

ภาคผนวก ง

ผลการติดตามตรวจสอบผลกระทบสิ่งแวดล้อม



ใบรายงานผลการวิเคราะห์

ชื่อลูกค้า : บริษัท พูลพิพัฒน์ จำกัด
ที่อยู่ : 90/54-57 อาคารสาทรธานี ชั้น 19 ถนนสาทรเหนือ แขวงสีลม เขตบางรัก กรุงเทพมหานคร 10500
ข้อมูลผู้ติดต่อ : โทรศัพท์ : 0 2233 3990-9 ต่อ 1967 อีเมล : warehouse@poonphol.com
สถานที่เก็บตัวอย่าง : บริเวณโกดัง 4 (155 หมู่ 2 ถนนปู่เจ้าสมิงพราย ตำบลสำโรงกลาง อำเภอพระประแดง จังหวัดสมุทรปราการ)
ชนิดตัวอย่าง : น้ำทิ้ง
วันที่เก็บ : 30 มีนาคม 2566
เวลาที่เก็บ : 09:00 น.
วิธีเก็บ : จ้วงเก็บ 1 ครั้ง, จ้วงเก็บ 1 ครั้ง และเทคนิคปลอดเชื้อ
ผู้เก็บตัวอย่าง : นายมานิตย์ ปานโชติ
ผู้วิเคราะห์ : นางสาวนภาพร ชื่นนุกขุม

ดัชนี	หน่วย	วิธีการวิเคราะห์	ผลการวิเคราะห์	ค่ามาตรฐาน	ขีดจำกัดต่ำสุดของการวัด
			น้ำทิ้ง T23AF691-0001		
ความเป็นกรดและด่าง ^a	-	ELECTROMETRIC METHOD AT SITE (SM: PART 4500-H ⁺ B)	7.7 (30°C)	5.5-9.0	-
ไนไตรต์ ^c	มิลลิกรัมต่อลิตร	AZIDE MODIFICATION METHOD (SM: PART 5210 B AND PART 4500-O C)	2.7	≤ 20	2.0
ของแข็งแขวนลอยทั้งหมด ^a	มิลลิกรัมต่อลิตร	TOTAL SUSPENDED SOLIDS DRIED AT 103-105 °C (SM: PART 2540 D)	5.8	≤ 50	5.0
น้ำมันและไขมัน ^c	มิลลิกรัมต่อลิตร	LIQUID-LIQUID, PARTITION-GRAVIMETRIC METHOD (SM: PART 5520 B)	ตรวจไม่พบ	≤ 5	3
แอมโมเนียไนโตรเจน ^c	มิลลิกรัมต่อลิตร	KJELDAHL METHOD (SM: PART 4500-NH ₃ B AND PART 4500-NH ₃ C)	3.8	-	1.5
MICROBIOLOGY					
โคลิฟอร์มแบคทีเรียทั้งหมด ^b	เอ็มพีเอ็นต่อ 100 มิลลิลิตร	MULTIPLE-TUBE FERMENTATION TECHNIQUE (SM: PART 9221 B)	4,900	-	1.8
สภาพตัวอย่าง สี/ลักษณะของน้ำ สีของตะกอน			เหลือง/ใส น้ำตาล		

^a : อยู่ในขอบข่ายที่ได้รับการรับรอง ISO/IEC 17025 จากหน่วยรับรองระดับประเทศ สำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม

^b : อยู่ในขอบข่ายที่ได้รับการรับรอง ISO/IEC 17025 จากหน่วยรับรองระดับประเทศ กรมวิทยาศาสตร์บริการ

^c : รายการทดสอบที่ได้รับการทวนสอบโดยระบบคุณภาพของห้องปฏิบัติการ แต่ไม่อยู่ในขอบข่ายที่ได้รับการรับรอง

SM : STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23rd EDITION, 2017.

มาตรฐาน : ประกาศกระทรวงอุตสาหกรรม เรื่อง กำหนดมาตรฐานควบคุมการระบายน้ำทิ้งจากโรงงาน พ.ศ. 2560 ตีพิมพ์ในราชกิจจานุเบกษา เล่ม 134 ตอนพิเศษ 153 ง ลงวันที่ 7 มิถุนายน พ.ศ. 2560



(นางสาวจิรพรรณ นุญลา)
ผู้ควบคุมห้องปฏิบัติการ

12 เมษายน 2566



ใบรายงานผลการวิเคราะห์

ชื่อลูกค้า : บริษัท พูลพิพัฒน์ จำกัด
ที่อยู่ : 90/54-57 อาคารสารธานี ชั้น 19 ถนนสารธานี แขวงสีลม เขตบางรัก กรุงเทพมหานคร 10500
ข้อมูลผู้ติดต่อ : โทรศัพท์ : 0 2233 3990-9 ต่อ 1967 อีเมล : warehouse@poonphol.com
สถานที่เก็บตัวอย่าง : บริเวณโกดัง 7 (155 หมู่ 2 ถนนปู่เจ้าสมิงพราย ตำบลสำโรงกลาง อำเภอพระประแดง จังหวัดสมุทรปราการ)
ชนิดตัวอย่าง : น้ำทิ้ง
วันที่เก็บ : 30 มีนาคม 2566
เวลาที่เก็บ : 09:10 น.
วิธีเก็บ : จ้วงเก็บ 1 ครั้ง, จ้วงเก็บ 1 ครั้ง และเทคนิคปลอดเชื้อ
ผู้เก็บตัวอย่าง : นายมานิตย์ ปานโชติ
ผู้วิเคราะห์ : นางสาวภาพพร ชื่นนุกชุม

