: 16300356

ชนิดเครื่องมือ: CONDUCTIVITY METER

รุ่น: Lab955

ตรวจสอบ (วัน)	รายการตรวจเช็ค	ตรวจสอบ (ตั้ง)	หมายเหตุ
22 Mar 2022		22 Mar 2022	
ปกติ	ไม่ปกติ	ปกติ	ไม่ปกติ
General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. ความสมบูรณ์เครื่อง	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสะอาด (ช่องใส่ตัวอย่าง, ภายใน-นอกเครื่อง)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. สวิตช์ ปิด - เปิด เครื่อง (On-Off Switch)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. ปุ่มกด (Keypad)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. หน้าจอ (Display, Screen Contrast)	<input checked="" type="checkbox"/>
Spectrophotometer			
<input type="checkbox"/>	<input type="checkbox"/>	6. แบตเตอรี่ (Battery Backup) >= 2.5 VDC	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	7. ตัวหมุนเลือกความยาวคลื่น (Wavelength Control)	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	8. ความยาวคลื่น (Wavelength Check)	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	9. แหล่งกำเนิดแสง (UV < 3,000 hour)	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	10. แหล่งกำเนิดแสง (Visible < 5,000 hour)	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	11. ช่องใส่ตัวอย่าง (Carousel Module)	<input type="checkbox"/>
pH Meter and Conductivity Meter			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	12. อินดิเคเตอร์ (Electrode and Connection Cable)	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	13. ระดับสารละลายใน Electrode (Level KCl)	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	14. ฝาปิดกันปลาย Electrode (Dust Protection Hood)	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	15. ขาตั้งอินดิเคเตอร์ (Stand)	<input type="checkbox"/>
Turbidimeter			
<input type="checkbox"/>	<input type="checkbox"/>	16. ค่าความขุ่นในตัวอย่าง (No Sample)	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	17. ระดับการส่องสว่างของแสง (>= 2.5 ไมล์ใน 3.0)	<input type="checkbox"/>
Automatic titrator			
<input type="checkbox"/>	<input type="checkbox"/>	18. สภาพ Piston Burettes	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	19. Function Rinsing and Dosing	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	20. ระบบท่อสายยางและอุปกรณ์ประกอบ	<input type="checkbox"/>

ข้อแนะนำ: Electrode ควบคุมอุณหภูมิ 24.9 °C โดย Control Waterbath ที่ 25.0 ±0.1 °C

Mr. Wasan Nuchnahee
Service Engineer



Certificate of Calibration

Equipment: CONDUCTIVITY METER Certificate No.: C24210091
Model: Lab955 Issued Date: 29 March 2021
Serial No. (or ID.): 16300356 Job No.: KSPR2104894
Manufacturer: SI Analytics Page: 1 of 2
Electrode Serial No. 16070067 Model: LF413T Brand: SI Analytics
Condition: In Condition

Customer: United Analyst and Engineering Consultant Company Limited
3 Soi Udomsuk 41 Sukhumvit Road,
Bangkok, Prakanong, Bangkok 10260 Thailand

Environment Condition: Temperature 23 °C ± 2 °C
Humidity 50 %RH ± 15 %RH

Calibration Place: Environment Laboratory, SPC RT Co., Ltd.
1194 Soi Wachiratham 57, Sukhumvit 101/1 Rd.,
Bangkok, Prakanong, Bangkok 10260 Thailand

Calibration By: Mr. Imron Ama
Calibration Date: 29 March 2021
The Method used: In house method, SPCC-WI-49, base on ASTM D 1125-14 and D 5391-14
Traceability: This certificate is traceable to the CRM maintained by DAAS/DKD calibration laboratory through Radiometer Analytical Co., Ltd. Certificate No. 1561, 1515, 1377

(Mr. Imron Ama)
Person in charge

SORT
บริษัท เอสซี ซีที จำกัด
SPC RT Co., Ltd.

(Mr. Dumrong Boonsopon)
Authorized signatory

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

Certificate No.: C24210091

Page: 2 of 2

Calibration Results:

Before Adjustment

Standard	Unit Under Calibration	Correction	Coverage Factor	Uncertainty (±)
Conductivity Solution	Reading		(k)	
24.97 µS/cm	26.7 µS/cm	-1.73 µS/cm	2.00	0.52 µS/cm
1408.3 µS/cm	1439 µS/cm	-30.7 µS/cm	2.00	7.8 µS/cm
111.31 mS/cm	112.4 mS/cm	-1.09 mS/cm	2.00	0.58 mS/cm

After Adjustment: at 1408.3 µS/cm

Standard	Unit Under Calibration	Correction	Coverage Factor	Uncertainty (±)
Conductivity Solution	Reading		(k)	
24.97 µS/cm	25.8 µS/cm	-0.83 µS/cm	2.00	0.52 µS/cm
1408.3 µS/cm	1410 µS/cm	-1.7 µS/cm	2.00	7.8 µS/cm
111.31 mS/cm	110.1 mS/cm	1.21 mS/cm	2.00	0.58 mS/cm

The End of Certificate

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

REPORT OF CALIBRATION

Certificate No. : SP22-007 Page 2 of 5

Environment Condition : Ambient Temperature 25 ± 5 °C
Relative humidity 55 ± 20 %RH

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

Certified Reference Materials :

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

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

Spectral Band Width of UUC : 4.0 nm.

Scan Speed of UUC : 200 nm/min

Scan Interval of UUC : 0.1 nm.

Resolution of UUC : Photometric 0.001 Abs.
Wavelength 0.1 nm.

FM-708-02 R01 1/11/2021

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REPORT OF CALIBRATION

Certificate No. : SP22-007 Page 3 of 5

Calibration Results : Without adjustment

Photometric Accuracy :

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

FM-708-02 R01 1/11/2021

เอกสารไม่ควบคุม

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REPORT OF CALIBRATION

Certificate No. : SP22-007 Page 4 of 5

Photometric Accuracy :

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

FM-708-02 R01 1/11/2021

เอกสารไม่ควบคุม

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REPORT OF CALIBRATION

Certificate No. : SP22-007 Page 5 of 5

Wavelength Accuracy :

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

Remark : - UUC = Unit Under Calibration

- N/A = Not Available

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

- * Indicates non TISI accredited

- End of Certificate -

FM-708-02 R01 1/11/2021

เอกสารไม่ควบคุม

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

CERTIFICATE OF CALIBRATION

Certificate No.: SP22-008 Page 1 of 5

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

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

Location of calibration : Laboratory 213

Equipment : UV-Vis Spectrophotometer

Manufacturer : Hitachi

Model : U-2900

Serial No. : 21E22-009


ID No. : UAE.WAT.051/2564

Received Date : 20 January 2022

Calibration Date : 20 January 2022

Issue Date : 24 January 2022

Condition Instrument : Good

Calibrated by :  Approved by : 
(Mr. Tanawat Rintiduch) (Ms. Chonchicha Sangsena)
Technical Manager Quality Manager

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

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

FM-708-02 R01 1/11/2021

เอกสารไม่ควบคุม

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

REPORT OF CALIBRATION

Certificate No.: SP22-008 Page 2 of 5

Environment Condition : Ambient Temperature 25 ± 5 °C
Relative humidity 55 ± 20 %RH

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

Certified Reference Materials :

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

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

Spectral Band Width of UUC : 1.5 nm.

Scan Speed of UUC : 200 nm/min

Scan Interval of UUC : 0.1 nm.

Resolution of UUC : Photometric 0.001 Abs.
Wavelength 0.1 nm.

FM-708-02 R01 1/11/2021

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REPORT OF CALIBRATION

Certificate No.: SP22-008 Page 3 of 5

Calibration Results : Without adjustment

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
420	0.0000	0.000	0.0000	0.0028	2.00
	0.5787	0.576	0.0027	0.0031	2.00
	1.0490	1.046	0.0030	0.0029	2.00
	2.1900	2.182	0.0080	0.0075	2.00
440	0.0000	0.000	0.0000	0.0028	2.00
	0.5607	0.559	0.0017	0.0034	2.00
	1.0247	1.023	0.0017	0.0035	2.00
	2.1229	2.116	0.0069	0.0079	2.00
465	0.0000	0.000	0.0000	0.0028	2.00
	0.5236	0.521	0.0026	0.0030	2.00
	0.9634	0.962	0.0014	0.0029	2.00
	1.9763	1.970	0.0063	0.0070	2.00
546.1	0.0000	0.000	0.0000	0.0028	2.00
	0.5191	0.519	0.0001	0.0031	2.00
	1.0003	0.999	0.0013	0.0033	2.00
	1.9987	1.992	0.0067	0.0084	2.00
590	0.0000	0.000	0.0000	0.0028	2.00
	0.5523	0.552	0.0003	0.0030	2.00
	1.0809	1.080	0.0009	0.0030	2.00
	2.0391	2.031	0.0081	0.0079	2.00
635	0.0000	0.000	0.0000	0.0028	2.00
	0.5601	0.560	0.0001	0.0031	2.00
	1.0512	1.052	-0.0008	0.0030	2.00
	1.9294	1.922	0.0074	0.0079	2.00