ดัชนี	หน่วย	วิธีการวิเคราะห์	ผลการวิเคราะห์	ค่ามาตรฐาน	ขีดจำกัดค่าสุดของการวัด
			น้ำทิ้ง T23AF691-0002		
ความเป็นกรดและด่าง ^a	-	ELECTROMETRIC METHOD AT SITE (SM: PART 4500-H ⁺ B)	7.7 (29°C)	5.5-9.0	-
ไนโตรเจน ^c	มิลลิกรัมต่อลิตร	AZIDE MODIFICATION METHOD (SM: PART 5210 B AND PART 4500-O C)	3.0	≤ 20	2.0
ของแข็งแขวนลอยทั้งหมด ^a	มิลลิกรัมต่อลิตร	TOTAL SUSPENDED SOLIDS DRIED AT 103-105 °C (SM: PART 2540 D)	7.5	≤ 50	5.0
น้ำมันและไขมัน ^c	มิลลิกรัมต่อลิตร	LIQUID-LIQUID, PARTITION-GRAVIMETRIC METHOD (SM: PART 5520 B)	ตรวจไม่พบ	≤ 5	3
แอมโมเนีย-ไนโตรเจน ^c	มิลลิกรัมต่อลิตร	KJELDAHL METHOD (SM: PART 4500-NH ₃ B AND PART 4500-NH ₃ C)	3.4	-	1.5
MICROBIOLOGY					
โคลิฟอร์มแบคทีเรียทั้งหมด ^b	เอ็มพีเอ็นต่อ 100 มิลลิลิตร	MULTIPLE-TUBE FERMENTATION TECHNIQUE (SM: PART 9221 B)	24,000	-	1.8
สภาพตัวอย่าง สี/ลักษณะของน้ำ สีของตะกอน			เหลือง/ใส น้ำตาล		

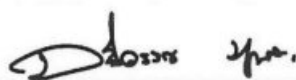
^a : อยู่ในขอบข่ายที่ได้รับการรับรอง ISO/IEC 17025 จากหน่วยรับรองระดับประเทศ สำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม

^b : อยู่ในขอบข่ายที่ได้รับการรับรอง ISO/IEC 17025 จากหน่วยรับรองระดับประเทศ กรมวิทยาศาสตร์บริการ

^c : รายการทดสอบที่ได้รับการทวนสอบโดยระบบคุณภาพของห้องปฏิบัติการ แต่ไม่อยู่ในขอบข่ายที่ได้รับการรับรอง

SM : STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, APHA, AWWA, WEF, 23rd EDITION, 2017.

มาตรฐาน : ประกาศกระทรวงอุตสาหกรรม เรื่อง กำหนดมาตรฐานควบคุมการระบายน้ำทิ้งจากโรงงาน พ.ศ. 2560 ตีพิมพ์ในราชกิจจานุเบกษา เล่ม 134 ตอนพิเศษ 153 ง ลงวันที่ 7 มิถุนายน พ.ศ. 2560



(นางสาวจิรพรรณ นุญลา)
ผู้ควบคุมห้องปฏิบัติการ

12 เมษายน 2566



ภาคผนวก จ
มาตรฐานคุณภาพน้ำทิ้ง





ประกาศกระทรวงอุตสาหกรรม
เรื่อง กำหนดมาตรฐานควบคุมการระบายน้ำทิ้งจากโรงงาน

พ.ศ. ๒๕๖๐

โดยที่เป็นการสมควรปรับปรุงการกำหนดมาตรฐานควบคุมการระบายน้ำทิ้งจากโรงงานประกอบกิจการโรงงาน เพื่อให้ได้มาตรฐานและวิธีการตรวจสอบน้ำทิ้งจากโรงงานให้เหมาะสมและเป็นไปตามมาตรฐานสากล รวมถึงเป็นการควบคุมการระบายน้ำทิ้งจากโรงงาน อาศัยอำนาจตามความในข้อ ๑๔ แห่งกฎกระทรวงฉบับที่ ๒ (พ.ศ. ๒๕๓๕) ออกตามความในพระราชบัญญัติโรงงาน พ.ศ. ๒๕๓๕ ที่ระบุว่า "ห้ามระบายน้ำทิ้งออกจากโรงงาน เว้นแต่ได้ทำการอย่างใดอย่างหนึ่งหรือหลายอย่างจนน้ำทิ้งนั้นมีลักษณะเป็นไปตามที่รัฐมนตรีกำหนดโดยประกาศในราชกิจจานุเบกษา แต่ทั้งนี้ต้องไม่ใช้วิธีทำให้เจือจาง (dilution)" รัฐมนตรีว่าการกระทรวงอุตสาหกรรมจึงออกประกาศ ดังต่อไปนี้