FM-708-02 R01 1/11/2021

เอกสารไม่ควบคุม

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REPORT OF CALIBRATION

Certificate No.: SP22-008 Page 4 of 5

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
235	0.0000	0.000	0.0000	0.0050	2.00
	0.7478	0.747	0.0008	0.0057	2.00
257	0.0000	0.000	0.0000	0.0050	2.00
	0.8686	0.865	0.0036	0.0059	2.00
313	0.0000	0.000	0.0000	0.0050	2.00
	0.2912	0.290	0.0012	0.0051	2.00
350	0.0000	0.000	0.0000	0.0050	2.00
	0.6448	0.640	0.0048	0.0055	2.00

FM-708-02 R01 1/11/2021

เอกสารไม่ควบคุม

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

REPORT OF CALIBRATION

Certificate No. : SP22-008 Page 5 of 5

Wavelength Accuracy :

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor k
241.72	241.0	0.72	0.18	2.00
279.45	279.0	0.45	0.18	2.00
287.81	287.0	0.81	0.18	2.00
334.06	333.5	0.56	0.18	2.00
360.93	360.0	0.93	0.18	2.00
418.59	418.0	0.59	0.18	2.00
445.94	445.5	0.44	0.18	2.00
453.66	453.0	0.66	0.18	2.00
460.02	459.5	0.52	0.18	2.00
536.59	536.0	0.59	0.18	2.00
637.98	637.5	0.48	0.18	2.00
431.38	431.0	0.38	0.18	2.00
472.50	472.0	0.50	0.18	2.00
513.47	513.0	0.47	0.18	2.00
528.88	528.5	0.38	0.18	2.00
573.17	573.0	0.17	0.18	2.00
585.35	585.0	0.35	0.20	2.00
684.40	684.0	0.40	0.18	2.00
740.72	740.5	0.22	0.20	2.00
748.55	748.5	0.05	0.18	2.00
807.03	807.0	0.03	0.18	2.00
879.28	879.5	-0.22	0.18	2.00

Remark : - UUC = Unit Under Calibration

- N/A = Not Available

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

- * Indicates non TISI accredited

- End of Certificate -

FM-510-02 R03 1/11/2021

เอกสารไม่ควบคุม

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

CERTIFICATE OF CALIBRATION

Certificate No. : SP21-015 Page 1 of 5

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

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

Location of calibration : Laboratory 315

Equipment : Spectrophotometer

Manufacturer : Agilent Technologies

Model : Cary 60

Serial No. : MY15410009

ID No. : N/A

Received Date : 29 May 2021

Calibration Date : 29 May 2021

Issue Date : 30 May 2021

Condition of Instrument : Used

Calibrated by : ทินวุฒิ (Mr.Tanawat Ritidsach) **Approved by :** ชูฉิชา (Miss Chonthicha Sangsarn) **Quality Manager**

The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.
The measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the DQE Services Co., Ltd.

FM-510-02 R03 1/10/2021

เอกสารไม่ควบคุม

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

REPORT OF CALIBRATION

Certificate No. : SP21-015 Page 2 of 5

Environment Condition : Ambient Temperature 25 ± 5 °C
Relative humidity 50 ± 15 %RH

Calibration method : In-house method CP-01 Calibration of UV-Vis Spectrophotometer Based on ASTM E275-08

Certified Reference Materials :

Material	Serial No.	Certificate No.	Due date
Absorbance Standard set	25760	80102	11/7/2021
Absorbance Standard set	25757	80105	11/7/2021
Wavelength Standard set	25806	80103	11/7/2021
Wavelength Standard set	25758	80104	11/7/2021

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

Spectral Band Width of UUC : 1.5 nm.

Scan Speed of UUC : 90 nm./min

Scan Interval of UUC : 0.15 nm.

Resolution of UUC : Photometric 0.0001 Abs.
Wavelength 0.1 nm.

FM-510-02 R03 1/10/2021

เอกสารไม่ควบคุม

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REPORT OF CALIBRATION

Certificate No. : SP21-015 Page 3 of 5

Wavelength Accuracy :

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor k
241.72	242.0	-0.28	0.19	2.00
279.45	279.5	-0.05	0.19	2.00
287.81	287.9	-0.09	0.19	2.00
334.06	333.8	0.26	0.19	2.00
360.93	360.5	0.43	0.19	2.00
418.59	418.2	0.39	0.19	2.00
445.94	445.6	0.34	0.19	2.00
453.66	453.3	0.36	0.19	2.00
460.02	459.8	0.22	0.19	2.00
536.59	536.7	-0.11	0.19	2.00
637.98	638.4	-0.42	0.19	2.00
431.38	430.9	0.48	0.19	2.00
472.50	472.5	0.00	0.19	2.00
513.47	513.4	0.07	0.19	2.00
528.88	529.2	-0.32	0.19	2.00
573.17	573.5	-0.33	0.19	2.00
585.35	584.8	0.55	0.20	2.00
684.40	684.9	-0.50	0.19	2.00
740.72	740.4	0.32	0.19	2.00
748.55	749.0	-0.45	0.19	2.00
807.03	807.1	-0.07	0.19	2.00
879.28	879.4	-0.12	0.19	2.00

FM-510-02 R03 1/10/2021

เอกสารไม่ควบคุม

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

REPORT OF CALIBRATION

Certificate No. : SP21-015 Page 4 of 5

Calibration Results : Without adjustment

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
420	0.0000	0.0000	0.0000	0.0042	2.00
	0.5791	0.5767	0.0024	0.0042	2.00
	1.0488	1.0444	0.0044	0.0042	2.00
	2.1914	2.1841	0.0073	0.0092	2.00
440	0.0000	0.0001	-0.0001	0.0042	2.00
	0.5618	0.5609	0.0009	0.0042	2.00
	1.0260	1.0244	0.0016	0.0042	2.00
	2.1259	2.1192	0.0067	0.0091	2.00
465	0.0000	0.0000	0.0000	0.0042	2.00
	0.5240	0.5212	0.0028	0.0042	2.00
	0.9639	0.9632	0.0007	0.0042	2.00
	1.9788	1.9717	0.0071	0.0091	2.00
546.1	0.0000	-0.0001	0.0001	0.0042	2.00
	0.5194	0.5184	0.0010	0.0042	2.00
	0.9991	0.9991	0.0000	0.0042	2.00
	1.9970	1.9911	0.0059	0.0093	2.00
590	0.0000	0.0000	0.0000	0.0042	2.00
	0.5523	0.5517	0.0006	0.0042	2.00
	1.0810	1.0802	0.0008	0.0042	2.00
	2.0369	2.0293	0.0076	0.0092	2.00
635	0.0000	-0.0001	0.0001	0.0042	2.00
	0.5596	0.5593	0.0003	0.0042	2.00
	1.0513	1.0505	0.0008	0.0042	2.00
	1.9268	1.9217	0.0051	0.0092	2.00

PM-519-02 R03 11/03/2011

เอกสารไม่ควบคุม

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

REPORT OF CALIBRATION

Certificate No. : SP21-015 Page 5 of 5

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
235	0.0000	0.0001	-0.0001	0.0075	2.00
	0.7498	0.7438	0.0060	0.0075	2.00
257	0.0000	0.0000	0.0000	0.0075	2.00
	0.8712	0.8647	0.0065	0.0075	2.00
313	0.0000	0.0000	0.0000	0.0075	2.00
	0.2920	0.2900	0.0020	0.0075	2.00
350	0.0000	0.0000	0.0000	0.0075	2.00
	0.6459	0.6428	0.0031	0.0075	2.00

Remark : - UUC = Unit Under Calibration
- N/A = Not Available
- The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor k, which for a normal distribution corresponds to a coverage probability of approximately 95%
- End of Certificate -

PM-519-02 R03 11/03/2011

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Request No. 25-64 / 0247 **MTC. ACL.No. 335 / 64**

CALIBRATION CERTIFICATE

NOMENCLATURE : 1. Atomic Absorption Spectrophotometer "Agilent Technologies" Model AA240FS
Serial No. MY13160001

2. Working standard solution "Merck", "PerkinElmer Pure"

Cadmium Lot No. 24-155CDY1, Chromium Lot No. 24-112CRAY1, Copper Lot No. 24-154CUY1, Iron Lot No. HC90432981, Lead Lot No. 24-162PBY1, Manganese Lot No. 24-146MNY1, Nickel Lot No. 24-187NY1, Zinc Lot No. 24-173ZNY1

SUBMITTED BY : United Analyst and Engineering Consultant Co., Ltd.
3 Sol Udomsuk41, Sukhumvit Road, Bangchak, Prakanong, Bangkok 10260

CALIBRATION PROCEDURE : 1. Performance Verification of Atomic Absorption Spectrophotometer (WI-500-02-30)
2. Estimation Uncertainty of Measurement in Analytical Chemistry (QP-513)



REFERENCE MATERIAL : Traceable to NIST "Agilent Technologies", "AccuStandard"

Cadmium Lot No. 0099663190, Chromium Lot No. 010187438, Copper Lot No. 0101965266, Iron Lot No. 216025090, Lead Lot No. 0104659412, Manganese Lot No. 0106301916, Nickel Lot No. 0984273115, Zinc Lot No. 216035069

CALIBRATION RANGE: 0.02,0.10,0.30,0.50,0.70 mg/L at 228.8 nm.Cd, 0.10,0.20,0.30,0.50,0.70 mg/L at 357.9 nm.Cr, 0.05,0.10,0.30,0.50,0.70 mg/L at 324.7 nm.Cu, 0.10,0.30,0.50,0.70,1.00 mg/L at 248.3 nm.Fe, 0.20,0.50,0.70,1.00,1.50 mg/L at 217.0 nm.Pb, 0.05,0.10,0.30,0.50,0.70 mg/L at 279.5 nm.Mn, 0.10,0.30,0.50,0.70,1.00 mg/L at 232.0 nm.Ni, 0.05,0.10,0.30,0.50,0.70 mg/L at 213.9 nm.Zn

AMBIENT CONDITIONS : Temperature 19.9 °C Relative humidity 46 %

The Atomic Absorption Spectrophotometer set has been calibrated against Reference Material traceable to National Institute of Standards and Technology (NIST) by The Analytical Chemistry Laboratory. The results are attached herewith.

Calibrated by  (Mr. Danai Srithongkum) Approved by  (Mrs. Thippaya Junvee Fortune)
Director of Analytical Chemistry Laboratory
Ref. 2025264011500187001
Calibration Date : 4 February 2021

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Request No. 25-64 / 0247 **1 / 5** **MTC. ACL. No. 335 / 64**

CALIBRATION DATA

1. Noise Level in term of standard deviation

Element	Cd	Cr	Cu	Fe	Pb	Mn	Ni	Zn
Absorbance	0.0009	-0.0003	-0.0004	-0.0011	-0.0001	-0.0003	-0.0002	0.0019
	0.0002	-0.0016	0.0003	0.0011	-0.0010	-0.0004	-0.0016	0.0006
	-0.0002	-0.0006	0.0001	-0.0007	-0.0006	-0.0003	-0.0014	0.0019
	0.0002	-0.0012	0.0002	-0.0010	-0.0013	-0.0010	-0.0017	0.0015
	0.0009	-0.0025	-0.0002	-0.0008	-0.0002	-0.0016	-0.0010	0.0011
	0.0001	-0.0023	0.0005	-0.0013	0.0000	-0.0001	-0.0005	0.0009
	0.0010	-0.0005	-0.001	0.0003	-0.0005	-0.0014	0.0006	0.0015
	0.0007	0.0000	0.0002	-0.0009	-0.0003	-0.0010	-0.0016	0.0011
	0.0005	-0.0006	-0.0004	-0.0009	0.0000	-0.0006	-0.0012	0.0011
	0.0007	-0.0013	-0.0003	-0.0005	-0.0007	-0.0001	-0.0003	0.0016
	0.0009	-0.0015	-0.0009	-0.0012	0.0002	-0.0006	-0.0015	0.0010
	0.0014	0.0006	-0.001	-0.0006	-0.0014	-0.0012	-0.0013	0.0005
	0.0002	0.0001	0.0003	-0.0003	-0.0006	-0.0013	-0.0006	0.0001
	0.0003	-0.0008	-0.0007	-0.0015	-0.0008	-0.0006	-0.0007	0.0011
	0.0008	-0.0011	0.0001	-0.0002	-0.0002	-0.0014	-0.0001	0.0002
	0.0000	-0.0006	-0.0005	-0.0018	0.0005	-0.0011	-0.0013	0.0007
	0.0001	0.0007	-0.0004	-0.0016	-0.0001	-0.0011	-0.0018	0.0013
	-0.0002	-0.0013	0.0000	-0.0008	-0.0008	-0.0005	-0.0007	0.0016
	0.0006	0.0003	0.0002	-0.0002	0.0000	-0.0013	-0.0011	0.0007
	0.0004	0.0004	0.0005	-0.0025	0.0001	-0.0014	-0.0014	0.0012
Average Absorbance	0.000	-0.001	0.000	-0.001	0.000	-0.001	-0.001	0.001
Standard Deviation	0.0004	0.0009	0.0005	0.0008	0.0005	0.0005	0.0006	0.0005

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INDUSTRIAL METROLOGY AND TESTING SERVICE CENTRE

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Request No. 25-64 / 0247

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MTC. ACL. No. 335 / 64

2. Precision

Element	Conc. (mg/l)	Absorbance										Ave. Abs.	SD	%RSD
Cd	0.02	0.0075	0.0072	0.0069	0.0072	0.0069	0.0073	0.0075	0.0074	0.0083	0.0081	0.007	0.0005	6.19
	0.30	0.0944	0.0947	0.0949	0.0936	0.0947	0.0942	0.0950	0.0938	0.0942	0.0945	0.094	0.0005	0.48
	0.70	0.2154	0.2157	0.2156	0.2157	0.2158	0.2158	0.2157	0.2163	0.2167	0.2162	0.216	0.0004	0.18
Cr	0.10	0.0070	0.0079	0.0076	0.0084	0.0079	0.0082	0.0092	0.0094	0.0089	0.0076	0.008	0.0008	9.35
	0.30	0.0202	0.0226	0.0206	0.0207	0.0222	0.0209	0.0223	0.0215	0.0221	0.0222	0.022	0.0009	4.00
	0.70	0.0439	0.0453	0.0455	0.0425	0.0438	0.0449	0.0441	0.0452	0.0447	0.0452	0.045	0.0009	2.10
Cu	0.05	0.0071	0.0081	0.0074	0.0070	0.0070	0.0065	0.0072	0.0077	0.0073	0.0067	0.007	0.0005	6.34
	0.30	0.0411	0.0411	0.0426	0.0420	0.0419	0.0409	0.0413	0.0414	0.0419	0.0411	0.042	0.0005	1.21
	0.70	0.0909	0.0899	0.0905	0.0906	0.0904	0.0897	0.0905	0.0902	0.0899	0.0904	0.090	0.0004	0.41
Fe	0.10	0.0077	0.0078	0.0080	0.0071	0.0074	0.0086	0.0076	0.0081	0.0085	0.0088	0.008	0.0005	6.89
	0.50	0.0409	0.0405	0.0410	0.0406	0.0410	0.0404	0.0408	0.0404	0.0400	0.0401	0.040	0.0004	0.92
	1.00	0.0797	0.0795	0.0805	0.0789	0.0791	0.0813	0.0795	0.0806	0.0806	0.0794	0.080	0.0008	0.98
Pb	0.20	0.0082	0.0086	0.0102	0.0086	0.0087	0.0091	0.0086	0.0089	0.0083	0.0088	0.009	0.0006	6.34
	0.70	0.0327	0.0314	0.0312	0.0325	0.0331	0.0312	0.0321	0.0322	0.0320	0.0317	0.032	0.0006	2.01
	1.50	0.0673	0.0678	0.0677	0.0677	0.0686	0.0673	0.0663	0.0672	0.0673	0.0675	0.067	0.0006	0.84
Mn	0.05	0.0095	0.0102	0.0100	0.0096	0.0105	0.0100	0.0102	0.0101	0.0096	0.0100	0.010	0.0003	3.17
	0.30	0.0626	0.0626	0.0622	0.0621	0.0605	0.0628	0.0618	0.0626	0.0620	0.0626	0.062	0.0007	1.08
	0.70	0.1397	0.1404	0.1415	0.1407	0.1404	0.1388	0.1424	0.1412	0.1408	0.1399	0.141	0.0010	0.71
Ni	0.10	0.0088	0.0087	0.0093	0.0090	0.0086	0.0082	0.0088	0.0089	0.0084	0.0096	0.009	0.0004	4.62
	0.50	0.0455	0.0445	0.0460	0.0469	0.0457	0.0471	0.0462	0.0466	0.0468	0.0444	0.046	0.0010	2.08
	1.00	0.0865	0.0878	0.0858	0.0872	0.0858	0.0862	0.0846	0.0867	0.0863	0.0865	0.086	0.0009	1.00
Zn	0.05	0.0323	0.0328	0.0331	0.0326	0.0338	0.0325	0.0340	0.0331	0.0340	0.0327	0.033	0.0006	1.91
	0.30	0.1735	0.1734	0.1743	0.1734	0.1751	0.1734	0.1719	0.1731	0.1724	0.1740	0.173	0.0007	0.40
	0.70	0.3552	0.3551	0.3564	0.3530	0.3560	0.3564	0.3577	0.3559	0.3586	0.3559	0.356	0.0015	0.42

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Request No. 25-64 / 0247

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MTC. ACL. No. 335 / 64

3. Accuracy

3.1 Reading on wavelength- Cadmium(Cd) at 228.8 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Cd	0.020	0.019	-0.001	5.00	± 0.005
	0.300	0.302	0.002	0.67	± 0.006
	0.700	0.698	-0.002	0.29	± 0.012

3.2 Reading on wavelength- Chromium (Cr) at 357.9 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Cr	0.100	0.106	0.006	6.00	± 0.015
	0.300	0.308	0.008	2.67	± 0.019
	0.700	0.657	-0.043	6.14	± 0.032