ข้อ ๑ ประกาศนี้เรียกว่า "ประกาศกระทรวงอุตสาหกรรม เรื่อง กำหนดมาตรฐานควบคุมการระบายน้ำทิ้งจากโรงงาน พ.ศ. ๒๕๖๐"

ข้อ ๒ ประกาศนี้ใช้บังคับตั้งแต่วันที่ ๗ มิถุนายน พ.ศ. ๒๕๖๐ เป็นต้นไป

ข้อ ๓ ให้ยกเลิกประกาศกระทรวงอุตสาหกรรม ฉบับที่ ๒ (พ.ศ. ๒๕๓๕) ออกตามความในพระราชบัญญัติโรงงาน พ.ศ. ๒๕๓๕ เรื่อง กำหนดคุณลักษณะของน้ำทิ้งที่ระบายนอกจากโรงงาน ลงวันที่ ๑๔ มิถุนายน พ.ศ. ๒๕๓๕

ข้อ ๔ ในประกาศนี้

"โรงงาน" หมายความว่า โรงงานจำพวกที่ ๑ จำพวกที่ ๒ จำพวกที่ ๓ ตามกฎหมายว่าด้วย

โรงงาน

"น้ำทิ้ง" หมายความว่า น้ำที่เกิดจากการประกอบกิจการโรงงาน น้ำจากการใช้น้ำ

ของโรงงานหรือจากกิจกรรมอื่นในโรงงาน ที่ระบายนอกจากโรงงาน หรือเขตประกอบการ

อุตสาหกรรม

ข้อ ๕ มาตรฐานน้ำทิ้ง ต้องมีคุณภาพดังต่อไปนี้

๕.๑ ความเป็นกรดและด่าง (pH) ตั้งแต่ ๕.๕ ถึง ๙.๐

๕.๒ อุณหภูมิ (Temperature) ไม่เกิน ๙๐ องศาเซลเซียส

๕.๓ สี (Color) ไม่เกิน ๓๐๐ เอิตีเอ็มไอ

๕.๔ ของแข็งละลายน้ำทั้งหมด (Total Dissolved Solids หรือ TDS) มีค่าดังนี้

(๑) กรณีระบายน้ำทิ้งลงน้ำ ต้องไม่เกิน ๓,๐๐๐ มิลลิกรัมต่อลิตร

(๒) กรณีระบายน้ำทิ้งลงน้ำที่มีค่าของแข็งละลายน้ำทั้งหมดเกินกว่า

๓,๐๐๐ มิลลิกรัมต่อลิตร ค่าของแข็งละลายน้ำทั้งหมดในน้ำทิ้งที่จะระบายจะต้องมีค่าเกินกว่าค่าของแข็ง

ละลายน้ำทั้งหมดที่มีอยู่ในแหล่งน้ำนั้นไม่เกิน ๕,๐๐๐ มิลลิกรัมต่อลิตร

๕.๕ ของแข็งแขวนลอยทั้งหมด (Total Suspended Solids) ไม่เกิน ๕๐ มิลลิกรัม

ต่อลิตร

๕.๖ บิโอดี (Biochemical Oxygen Demand) ไม่เกิน ๒๐ มิลลิกรัมต่อลิตร

๕.๗ ซีโอดี (Chemical Oxygen Demand) ไม่เกิน ๑๒๐ มิลลิกรัมต่อลิตร

๕.๘ ซัลไฟด์ (Sulfide) ไม่เกิน ๓ มิลลิกรัมต่อลิตร

/๕.๔ ไซยาไนด์...