3.3 Reading on wavelength- Copper (Cu) at 324.7 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Cu	0.04955	0.050	0.000	0.91	± 0.004
	0.29730	0.316	0.019	6.29	± 0.009
	0.69370	0.696	0.002	0.33	± 0.018

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INDUSTRIAL METROLOGY AND TESTING SERVICE CENTRE

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Request No. 25-64 / 0247

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MTC. ACL. No. 335 / 64

3.4 Reading on wavelength- Iron (Fe) at 248.3 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Fe	0.100	0.091	-0.009	9.00	± 0.012
	0.500	0.485	-0.015	3.00	± 0.015
	1.000	0.960	-0.040	4.00	± 0.060

3.5 Reading on wavelength- Lead (Pb) at 217.0 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Pb	0.1988	0.205	0.006	3.12	± 0.013
	0.6958	0.703	0.007	1.03	± 0.018
	1.4910	1.463	-0.028	1.88	± 0.033

3.6 Reading on wavelength- Manganese (Mn) at 279.5 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Mn	0.04955	0.049	-0.001	1.11	± 0.005
	0.29730	0.307	0.0097	3.26	± 0.007
	0.69370	0.694	0.0003	0.04	± 0.013

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INDUSTRIAL METROLOGY AND TESTING SERVICE CENTRE

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Request No. 25-64 / 0247

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MTC. ACL. No. 335 / 64

3.7 Reading on wavelength- Nickel (Ni) at 232.0 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Ni	0.1003	0.099	-0.001	1.30	± 0.010
	0.5015	0.525	0.024	4.69	± 0.025
	1.0030	0.987	-0.016	1.60	± 0.045

3.8 Reading on wavelength- Zinc (Zn) at 213.9 nm.

Element	Standard Value of RM (mg/l)	Reading (mg/l)	Error of Measurement (mg/l)	Error of Measurement (%)	Uncertainty (mg/l)
Zn	0.050	0.046	-0.004	8.00	± 0.011
	0.300	0.322	0.022	7.33	± 0.021
	0.700	0.681	-0.019	2.71	± 0.042

Remark : The reported uncertainty is an expanded uncertainty calculated using a coverage factor of 2 (k = 2)
which gives a level of confidence of approximately 95%

Calibrated by: [Signature]
(Mr. Danai Srithongkum)

Approved by: [Signature]
(Mrs. Thippaya Junvee Fortune)

Director of Analytical Chemistry Laboratory
Calibration date : 4 February 2021

INDUSTRIAL METROLOGY AND TESTING SERVICE CENTRE

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Request No. 25-65 / 0398

MTC. ACL.No. 486 / 65

CALIBRATION CERTIFICATE

NOMENCLATURE : 1. Atomic Absorption Spectrophotometer "Agilent Technologies"

Model AA240FS, Serial No. MY13160001

2. Working standard solution "Inorganic Ventures"

Multi Analyte Custom Grade Solution, Lot No. P2-ME8675610

SUBMITTED BY: United Analyst and Engineering Consultant Co., Ltd.

3 Soi Udomsuk41, Sukhumvit Road, Bangchak, Prakanong, Bangkok 10260

CALIBRATION PROCEDURE : 1. Performance Verification of Atomic Absorption Spectrophotometer (WI-500-02-30)

2. Estimation Uncertainty of Measurement in Analytical Chemistry (QR-513)

REFERENCE MATERIAL : Traceable to NIST "Agilent Technologies", "Carlo Erba"

Cadmium Lot No. 0108047046, Chromium Lot No. 0106315418, Copper Lot No. 0107480530, Iron Lot No. 0104697566,

Lead Lot No. 0104659473, Manganese Lot No. T109228A, Nickel Lot No. 0104978044, Zinc Lot No. 0100792297

CALIBRATION RANGE: 0.02,0.10,0.30,0.50,0.70 mg/L at 228.8 nm.Cd, 0.10,0.20,0.30,0.50,0.70 mg/L at 357.9 nm.Cr,

0.05,0.10,0.30,0.50,0.70 mg/L at 324.7 nm.Cu, 0.10,0.30,0.50,0.70,1.00 mg/L at 248.3 nm.Fe, 0.20,0.50,0.70,1.00,1.50 mg/L

at 217.0 nm.Pb, 0.05,0.10,0.30,0.50,0.70 mg/L at 279.5 nm.Mn, 0.10,0.30,0.50,0.70,1.00 mg/L at 252.0 nm.Ni,

0.05,0.10,0.30,0.50,0.70 mg/L at 213.9 nm.Zn

AMBIENT CONDITIONS : Temperature 22 °C Relative humidity 60 %

The Atomic Absorption Spectrophotometer set has been calibrated against Reference Material traceable to National Institute of Standards and Technology (NIST) by The Analytical Chemistry Laboratory. The results are attached herewith.

Calibrated by (Mr. Danai Srithongkum)

Approved by (Mrs. Thippaya Jaisri Fortune)
Director of Analytical Chemistry Laboratory
Ref. 2025265020400522001
Calibration Date : 3 February 2022

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

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Request No. 25-65 / 0398

1 / 5

MTC. ACL. No. 486 / 65

CALIBRATION DATA

1. Noise Level in term of standard deviation

Element	Cd	Cr	Cu	Fe	Pb	Mn	Ni	Zn
Absorbance	-0.0004	0.0002	0.0007	0.0002	-0.0016	-0.0001	-0.0004	-0.0001
	0.0002	-0.0005	0.0010	0.0007	0.0000	-0.0003	0.0007	-0.0014
	-0.0002	0.0001	0.0008	0.0000	-0.0001	-0.0003	-0.0012	-0.0006
	0.0000	-0.0007	0.0007	0.0000	-0.0005	-0.0004	-0.0004	-0.0012
	0.0001	0.0004	0.0013	0.0014	-0.0001	-0.0001	0.0003	-0.0008
	0.0000	-0.0004	0.0003	-0.0012	-0.0005	-0.0007	-0.0004	-0.0008
	0.0000	-0.0009	0.0009	-0.0002	-0.0010	-0.0008	0.0007	-0.0003
	-0.0004	-0.0003	0.0015	0.0010	-0.0005	-0.0003	-0.0002	-0.0004
	0.0004	0.0006	0.0014	-0.0004	-0.0014	-0.0005	-0.0006	-0.0003
	-0.0006	-0.0013	0.0012	-0.0006	-0.0006	-0.0006	-0.0007	-0.0007
	0.0005	-0.0003	0.0014	-0.0004	-0.0008	-0.0003	-0.0006	-0.0011
	-0.0007	-0.0014	0.0004	-0.0001	-0.0001	0.0000	0.0000	-0.0003
	0.0008	0.0004	0.0005	-0.0006	-0.0008	0.0000	-0.0005	-0.0009
	0.0011	0.0002	0.0005	0.0017	-0.0016	-0.0008	0.0004	-0.0005
	0.0002	0.0010	0.0014	-0.0002	-0.0010	-0.0010	0.0002	-0.0001
	0.0001	-0.0011	0.0011	-0.0003	-0.0011	-0.0003	-0.0008	-0.0012
	0.0000	-0.0015	0.0009	-0.0010	-0.0011	-0.0013	0.0000	-0.0004
	0.0015	-0.0012	0.0005	0.0002	-0.0017	-0.0001	0.0005	-0.0002
	0.0006	0.0014	0.0010	0.0002	-0.0003	0.0001	-0.0006	-0.0010
	0.0001	0.0003	0.0003	-0.0001	-0.0004	-0.0002	-0.0001	-0.0001
Average Absorbance	0.000	0.000	0.001	0.000	-0.001	0.000	0.000	-0.001
Standard Deviation	0.0005	0.0008	0.0004	0.0007	0.0005	0.0004	0.0005	0.0004