๕.๙ ไซยาไนด์ (Cyanides CN) ไม่เกิน ๐.๒ มิลลิกรัมต่อลิตร

๕.๑๐ น้ำมันและไขมัน (Oil and Grease) ไม่เกิน ๕ มิลลิกรัมต่อลิตร

๕.๑๑ ฟอร์มาลดีไฮด์ (Formaldehyde) ไม่เกิน ๑ มิลลิกรัมต่อลิตร

๕.๑๒ สารประกอบฟีนอล (Phenols) ไม่เกิน ๑ มิลลิกรัมต่อลิตร

๕.๑๓ คลอรีนอิสระ (Free Chlorine) ไม่เกิน ๑ มิลลิกรัมต่อลิตร

๕.๑๔ สารฆ่าศัตรูพืชและสัตว์ (Pesticide) ต้องตรวจไม่พบ

๕.๑๕ ทีเคเอ็น (Total Kjeldahl Nitrogen) ไม่เกิน ๑๐๐ มิลลิกรัมต่อลิตร

๕.๑๖ ไส้หอยหูก มีค่าดังนี้

(๑) สังกะสี (Zn) ไม่เกิน ๕.๐ มิลลิกรัมต่อลิตร

(๒) โครเมียมเฮกซะวาเลนต์ (Hexavalent Chromium) ไม่เกิน ๐.๒๕

มิลลิกรัมต่อลิตร

ต่อลิตร

(๓) โครเมียมไตรวาเลนต์ (Trivalent Chromium) ไม่เกิน ๐.๗๕ มิลลิกรัม

(๔) สารหนู (As) ไม่เกิน ๐.๒๕ มิลลิกรัมต่อลิตร

(๕) ทองแดง (Cu) ไม่เกิน ๒.๐ มิลลิกรัมต่อลิตร

(๖)ปรอท (Hg) ไม่เกิน ๐.๐๐๕ มิลลิกรัมต่อลิตร

(๗) แคดเมียม (Cd) ไม่เกิน ๐.๐๓ มิลลิกรัมต่อลิตร

(๘) แบเรียม (Ba) ไม่เกิน ๑.๐ มิลลิกรัมต่อลิตร

(๙) ซีลีเนียม (Se) ไม่เกิน ๐.๐๒ มิลลิกรัมต่อลิตร

(๑๐) ตะกั่ว (Pb) ไม่เกิน ๐.๒ มิลลิกรัมต่อลิตร

(๑๑) นิกเกิล (Ni) ไม่เกิน ๑.๐ มิลลิกรัมต่อลิตร

(๑๒) แมงกานีส (Mn) ไม่เกิน ๕.๐ มิลลิกรัมต่อลิตร

ข้อ ๖ การตรวจสอบค่ามาตรฐานน้ำทิ้งจากโรงงาน ตามข้อ ๕ ให้วิธีดังต่อไปนี้

๖.๑ ความเป็นกรดและด่าง ให้ใช้เครื่องวัดความเป็นกรดและด่างของน้ำ

(pH Meter) ที่มีความละเอียดไม่ต่ำกว่า ๐.๑ หน่วย

๖.๒ อุณหภูมิ ให้ใช้เครื่องวัดอุณหภูมิวัดขณะทำการเก็บตัวอย่าง

๖.๓ สี ให้ใช้ซีโอดีเอ็มไอ (ADMI Method)

๖.๔ ของแข็งละลายน้ำทั้งหมด ให้ใช้วิธีระเหยตัวอย่างที่กรองผ่านกระดาษกรอง

ในแก้ว (Glass Fiber Filter Disk) และอบแห้งที่อุณหภูมิ ๑๘๐ องศาเซลเซียส เป็นเวลาอย่างน้อย ๑ ชั่วโมง

๖.๕ ของแข็งแขวนลอยทั้งหมด ให้ใช้วิธีการกรองผ่านกระดาษกรองใยแก้ว (Glass Fiber Filter) และอบแห้งที่อุณหภูมิ ๑๐๓ - ๑๐๕ องศาเซลเซียส เป็นเวลาอย่างน้อย ๑ ชั่วโมง

๖.๖ บิโอดี ให้ใช้วิธีบิวต์วอยล์ที่อุณหภูมิ ๒๐ องศาเซลเซียส เป็นเวลา ๕ วัน

๖.๗ ซีโอดี ให้ใช้วิธีบิวต์วอยล์ในดิลูชัน (Azide Modification) หรือวิธีเมมเบรนอิเล็กโทรด

(Membrane Electrode)

๖.๘ ซัลไฟด์ ให้ใช้วิธีไอโอดิเมตริก (Iodometric Method) หรือวิธีบิลิมูต

Dichromate)

(Methylene Blue Method)

๖.๙ ซีโอดี ให้ใช้วิธีไอโอดิเมตริก (Iodometric Method) หรือวิธีบิลิมูต

Dichromate)

(Methylene Blue Method)

๖.๙ ซีโอดี ให้ใช้วิธีไอโอดิเมตริก (Iodometric Method) หรือวิธีบิลิมูต

Dichromate)

(Methylene Blue Method)

๖.๙ ซีโอดี ให้ใช้วิธีไอโอดิเมตริก (Iodometric Method) หรือวิธีบิลิมูต

Dichromate)

(Methylene Blue Method)

๖.๙ ซีโอดี ให้ใช้วิธีไอโอดิเมตริก (Iodometric Method) หรือวิธีบิลิมูต

Dichromate)

(Methylene Blue Method)

- ๖.๕ โยไนต์ ให้ใช้การกลั่น (Distillation) และตรวจวัดด้วยวิธีเทียบสี (Colorimetric Method) หรือวิธี Flow Injection Analysis
- ๖.๑๐ น้ำมันและไขมัน ให้ใช้วิธีสกัดด้วยเทคนิค Liquid - Liquid Extraction หรือ Soxhlet Extraction ด้วยตัวทำละลายและแยกน้ำมันของน้ำมันและไขมัน
- ๖.๑๑ ฟอสฟอรัส ให้ใช้วิธีเทียบสี (Colorimetric Method)
- ๖.๑๒ สารประกอบฟีนอล ให้ใช้การกลั่น (Distillation) และตรวจวัดด้วยวิธีเทียบสี (Colorimetric Method)
- ๖.๑๓ คลอรีนอิสระ ให้ใช้วิธีไตเตรท (Titrimetric Method) หรือวิธีเทียบสี (Colorimetric Method)
- ๖.๑๔ สารกำจัดพืชและสัตว์ ให้ใช้วิธีกำจัดโครมาโตกราฟี (Gas-Chromatographic Method) หรือวิธีโครมาโตกราฟีแบบประสิทธิภาพสูง (High-Performance Liquid Chromatographic Method)
- ๖.๑๕ ซีเคเอ็น ให้ใช้วิธีเจลดาล (Kjeldahl)
- ๖.๑๖ โลหะหนัก

(๑) สังกะสี ทองแดง แคดเมียม แร่ใยหิน ตะกั่ว นิกเกิลและแมงกานีส ให้ใช้วิธีย่อยสลายด้วยน้ำย่อย (Acid digestion) และวัดหาปริมาณโลหะด้วยวิธีอะตอมมิคแอนโดมของพลาสมา (Atomic Absorption Spectrometry : AAS) หรือวิธีอินดักทีฟพลาสมา (Inductively Coupled Plasma)

(๒) โครเมียม

- ก) โครเมียมทั้งหมด ให้ใช้วิธีย่อยสลายด้วยน้ำย่อย (Acid digestion) และวัดหาปริมาณโลหะด้วยวิธีอะตอมมิคแอนโดมของพลาสมา (Atomic Absorption Spectrometry : AAS) หรือวิธีอินดักทีฟพลาสมา (Inductively Coupled Plasma)
- ข) โครเมียมเฉพาะวาเลนซ์ ให้ใช้วิธีเทียบสี (Colorimetric Method) หรือวิธีสกัดด้วยวิธีอะตอมมิคแอนโดมของพลาสมา (Atomic Absorption Spectrometry : AAS) หรือวิธีอินดักทีฟพลาสมา (Inductively Coupled Plasma)

ค) โครเมียมโครมาโทกราฟี ให้ใช้วิธีคำนวณจากค่าส่วนต่างของโครเมียมทั้งหมดกับโครเมียมเฉพาะวาเลนซ์

- (๓) สารหนูและซีลีเนียม ให้ใช้วิธีอะตอมมิคแอนโดมของพลาสมา (Atomic Absorption Spectrophotometry) ชนิดไฮโดรเจนเนจ (Hydride Generation) หรือวิธีอินดักทีฟพลาสมา (Inductively Coupled Plasma)

(๔) ปรีท ให้ใช้วิธีโคลด์เวปอะตอมมิคแอนโดมของพลาสมา (Cold Vapor Atomic Absorption Spectrometry) หรือวิธีโคลด์เวปอะตอมมิคฟลูออเรสเซนซ์ (Cold Vapor Atomic Fluorescence Spectrometry) หรือวิธีอินดักทีฟพลาสมา (Inductively Coupled Plasma)

ข้อ ๗ การตรวจสอบค่ามาตรฐานทั้งจากโรงงาน ตามข้อ ๖ ให้เป็นไปตามคู่มือวิธีวิเคราะห์น้ำและน้ำเสียของสมาคมวิศวกรรมสิ่งแวดล้อมแห่งประเทศไทย หรือ Standard Methods for the Examination of Water and Wastewater ซึ่ง American Public Health Association, American Water Work

/ Association ...

Association และ Water Environment Federation ของประเทศสหรัฐอเมริกา กำหนด หรือตามที่กรมโรงงานอุตสาหกรรมกำหนด

ข้อ ๘ การเก็บตัวอย่างน้ำทิ้งเพื่อการตรวจสอบค่ามาตรฐาน ตามข้อ ๕ ให้เป็นดังต่อไปนี้

- ๘.๑ จุดเก็บตัวอย่าง ให้เก็บในจุดระบายน้ำที่ออกจากโรงงาน ไม่ว่าจะมีจุดเดียวหรือหลายจุดก็ตาม หรือจุดอื่นที่สามารถใช้เป็นตัวแทนของน้ำทิ้งที่ระบายออกจากโรงงาน การมีการระบายน้ำหลายจุดให้เก็บทุกจุด

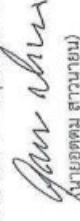
๘.๒ วิธีการเก็บตัวอย่างน้ำทิ้ง ณ จุดเก็บตัวอย่างตาม ๘.๑ ให้เก็บแบบจับ

(Grab Sample)

ข้อ ๙ การกำหนดค่ามาตรฐานน้ำทิ้งให้แตกต่างไปจากข้อ ๕ สำหรับโรงงานในประเภทหรือชนิดใดเป็นการเฉพาะให้เป็นไปตามประกาศกรมโรงงานอุตสาหกรรม