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Request No. 25-65 / 0398

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MTC. ACL. No. 486 / 65

2. Precision

Element	Conc. (mg/L)	Absorbance										Ave. Abs.	SD	%RSD
Cd	0.02	0.0074	0.0062	0.0065	0.0062	0.0070	0.0068	0.0070	0.0065	0.0065	0.0069	0.007	0.0004	5.76
	0.30	0.0952	0.0959	0.0951	0.0957	0.0952	0.0950	0.0952	0.0948	0.0956	0.0943	0.095	0.0005	0.49
	0.70	0.2213	0.2180	0.2203	0.2208	0.2234	0.2211	0.2196	0.2219	0.2201	0.2194	0.221	0.0015	0.67
Cr	0.10	0.0096	0.0098	0.0097	0.0102	0.0106	0.0097	0.0098	0.0099	0.0103	0.0093	0.010	0.0004	3.83
	0.30	0.0309	0.0302	0.0300	0.0316	0.0306	0.0299	0.0309	0.0297	0.0311	0.0296	0.030	0.0007	2.20
	0.70	0.0659	0.0667	0.0664	0.0668	0.0656	0.0662	0.0658	0.0638	0.0638	0.0669	0.066	0.0011	1.70
Cu	0.05	0.0080	0.0075	0.0078	0.0075	0.0077	0.0081	0.0080	0.0075	0.0074	0.0076	0.008	0.0003	3.26
	0.30	0.0417	0.0419	0.0412	0.0421	0.0424	0.0420	0.0423	0.0403	0.0418	0.0415	0.042	0.0006	1.47
	0.70	0.0969	0.0965	0.0972	0.0957	0.0961	0.0958	0.0961	0.0963	0.0959	0.0972	0.096	0.0006	0.58
Fe	0.10	0.0090	0.0105	0.0078	0.0099	0.0091	0.0093	0.0096	0.0094	0.0093	0.0084	0.009	0.0007	8.11
	0.50	0.0462	0.0470	0.0464	0.0466	0.0467	0.0462	0.0467	0.0460	0.0468	0.0466	0.047	0.0003	0.67
	1.00	0.0867	0.0886	0.0910	0.0892	0.0897	0.0873	0.0892	0.0885	0.0888	0.0874	0.089	0.0013	1.41
Pb	0.20	0.0091	0.0095	0.0088	0.0087	0.0082	0.0094	0.0090	0.0087	0.0082	0.0090	0.009	0.0004	4.94
	0.70	0.0322	0.0321	0.0324	0.0318	0.0335	0.0326	0.0327	0.0315	0.0336	0.0321	0.032	0.0007	2.09
	1.50	0.0653	0.0645	0.0663	0.0664	0.0652	0.0671	0.0662	0.0666	0.0657	0.0648	0.066	0.0008	1.28
Mn	0.05	0.0092	0.0092	0.0097	0.0087	0.0085	0.0079	0.0096	0.0085	0.0084	0.0099	0.009	0.0007	7.33
	0.30	0.0616	0.0630	0.0632	0.0633	0.0634	0.0628	0.0640	0.0633	0.0640	0.0629	0.063	0.0007	1.08
	0.70	0.1396	0.1366	0.1386	0.1377	0.1386	0.1386	0.1396	0.1380	0.1374	0.1383	0.138	0.0009	0.67
Ni	0.10	0.0102	0.0092	0.0097	0.0104	0.0091	0.0105	0.0105	0.0096	0.0098	0.0102	0.010	0.0005	5.22
	0.50	0.0488	0.0489	0.0489	0.0495	0.0484	0.0490	0.0481	0.0492	0.0495	0.0492	0.049	0.0004	0.91
	1.00	0.0976	0.0979	0.0975	0.0992	0.0977	0.0973	0.0986	0.0962	0.0985	0.0982	0.098	0.0008	0.85
Zn	0.05	0.0340	0.0349	0.0340	0.0352	0.0337	0.0351	0.0344	0.0346	0.0349	0.0343	0.035	0.0005	1.49
	0.30	0.1669	0.1653	0.1628	0.1642	0.1657	0.1637	0.1659	0.1652	0.1654	0.1657	0.165	0.0012	0.72
	0.70	0.3456	0.3467	0.3445	0.3430	0.3422	0.3444	0.3437	0.3438	0.3435	0.3438	0.344	0.0013	0.37

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Request No. 25-65 / 0398

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MTC. ACL. No. 486 / 65

3. Trueness

3.1 Reading on wavelength- Cadmium(Cd) at 228.8 nm.

Element	Standard Value of RM (mg/L)	Reading (mg/L)	Error of Measurement (mg/L)	Error of Measurement (%)	Uncertainty (mg/L)
Cd	0.02004	0.019	-0.001	5.19	± 0.004
	0.30060	0.291	-0.010	3.19	± 0.006
	0.70140	0.678	-0.023	3.34	± 0.012

3.2 Reading on wavelength- Chromium (Cr) at 357.9 nm.

Element	Standard Value of RM (mg/L)	Reading (mg/L)	Error of Measurement (mg/L)	Error of Measurement (%)	Uncertainty (mg/L)
Cr	0.1002	0.101	0.001	0.80	± 0.007
	0.3006	0.298	-0.003	0.86	± 0.012
	0.7014	0.635	-0.066	9.47	± 0.023

3.3 Reading on wavelength- Copper (Cu) at 324.7 nm.

Element	Standard Value of RM (mg/L)	Reading (mg/L)	Error of Measurement (mg/L)	Error of Measurement (%)	Uncertainty (mg/L)
Cu	0.0502	0.046	-0.004	8.37	± 0.004
	0.3012	0.295	-0.006	2.06	± 0.010
	0.7028	0.694	-0.009	1.25	± 0.021

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MTC. ACL. No. 486 / 65

3.4 Reading on wavelength- Iron (Fe) at 248.3 nm.

Element	Standard Value of RM (mg/L)	Reading (mg/L)	Error of Measurement (mg/L)	Error of Measurement (%)	Uncertainty (mg/L)
Fe	0.1003	0.106	0.006	5.68	± 0.008
	0.5015	0.522	0.021	4.09	± 0.017
	1.0030	0.993	-0.010	1.00	± 0.032

3.5 Reading on wavelength- Lead (Pb) at 217.0 nm.

Element	Standard Value of RM (mg/L)	Reading (mg/L)	Error of Measurement (mg/L)	Error of Measurement (%)	Uncertainty (mg/L)
Pb	0.1988	0.197	-0.002	0.91	± 0.014
	0.6958	0.722	0.026	3.77	± 0.022
	1.4910	1.463	-0.028	1.88	± 0.041

3.6 Reading on wavelength- Manganese (Mn) at 279.5 nm.

Element	Standard Value of RM (mg/L)	Reading (mg/L)	Error of Measurement (mg/L)	Error of Measurement (%)	Uncertainty (mg/L)
Mn	0.04955	0.054	0.004	8.98	± 0.004
	0.29730	0.317	0.0197	6.63	± 0.006
	0.69370	0.682	-0.0117	1.69	± 0.012

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MTC. ACL. No. 486 / 65

3.7 Reading on wavelength- Nickel (Ni) at 232.0 nm.

Element	Standard Value of RM (mg/L)	Reading (mg/L)	Error of Measurement (mg/L)	Error of Measurement (%)	Uncertainty (mg/L)
Ni	0.099	0.102	0.003	3.03	± 0.007
	0.495	0.489	-0.006	1.21	± 0.010
	0.990	0.975	-0.015	1.52	± 0.020

3.8 Reading on wavelength- Zinc (Zn) at 213.9 nm.

Element	Standard Value of RM (mg/L)	Reading (mg/L)	Error of Measurement (mg/L)	Error of Measurement (%)	Uncertainty (mg/L)
Zn	0.050	0.050	0.000	0.00	± 0.012
	0.300	0.307	0.007	2.33	± 0.011
	0.700	0.660	-0.040	5.71	± 0.015

Remark : The reported uncertainty is an expanded uncertainty calculated using a coverage factor of 2 (k = 2)
which gives a level of confidence of approximately 95%

Calibrated by

(Mr. Danai Srithongkum)

Approved by

(Mrs. Thippaya Junvee Fortune)

Director of Analytical Chemistry Laboratory

Calibration date : 3 February 2022

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FMBL/MTC.002 Rev.4

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Calibration Certificate

Certificate No.: 2103270-001-01
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: Electronic Balance

Manufacturer: Mettler Toledo

Model: AB204-S/FACT

Serial No.: 1129361010

ID No.: UAE.WAS.002/2552

Order No.: 2103270

Operation No.: 2103270-001

Date of Receipt: 11 June 2021

Date of Calibration: 11 June 2021

Calibrated by Mr.Yothin Charoensuk
Scientist

Approved by (Mr.Pheraphat Tuanjit)
Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team

Date of Issue: 15 June 2021

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: 00 Date: 14-12-61

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Calibration Report

Certificate No.: 2103270-001-01
Equipment: Electronic Balance
Model: AB204-S/FACT
Serial No.: 1129361010
Capacity: 220 g
Manufacturer: Mettler Toledo
Resolution: 0.0001 g
ID No.: UAE.WAS.002/2552

Page 2 of 3

Date of Calibration: 11 June 2021

Environment Condition: Ambient Temperature: 21.1 ± 0.4 °C Relative Humidity: 48 ± 4 %

Place of Calibration: Laboratory, united analyst and engineering consultant co.,ltd.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-PA-001 3n-Route Method Based on UKAS LAB 14 Calibration of Weighing Machines : 2006

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1mg to 200g	8503587572	TCS	H00040405	20 April 2022
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	PORPE 490	NFLBTH 004/18	Quality Reborn	QR21-0300	15 February 2022

3. This certification is traceable to SI UNIT

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.

Calibration Results:

1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
100	0.00067
200	0.00057

2. Off-Center Error:

A mass of 50 g was placed and moved to various position on pan.

The balance reading obtained is given in the table.