ข้อ ๑๐ ให้ประกาศกรมโรงงานอุตสาหกรรม (พ.ศ. ๒๕๓๔) เรื่อง กำหนดคุณลักษณะน้ำทิ้งที่ระบายออกจากโรงงานให้มีค่าแตกต่างจากที่กำหนดไว้ในประกาศกระทรวงอุตสาหกรรม ฉบับที่ ๒ (พ.ศ. ๒๕๓๔) เรื่อง กำหนดคุณลักษณะของน้ำทิ้งที่ระบายออกจากโรงงาน ลงวันที่ ๑๘ กุมภาพันธ์ พ.ศ. ๒๕๔๐ ยังคงบังคับใช้ได้ต่อไปจนกว่าจะได้มีการยกเลิก

ประกาศ ณ วันที่ ๙๖ พฤษภาคม พ.ศ. ๒๕๖๐



นายอดิศร สอนายม

รัฐมนตรีว่าการกระทรวงอุตสาหกรรม

ภาคผนวก ฉ

หนังสืออนุญาตขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน



รายการใบรับรองสอบเทียบ / พวนสอบ เครื่องมือหลักประจำห้องปฏิบัติการ สำหรับวิเคราะห์คุณภาพน้ำ

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
Laboratory Instrument/Equipment.									
1	pH Meter	ความเป็นกรดและด่าง ของแข็งแขวนลอยทั้งหมด	Hanna Instrument	HI2211 / 8165345	National Food Institute, Ministry of Industry, Thailand	2202097-001-01	16 Mar 22	15 Mar 23	-
2	Analytical Balance (Repeatability 0.01 mg)		Mettler-Toledo	XSR205DU C210685394	National Food Institute, Ministry of Industry, Thailand	TH2058-043-050622-ACC-TH	9 May 22	8 May 23	-
3	Hot Air Oven		Memmert	UF55 / B216.1666	Technology Promotion Association (Thailand-Japan)	22TM1490	19 Oct 22	18 Oct 23	-
4	Analytical Balance (Repeatability 0.1 mg)	น้ำมีนและไขมัน	Mettler-Toledo	AB-204S/FACT / 1129361010	National Food Institute, Ministry of Industry, Thailand	2203120-001-01	1 Jun 22	31 May 23	-
5	BOD Incubator		Arco	UC4-1320 / (UAE.WAO.015_2561)	Technology Promotion Association (Thailand-Japan)	22TM90	17 Feb 22	16 Feb 23	-
6	BOD Incubator	แอมโมเนียไนโตรเจน	Arco	UC4-1320 / (UAE.WAO.015_2561)	Technology Promotion Association (Thailand-Japan)	22TM90	17 Feb 22	16 Feb 23	-
7	UV-VIS Spectrophotometer		Hitachi	U-1900 / 2021-064	DOE Services Co.,Ltd.	SP22-007	20 Jan 22	19 Jan 23	-
8	UV-VIS Spectrophotometer	ไดลิฟอรัมแบบเคซีเรย์	Merck	U-2900 / 21E22-009	DOE Services Co.,Ltd.	SP22-008	20 Jan 22	19 Jan 23	-
9	Distillation Unit		FOSS TECATOR	2520 / 91794469	National Food Institute, Ministry of Industry, Thailand	2202361-001-01	6 Apr 22	5 Apr 23	-
10	Incubator (Cooled Incubator)		Memmert	IPP 260 / V616.0066	Technology Promotion Association (Thailand-Japan)	22TM672	5 May 22	4 May 23	-
11	Incubator (Cooled Incubator)		Memmert	IPP 260 / V618.0033	Technology Promotion Association (Thailand-Japan)	22TM503	3 May 22	2 May 23	-

รายการใบรับรองสอบเทียบ / พวนสอบ เครื่องมือหลักประจำห้องปฏิบัติการ สำหรับวิเคราะห์คุณภาพน้ำ

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
Laboratory Instrument/Equipment:									
12	Water Bath	โคลิฟอร์มแบคทีเรีย	Memmert	WNE 14 / L416.0606	Technology Promotion Association (Thailand-Japan)	22TM333	7 Mar 22	6 Mar 23	-
13	Water Bath		Memmert	WNE 14 / L416.0612	Technology Promotion Association (Thailand-Japan)	22TM334	7 Mar 22	6 Mar 23	-
14	Analytical Balance		Mettler-Toledo	MS603S / B0070110311	National Food Institute, Ministry of Industry, Thailand	TH2058-096-040722-ACC-TH	7 Apr 22	6 Apr 23	-
15	Auto Clave		ALP	CL-40L / 808763	Technology Promotion Association (Thailand-Japan)	22TM681	27 May 22	26 May 23	-

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

รายการใบรับรองสอบเทียบ / ทวนสอบ เครื่องมือหลักประจำห้องปฏิบัติการ สำหรับวิเคราะห์คุณภาพน้ำ

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
Laboratory Instrument/Equipment.									
1	pH Meter	ความเป็นกรดและด่าง	Mettler-Toledo	Seven Easy S20 / 1231155210	National Food Institute, Ministry of Industry, Thailand	2301846-001-01	24 Feb 23	23 Feb 24	-
2	Analytical Balance (Repeatability 0.01 mg)	ของแข็งแขวนลอยทั้งหมด	Mettler-Toledo	XSR205DU C210685394	National Food Institute, Ministry of Industry, Thailand	23MM113	26 Apr 23	24 Apr 24	-
3	Hot Air Oven		Memmert	UF55 / B216.1666	Technology Promotion Association (Thailand-Japan)	22TM1490	19 Oct 22	18 Oct 23	-
4	Analytical Balance (Repeatability 0.1 mg)	น้ำมันและไขมัน	Mettler-Toledo	AB-204S/FACT / 1129361010	National Food Institute, Ministry of Industry, Thailand	2303074-001-01	26 May 23	24 May 24	-
5	BOD Incubator	บีโอดี	Arco	UC4-1320 / (UAE.WAO.015_2561)	Technology Promotion Association (Thailand-Japan)	23TM249	15 Feb 23	14 Feb 24	-
6	BOD Incubator		Arco	UC4-1320 / (UAE.WAO.015_2561)	Technology Promotion Association (Thailand-Japan)	23TM375	12 Apr 23	10 Apr 24	-
7	UV-VIS Spectrophotometer	แอมโมเนีย-ไนโตรเจน	Hitachi	U-1900 / 2021-064	DOE Services Co.,Ltd.	SP23-007	6 Jan 23	5 Jan 24	-
8	UV-VIS Spectrophotometer		Merck	U-2900 / 21E22-009	DOE Services Co.,Ltd.	SP23-008	6 Jan 23	5 Jan 24	-
9	Distillation Unit		FOSS TECA TOR	2520 / 91794469	National Food Institute, Ministry of Industry, Thailand	2302413-001-01	30 Mar 23	28 Mar 24	-
10	Incubator (Cooled Incubator)	โพลีฟอร์มแบคทีเรีย	Memmert	IPP 260 / V616.0066	Technology Promotion Association (Thailand-Japan)	23TM728	27 Apr 23	25 Apr 24	-
11	Incubator (Cooled Incubator)		Memmert	IPP 260 / V618.0033	Technology Promotion Association (Thailand-Japan)	23TM729	27 Apr 23	25 Apr 24	-

รายการใบรับรองสอบเทียบ / ทวนสอบ เครื่องมือหลักประจำห้องปฏิบัติการ สำหรับวิเคราะห์คุณภาพน้ำ

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
Laboratory Instrument/Equipment.									
12	Water Bath	เคิลฟ์ไฮม์แมคทีเรีย	Memmert	WNE 14 / L416.0606	Technology Promotion Association (Thailand-Japan)	23TM193	15 Feb 23	14 Feb 24	-
13	Water Bath		Memmert	WNE 14 / L416.0612	Technology Promotion Association (Thailand-Japan)	23TM194	15 Feb 23	14 Feb 24	-
14	Analytical Balance		Mettler-Toledo	MS603S / B0070110311	National Food Institute, Ministry of Industry, Thailand	TH2058-096-040722-ACC-TH	7 Apr 22	6 Apr 23	-
15	Auto Clave		ALP	CL-40L / 808763	Technology Promotion Association (Thailand-Japan)	23TM763	27 Apr 23	25 Apr 24	-

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

Calibration Certificate

Certificate No.: 2202097-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakanong, Bangkok 10269

Page 1 of 5

Equipment: pH Meter
Manufacturer: HANNA INSTRUMENTS
Model: HI 2211
Serial No.: 08169345
ID No.: UAE.WAT.0042556
Order No.: 2202097
Operation No.: 2202097-001
Date of Receipt: 11 March 2022
Date of Calibration: 16 March 2022

Calibrated by Mr.Masas. Sornrak Specialist
Approved by  (Mr.Pheraphat. Tungsri) Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team
Date of Issue: 21 March 2022

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 related 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.

FCS-009 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2202097-001-01
Equipment: pH Meter
Resolution: 0.01 pH ; 0.5% rdg
Manufacturer: HANNA INSTRUMENTS Model: HI 2211
Serial No.: 08169345 Type: Bench top
ID No.: UAE.WAT.0042556

Page 2 of 5

Date of Calibration: 16 March 2022

Location: Chemical Calibration Laboratory, National Food Institute.