1	2	3	4	5	6	(Maximum Difference)
(g)	(g)	(g)	(g)	(g)	(g)	(g)
50.0000	49.9999	49.9999	50.0000	50.0000	50.0000	0.0001

F-CS-012 Revision: 00 Date: 14-12-61

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Calibration Report

Certificate No.: 2103270-001-01

Equipment: Electronic Balance

Manufacturer: Mettler Toledo

Model: AB204-S/FACT

Resolution: 0.0001 g

Serial No.: 1129361010

ID No.: UAE.WAS.002/2552

Capacity: 210 g

Date of Calibration: 11 June 2021

Page 3 of 3

Calibration Results: (Continued)

Calibration Range: 0-200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value:

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (±g)	Coverage Factor k
Unloaded	0.0000	0.0000	0.0000	0.000092	2.00
0.01	0.01000	0.0100	0.0000	0.000092	2.00
0.05	0.05000	0.0500	0.0000	0.000092	2.00
0.1	0.10001	0.1000	0.0000	0.000091	2.00
0.2	0.20001	0.2001	-0.0001	0.000093	2.00
0.5	0.50001	0.5000	0.0000	0.000093	2.00
1	1.00001	1.0000	0.0000	0.000093	2.00
2	2.00002	2.0001	-0.0001	0.000093	2.00
5	5.00002	4.9999	0.0001	0.000094	2.00
10	10.00001	9.9998	0.0002	0.000096	2.00
20	20.00001	20.0000	0.0000	0.00010	2.00
50	50.00004	50.0000	0.0000	0.00013	2.00
70	70.00007	70.0000	0.0001	0.00014	2.00
100	100.00009	100.0000	0.0001	0.00016	2.00
150	150.00013	150.0000	0.0001	0.00021	2.00
200	200.00016	200.0001	0.0000	0.00028	2.00

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 %.

***** End *****

FCS-012 Revision: 00 Date: 14-12-61

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Cert. No.: 21TM1876
Page: 1 of 3

Certificate of Calibration

Equipment: Hot Air Oven

Manufacturer: Memmert

Model: UF 55

Serial No.: B216.1666

ID No.: UAE.WAO.027/2559

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

Location: Lab Floor 2

Received Order: 29 October 2021

Calibration Date: 29 October 2021

Ambient Temperature: (26 ± 10) °C

Relative Humidity: (50 ± 30) %

Calibrated by: Kunthit Promrat

Approved by:

Approved Signatory

() Pornthippa Tameyakul
(x) Malee Butkruea
() Suwit Imjai

Issue Date: 4 November 2021

The Uncertainties are for a confidence probability of approximately 95 %

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Approval of the head of Corporate Services & Equipment Calibration and Testing Services.

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Equipment: Hot Air Oven
Condition As-Received: Used Item
Reference: 2110-0701OC-1Cert. No.: 21TM1876
Page: 2 of 3

Procedure Used :-

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD) and Thermocouple Type T.

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34970A	MY44067817	21LM10	20 Jul 2022

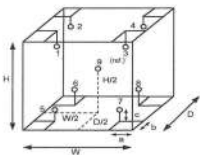
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



Probe Installation Details : Dimension of Chamber :

a = 5.0 cm	D = 0.33 m
b = 5.0 cm	W = 0.40 m
c = 5.0 cm	H = 0.40 m
	Capacity = 0.053 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	28	28
REL.Humid. (%)	56	55
AC Supply (Volt)	230	230

Ref. Std. ID No. @ Calibration Point		
Position	(140, 180) °C	(104) °C
1	21-15TC-01	15RTD2/11
2	21-15TC-02	15RTD2/12
3	21-15TC-03	15RTD2/13
4	21-15TC-04	15RTD2/14
5	21-15TC-05	15RTD2/15
6	21-15TC-06	15RTD2/20
7	21-15TC-07	15RTD2/17
8	21-15TC-08	15RTD2/18
9 (ref.)	21-15TC-09	15RTD2/19

เอกสารไม่ควบคุม

Equipment: Hot Air Oven
Condition As-Received: Used Item
Reference: 2110-0701OC-1Cert. No.: 21TM1876
Page: 3 of 3

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor k
104.0	104.0	104.0	0.11	0.52	0.72	0.42	2
140.0	140.0	140.0	0.25	1.1	1.4	1.1	2
180.0	180.0	180.0	0.18	0.87	1.2	1.1	2

Calibration Point (°C)	Measured Temperature (°C)								
	1	2	3	4	5	6	7	8	9 (ref.)
104.0	103.852	103.978	104.382	104.323	103.778	104.015	104.312	104.196	103.907
140.0	140.309	140.730	140.426	140.270	139.531	139.666	140.067	139.895	139.750
180.0	180.598	180.339	180.755	180.619	179.716	179.829	180.204	180.365	179.975

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 %.

-000-

เอกสารไม่ควบคุม



Cert. No.: 21TM1405
Page: 1 of 3

Certificate of Calibration

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 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Lab Floor 2
Received Order : 17 August 2021
Calibration Date : 17 August 2021
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Khil Rutanaprapachai
Approved by :
() Pornthippa Tameyakul
(✓) Malee Butkruea
() Suwit Imjai
Issue Date : 1 September 2021

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.

เอกสารไม่ควบคุม
A 0031567



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2108-0364OC-1

Cert. No.: 21TM1405
Page: 2 of 3

Procedure Used :-

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

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34970A	MY41021843	21LM2	18 Feb 2022

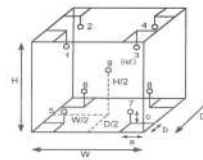
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available



Probe Installation Details :

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

Dimension of Chamber :

D = 0.53 m
W = 1.2 m
H = 1.2 m
Capacity = 0.76 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	28	29
REL.Humid. (%)	52	55
AC Supply (Volt)	220	221

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

เอกสารไม่ควบคุม
a 1069646



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2108-0364OC-1
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Not Available

Cert. No.: 21TM1405
Page: 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor k
20.0	19.5	19.3	0.46	0.45	1.0	0.78	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
20.0	20.018	20.137	20.086	19.942	20.157	20.093	19.968	19.860	20.048

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
a 1069645



Cert. No.: 21TM1406
Page: 1 of 3

Certificate of Calibration

Equipment : BOD Incubator
Manufacturer : Arco
Model : UC4-1320
Serial No. : -
ID No. : UAE.WAO.018/2559
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Lab Floor 2
Received Order : 17 August 2021
Calibration Date : 17 August 2021
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Khil Rutanaprapachai
Approved by :
() Pornthippa Tameyakul
(✓) Malee Butkruea
() Suwit Imjai
Issue Date : 1 September 2021

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.

เอกสารไม่ควบคุม
A 0031568



Equipment : BOD Incubator
 Condition As-Received : Used Item
 Reference : 2108-0364OC-2

Cert. No.: 21TM1406
 Page.: 2 of 3

Procedure Used :-

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

Condition of this result of calibration

1. Reference standard instrument:-

Instrument Model Serial No. Cert. No. Due Date
 1) Data Acquisition 34970A MY41021843 21LM2 18 Feb 2022

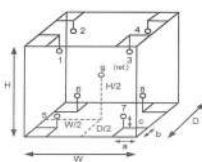
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available



Probe Installation Details :

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

Dimension of Chamber :

D = 0.53 m
 W = 1.2 m
 H = 1.2 m
 Capacity = 0.76 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	28	29
REL.Humid. (%)	52	55
AC Supply (Volt)	220	221

Position :	Ref. Std. ID No.:
1	21-04RTD-11
2	21-04RTD-12
3	21-04RTD-13
4	21-04RTD-14
5	21-04RTD-15
6	21-04RTD-16
7	21-04RTD-17
8	21-04RTD-18
9 (ref.)	21-04RTD-19

เอกสารไม่ควบคุม
 1069644



Equipment : BOD Incubator
 Condition As-Received : Used Item
 Reference : 2108-0364OC-2

Cert. No.: 21TM1406
 Page.: 3 of 3

Result of Calibration :- (*) Without Adjustment
 Function of UUC* : Temperature Source
 Fresh air setting : Not Available

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor k
20.0	19.8	19.7	0.37	0.50	1.1	0.62	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
20.0	20.040	19.742	20.203	19.762	19.784	19.819	19.764	19.797	19.787

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
 1069644



Hanna Instruments (Thailand) Ltd.

410/67-68 Soi Ratchadapisek 24, Ratchadapisek Rd., Samen-nok,
 Huaykwang, Bangkok 10310 Tel: 0-2541-4199 Fax: 0-2541-4198

Certificate No. : HIT-2121-0516

Page : 1 of 3

CERTIFICATE OF CALIBRATION

Equipment : COD Test Tube Heater
 Meter Model : HI839800-02 Serial No. : 4500052101
 Manufacturer : Hanna Instruments
 Made in : Romania
 Condition As-Received : Used Product
 Reference : RE210675
 Customer name : United Analyst and Engineering Consultant Co., Ltd.
 3 Soi Udonsuk 41, Sukhumvit Rd., Bangchak
 Phrakhanong, Bangkok 10260
 Received date : 13 May 2021
 Calibrate date : 17 May 2021
 Issue date : 17 May 2021
 Ambient Temperature : (25 ± 2) °C
 Relative Humidity : (50 ± 15) % RH
 Calibrated Location : Hanna Instruments (Thailand) Ltd.

Calibrated by :

Mr. Pichit Perthong
 Calibration Engineer

Approved by :

Mr. Anan Suwanchaisakul

Authorized Signatory

This certificate was certified only for the instrument we calibrated.

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

** This certificate may not be reproduced other than in full, except with the prior written **

approval of the head of Hanna Instrument (Thailand)

เอกสารไม่ควบคุม



Certificate No. : HIT-2121-0516
 Page : 2 of 3

Condition of this result of calibration

Reference Standard Instruments :

Instruments	Model	Serial No.	Certificate No.	Traceable
Thermometer With Sensor	HI935005	03250060101	21T167	Technology Promotion Association (Thailand-Japan)

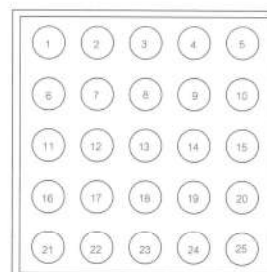
Reference / Procedure :

This equipment was calibration by comparison to the reference standard (Standard platinum resistance thermometer) whose accuracy is traceable to the national standard. The calibration was performed by generating the specified working point of temperature then recorded the temperature reading values against the reference standard according to Hanna Calibration Laboratory work Instruction No. 141.

This temperature scale used was based on ITS-90

All data shown below were as-received values without adjustment.

SITE CALIBRATION



เอกสารไม่ควบคุม

Result of Calibration :

Calibration Point	Unit Under Calibration Setting	Unit Under Calibration Reading	Temperature Stability	Uncertainty of Measurement
150.0 (°C)	150.6 (°C)	150.3 (°C)	2.0 (°C)	± 0.62 (°C)

Calibration Point (°C)	Average Standard Reading (°C)				
	Position				
150.0	1	2	3	4	5
	149.4	150.6	150.8	150.6	150.0
	6	7	8	9	10
	149.5	150.8	151.0	151.0	150.2
	11	12	13	14	15
	149.7	150.7	151.0	151.0	150.2
	16	17	18	19	20
	149.4	150.7	150.9	150.8	150.0
	21	22	23	24	25
	149.0	149.8	150.2	150.3	149.1

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

** End of certificate **

เอกสารไม่ควบคุม

Verification Certificate

Substitute for Certificate No.: 2103014-001-01
Certificate No.: 2103014-001-02
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 SOI UDOMSUK 41, SUKHUMVIT ROAD,
BANGCHAK, PRAKHANONG, BANGKOK, 10260

Page 1 of 4

Equipment: HEATING BLOCK DIGESTION
Manufacturer: VELP SCIENTIFICA
Model: DKL20
Serial No.: 213517
ID No.: UAE.WAS.005/2555
Order No.: 2103014
Operation No.: 2103014-001
Date of Receipt: 30 May 2021
Date of Calibration: 2,7 June 2021

Calibrated by Mr.Nuttapol Niyomchat
Expert

Approved by (Mr.Pheraphat Tuanjit)
Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team

Date of Issue: 25 June 2021

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-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

Verification Report

Certificate No.: 2103014-001-02
Equipment: HEATING BLOCK DIGESTION
Model: DKL20 Serial No.: 213517
Resolution: 1 °C ID No.: UAE.WAS.005/2555
Manufacturer: VELP SCIENTIFICA

Date of Calibration: 2,7 June 2021 Page 2 of 4

Location: Calibration Laboratory, NATIONAL FOOD INSTITUTE
Environment Condition: Ambient Temperature (25 ± 3) °C
Relative Humidity (55 ± 15) %
Line Voltage (220 ± 10) Volt

Condition of this results of Calibration:

- This instrument was calibrated by insert standard thermocouples type R into its heating block digestion and compared to temperature obtained from reference standards thermometer at calibrated point.
- 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.	Certificate No.	Due Date	Through
Digital Thermometer with Thermocouple	34970A/34901A	MY4045576/MY41194433	TC21/0041	24-Apr-2022	N.F.I. Technical Center Laboratory
	Type R	TCR181-183 / CMI181-183			

- 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 : Hour 30 Minute At 380 °C

- Result of Calibration : ☒ Without adjustment ☐ After adjustment

F-CS-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

Verification Report

Certificate No.: 2103014-001-02
Equipment: HEATING BLOCK DIGESTION
Model: DKL20 Serial No.: 213517
Resolution: 1 °C ID No.: UAE.WAS.005/2555
Manufacturer: VELP SCIENTIFICA

Date of Calibration: 2,7 June 2021 Page 3 of 4

Calibration point: 380 °C

Calibration result:

Reporting of Temperature

Block No.	UUC* Setting (°C)	UUC* Reading (°C)	Stability (±°C)	Standard Thermometer (°C)	Uncertainty (±°C)
1	380	379 - 380	0.53	383.17	1.8
2	380	379 - 380	0.32	383.16	1.8
3	380	379 - 380	0.39	382.99	1.8
4	380	379 - 380	0.18	381.23	1.8
5	380	379 - 380	0.49	382.97	1.8
6	380	379 - 380	0.49	382.85	1.8
7	380	379 - 380	0.54	382.97	1.8
8	380	379 - 380	0.24	382.95	1.8
9	380	379 - 380	0.61	383.17	1.8
10	380	379 - 380	0.73	381.14	1.9
11	380	379 - 380	0.73	382.53	1.9
12	380	379 - 380	0.76	381.56	1.9
13	380	379 - 380	0.38	382.25	1.7
14	380	379 - 380	0.43	383.00	1.7
15	380	379 - 380	0.31	383.08	1.7
16	380	379 - 380	0.22	381.78	1.7
17	380	379 - 380	0.31	382.99	1.7
18	380	379 - 380	0.37	383.24	1.7
19	380	379 - 380	0.32	380.98	1.7
20	380	379 - 380	0.31	382.63	1.7

Note:

- UUC* = Unit Under Calibration

- Immersion depth of standard thermometer in tube level high of sand is equal heater plate of UUC.

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

F-CS-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

Verification Report

Certificate No.: 2103014-001-02
 Equipment: HEATING BLOCK DIGESTION
 Model: DKL20 Serial No.: 213517
 Resolution: 1 °C ID No.: UAE.WAS.005/2555
 Manufacturer: VEP SCIENTIFICA
 Date of Calibration: 2,7 June 2021 Page 4 of 4
 Calibration point: 380 °C
 Calibration result: Continued

Figure 1. Location of Reference Standard and Block Diagram of Digestion Unit



Sensor Installation Location

Remark: Edited ID No. from UAE.WAB.005/2555 to UAE.WAS.005/2555.

Note:

- UUC* = Unit Under Calibration
- Immersion depth of standard thermometer in tube level high of sand is equal heater plate of UUC.
- Stability = One-half of the greatest maximum difference of measured temperatures at one sensors, for at least half an hour after reaching steady state.

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: 00 Date: 14-12-61

เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
 CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
 534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
 TEL. 0-2717-3066-27 FAX. 0-2719-0484



Cert. No.: 21TM708
 Page.: 1 of 3

Certificate of Calibration

Equipment : Incubator
 Manufacturer : Memmert
 Model : IPP260
 Serial No. : V615.0187
 ID No. : UAE.MIC.003/2559
 Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
 3 Soi Udomsuk 41, Sukhumvit Road,
 Bangkok, Phrakhanong,
 Bangkok 10260
 Location : Microbiology Laboratory
 Received Order : 21 April 2021
 Calibration Date : 21 April 2021
 Ambient Temperature : (26 ± 10) °C
 Relative Humidity : (50 ± 30) %
 Calibrated by : Kritsada Chaitrong
 Approved by :
 () Ponthippa Tameyakul
 (✓) Malee Butkrusa
 () Suwit Imjai
 Issue Date : 5 May 2021

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

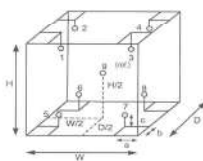
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 Approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

เอกสารไม่ควบคุม

A 0027609



Equipment : Incubator
 Condition As-Received : Used Item
 Reference : 2104-00190C-1
 Certificate No.: 21TM708
 Page.: 2 of 3
 Probe Used :-
 Calibration were conducted using calibration procedure CP-OT02 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 MY44060450 21LM4 NIMT 06 Mar 2022
 2. This certification is traceable to the SI unit.
 3. This certificate is valid only to the item calibrated on date and place of calibration.
 Remark : NIMT : National Institute of Metrology Thailand.
 Result of Calibration :- (*) Without Adjustment
 Function of UUC* : Temperature Source
 Fresh air setting : Close



Probe Installation Details : Dimension of Chamber :
 a = 10 cm D = 0.50 m
 b = 10 cm W = 0.64 m
 c = 10 cm H = 0.80 m
 Capacity = 0.26 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	24	23
REL Humid. (%)	60	63
AC Supply (Volt)	223	224

Position :	Ref. Std. ID No.:
1	19-14RTD-01
2	19-14RTD-02
3	19-14RTD-03
4	19-14RTD-04
5	19-14RTD-05
6	19-14RTD-06
7	21-14RTD-07
8	19-14RTD-08
9 (ref.)	19-14RTD-09

เอกสารไม่ควบคุม

a 1052708



Equipment : Incubator
 Condition As-Received : Used Item
 Reference : 2104-00190C-1
 Certificate No.: 21TM708
 Page.: 3 of 3
 Result of Calibration :- (*) Without Adjustment
 Function of UUC* : Temperature Source

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor k
35.0	35.0	35.0	0.11	0.36	0.55	0.30	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
35.0	34.946	35.035	35.120	35.067	34.989	35.121	34.745	35.004	34.994

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

a 1052707



Cert. No.: 21TM1355/1
Page: 1 of 3

Certificate of Calibration

This Certificate was issued to replace to the Certificate No. 21TM1355
Equipment : Water Bath

Manufacturer : Memmert

Model : WB 14

Serial No. : I401.0569

ID No. : UAE.MIC.004/2544

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

Location : Microbiology Laboratory

Received Order : 14 July 2021

Calibration Date : 14 July 2021

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Preecha Hlahib

Approved by :
Approved Signatory

() Ponnthippa Tameyakul
(✓) Malee Butkruea
() Suwit Imjai

Issue Date : 30 July 2021

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services / Equipment Calibration and Testing Services.

เอกสารไม่ควบคุม
A 0030834



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2107-0318OC-5
Procedure Used :-

Cert. No.: 21TM1355/1
Page: 2 of 3

Calibration were conducted using in-house calibration procedure CP-OT04 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	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34972A	MY57013823	21LM3	26 Feb 2022

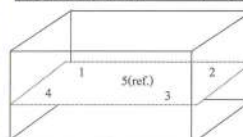
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

	Environmental		AC Voltage Supply
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	25	54	220
Finished of Calibration	25	57	222



Front

Position :	Ref. Std. S/N :
1	4804539-006
2	4804539-007
3	4804539-008
4	4804539-009
5(ref.)	4804539-010

เอกสารไม่ควบคุม
a 1065556



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2107-0318OC-5
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 21TM1355/1
Page: 3 of 3

Calibration point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Average* Standard Reading (°C)				
			Position				
41.5	41.2	41.2	1	2	3	4	5 (ref.)
			41.418	41.379	41.374	41.447	41.420

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Uncertainty (± °C)	Coverage Factor k
41.5	0.084	0.043	0.15	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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a 1065555



Cert. No.: 22TM563
Page: 1 of 3

Certificate of Calibration

Equipment : Incubator

Manufacturer : Memmert

Model : IPP 260

Serial No. : V815.0187

ID No. : UAE.MIC.003/2559

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

Location : Microbiology Laboratory

Received Order : 7 April 2022

Calibration Date : 7 April 2022

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Prawat Sodavitchit

Approved by :
Approved Signatory

() Ponnthippa Tameyakul
(✓) Malee Butkruea
() Suwit Imjai

Issue Date : 18 April 2022

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services / Equipment Calibration and Testing Services.

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A 0040248

Calibration Report

Certificate No.: 2200708-001-01

Equipment:

Electronic Balance

Model: AX 105 DR

Serial No.: 1122100406

Capacity: 110 g

Manufacturer: METTLER TOLEDO

Resolution: 0.0001 g/ 0.0001 g

ID No.: UAE.WAO.004/2546

Date of Calibration: 24 November 2021

Page 3 of 4

Calibration Results: (Continued)

Calibration Range: 0-100 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 0 - 30 g ; Resolution: 0.0001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor k
Unload	0.00000	0.00000	0.00000	0.000089	2.00
0.01	0.009998	0.01000	0.00001	0.00011	2.00
0.02	0.019997	0.02000	0.00001	0.00012	2.00
0.05	0.049991	0.05000	0.00001	0.00011	2.00
0.1	0.100002	0.10000	0.00000	0.00012	2.00
0.2	0.200004	0.20000	0.00000	0.00013	2.00
0.5	0.499994	0.50000	-0.00001	0.00014	2.00
1	0.999986	1.00000	-0.00001	0.00016	2.00
2	1.999989	1.99998	0.00001	0.00019	2.00
5	4.999979	4.99998	0.00000	0.00022	2.00
10	10.000026	9.99994	0.00009	0.00024	2.00
20	20.000037	19.99991	0.00013	0.00029	2.00
30	30.000063	30.00000	0.00006	0.0003	2.00

FCS-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2200708-001-01

Equipment:

Electronic Balance

Model: AX 105 DR

Serial No.: 1122100406

Capacity: 110 g

Manufacturer: METTLER TOLEDO

Resolution: 0.0001 g/ 0.0001 g

ID No.: UAE.WAO.004/2546

Date of Calibration: 24 November 2021

Page 4 of 4

Calibration Results: (Continued)

Calibration Range: 0-100 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 31 - 100 g ; Resolution: 0.0001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor k
40	40.00000	39.9999	0.0001	0.00014	2.00
45	44.99998	44.9999	0.0001	0.00015	2.00
50	49.99999	49.9999	0.0001	0.00016	2.00
55	54.99997	54.9998	0.0002	0.00016	2.00
60	60.00002	59.9999	0.0001	0.00018	2.00
65	65.00000	64.9999	0.0001	0.00018	2.00
70	70.00003	69.9999	0.0001	0.00019	2.00
75	75.00001	74.9999	0.0001	0.00020	2.00
80	80.00005	79.9998	0.0002	0.00021	2.00
85	85.00003	84.9998	0.0002	0.00022	2.00
90	89.99999	89.9998	0.0002	0.00021	2.00
100	99.99997	99.9998	0.0002	0.00020	2.00

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 %.

FCS-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
 CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
 3344 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
 TEL. 0-2717-3000-27 FAX. 0-2719-0404



Certificate of Calibration

Cert. No.: 20TM405

Page: 1 of 3

Equipment: Autoclave

Model: CL-40L

Serial No.: 802684

ID No.: UAE.LAB.014/2550

Manufacturer: ALP

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

Location: Air Analysis Unit

Ambient Temperature: (26 ± 10) °C

Relative Humidity: (50 ± 30) %

Calibrated by: Tawatchai Pama

Approved by:

() Ponthipha Tameyakul
 () Malee Buikrua
 (✓) Suwit Injai

Issue Date: 4 March 2020

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.

เอกสารไม่ควบคุม

A 0011864



Equipment: Autoclave
 Model: CL-40L
 Serial No.: 802684
 ID No.: UAE.LAB.014/2550
 Manufacturer: ALP
 Received Order: 26 February 2020
 Condition As-Received: Used Item
 Calibration Date: 27 February 2020
 Reference: 2002-0784OC-5

Cert. No.: 20TM405

Page: 2 of 3

Procedure Used :-

Calibration were conducted using in-house calibration procedure CP-OT03 according to direct measurement method with Data Acquisition which connected with Thermocouple Type T
 The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY44060450	191276	NIMT	05 Mar 2020

2. This certification is traceable to the SI unit.

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

4. This result of calibration covers laboratory autoclaves for the sterilization of goods and material which could be infected with organisms categorized as Hazard Group 1, 2 and 3**

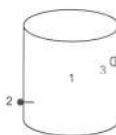
(** = Categorization of pathogens according to hazard and categories of containment, second edition, 1990)
 It does not cover autoclaves for use with material infect with organisms in Hazard Group 4, for which complete containment and sterilization of infected condensate is considered to be essential.

This result of calibration does not apply to sterilizers or disinfectors used for medical, dental, pharmaceutical or veterinary purposes which are directly concerned with patient care, or those used for fabrics subjected to sterilization which are required to be dry at the end of cycle.

Remark: NIMT : National Institute of Metrology Thailand.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source



	Environmental		
	(°C)	(% R.H.)	(Volt)
Beginning of Calibration	24	87	240
Finished of Calibration	23	85	240

Position	Description	Ref. Std. Thermocouple
1 =	Center of chamber	19-14TC-04
2 =	Temperature sensor	19-14TC-05
3 =	Exhaust port	19-14TC-06

เอกสารไม่ควบคุม

A 0036427



Equipment : Autoclave
Model : CL-40L
Serial No. : 802664
ID No. : UAE.LAB.014/2550
Manufacturer : ALP
Received Order : 26 February 2020
Condition As-Received : Used Item
Calibration Date : 27 February 2020
Reference : 2002-0784OC-5
Result of Calibration :- (") Without Adjustment

Cert. No.: 20TM405
Page.: 3 of 3

Operating parameter Set : Temperature = 116 °C
Sterilization period = 15 minute

UUC* Setting (°C)	UUC* Reading (°C)	Position	Average* Standard Reading (°C)	Stability (± °C)	Pressure Reading (MPa)	Uncertainty (± °C)	Coverage Factor <i>k</i>
116	116	1	116.594	0.16	0.08	0.90	2
		2	116.430				
		3	116.361				

Operating parameter Set : Temperature = 122 °C
Sterilization period = 15 minute

UUC* Setting (°C)	UUC* Reading (°C)	Position	Average* Standard Reading (°C)	Stability (± °C)	Pressure Reading (MPa)	Uncertainty (± °C)	Coverage Factor <i>k</i>
122	122	1	122.474	0.17	0.12	1.1	2
		2	122.301				
		3	122.285				

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

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

UUC* : Unit Under Calibration

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

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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