Environment Condition: Ambient Temperature: (23.0 ± 1.5) °C Relative Humidity: (49.5 ± 5) %

Condition of Equipment: Good Condition

Condition of this Results of Calibration

1. Calibration Method: In house method: W-CC-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	2708007	Fluke	SCU-21P-9887	24 June 2022
2.2 Digital Thermometer	2708007	Fluke	CG-640599-01	30 October 2022
2.3 Thermo-Hygro Meter	www.kd.BTH 00858	PONPE	QR21-2787	15 November 2022

Certified Reference Material	Lot No.	Manufacturer	Ref No	Expiry Date
2.4 pH buffer 4.008 (Primary pH buffer Solution)	788012	CPCharm	PH216 L5	21 November 2023
2.5 pH buffer 6.860 (Primary pH buffer Solution)	788013	CPCharm	PH217 L5	21 November 2023
2.6 pH buffer 10.01 (Primary pH buffer Solution)	788015	CPCharm	PH225 L5	21 November 2022
2.7 pH buffer 7.00 (Standard pH buffer Solution)	776840	CPCharm	PH107 L5	8 November 2022

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

3.1 Instruments No.2.1 through NIS-TIS-TIS 17025 Laboratory Accreditation of Calibration No.0075

3.2 Instruments No.2.2 through NIS-TIS-TIS 17025 Laboratory Accreditation of Calibration No.0091

3.3 Instruments No.2.3 through NIS-TIS-TIS 17025 Laboratory Accreditation of Calibration No.0292

3.4 Certified Reference Material No. 2.4 to 2.6 traceable to: Primary measurement method: In-house call using calibrated thermometer, barometer, and manometer. The Standard Solution preparation and certified by CPCharm Ltd is accredited to ISO 17034 and ISO/IEC 17025.

3.5 Certified Reference Material No. 2.7 traceable to: BSM Refs HI-7 Luth 30.04.2020; BSM Refs HI-8 Luth 28.05.2020; BSM Refs HI-8 Luth 30.04.2020; BSM Refs HI-10 Luth 28.05.2020. The Standard Solution preparation and certified by CPCharm Ltd is accredited to ISO 17034 and ISO/IEC 17025

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

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

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

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2202097-001-01
Equipment: pH Meter
Resolution: 0.01 pH ; 0.1% rdg
Manufacturer: HANNA INSTRUMENTS Model: HI 2211
Serial No.: 08169345 Type: Bench top
ID No.: UAE.WAT.0042556

Page 3 of 5

Date of Calibration: 16 March 2022

Calibration Results: 1. Calibration of pH Meter (Manual Temperature Compensation at 25 °C)

Measured pH	DC Voltage Standard (mV)	Average Indicator Reading		Uncertainty (mV)	Coverage Factor (k)
		mV	pH		
0	414.117	414	0.00	0.58	2.00
2	269.811	269.7	2.00	0.583	2.00
4	125.493	125.4	4.00	0.583	2.00
6	99.199	99.2	6.00	0.583	2.00
7	-3.991	9.1	7.00	0.583	2.00
8	-95.198	-95.1	8.00	0.583	2.00
10	-177.463	-177.3	10.00	0.583	2.00
12	-295.912	-295.9	12.00	0.583	2.00
14	-414.119	-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: LE420
Serial No.: 1142632 ID No: N/A

Performance of Electrode system (Three-Point Calibration at pH, pH and pH)

Certified Value (25 °C pH)	Average Indicator Reading		Relative Slope (%)	Uncertainty (± pH)	Coverage Factor (k)
	pH	mV			
4.006	4.01	190.5	99.3	0.0071	2.00
6.866	6.87	12.5	-	0.0074	2.00
10.015	10.01	-171.5	99.1	0.0090	2.00
6.953	6.88	5.2	-	0.0092	2.00

FCS-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.: 08169345 ID No.: UAE.WAT.0042556
Manufacturer: HANNA INSTRUMENTS

Page 4 of 5

Date of Calibration: 16 March 2022

Location: Chemical Calibration Laboratory, National Food Institute.

Environment Condition: Ambient Temperature: (23.0 ± 1.5) °C
Relative Humidity: (50 ± 4) %

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
HAND-HELD THERMOMETER	1523	2118164	PSLT 080164	24-Jun-22	T16TR
Platinum Resistance Thermometer (PRT)	9927A	877332			

Support Equipment: Low Temperature Bath (BOCAL-6) Model: Europa-6 Plus Size: 5N: 3415022

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

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

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 220297-001-01
Equipment: Digital Thermometer with RTD (pH Meter)
 Resolution: 0.1 °C Model: HI 2211
 Serial No.: 08105345 ID No.: UAE.WAT.0042556
 Manufacturer: HANNA INSTRUMENTS

Date of Calibration: 18 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: 2.0 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 level of confidence of approximately 95 %.

----- End -----

F-C5-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

Calibration Certificate ID
 TH0558-043-050822-ACC-TH

METTLER TOLEDO

Mettler-Toledo (Thailand) Ltd.
 848/4 - 848/5 Lamlai Rd., Bangna Tai Sub-District,
 Bangna District, Bangkok 10260
 +66 2723 0382
 MT-TH.ServiceSupport@mt.com



Accuracy Calibration Certificate

Customer

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

Weighing Device

Manufacturer: Mettler-Toledo **Instrument Type:** Weighing Instrument
Model: XBR205DU **Asset Number:** UAE.WAO.0102993
Serial No.: C210885394 **Terminal Model:** BRAT
Building: N/A **Terminal Serial No.:** C210885394
Floor: 2 **Terminal Asset No.:** N/A
Room: Balance Room

Range	Max. Capacity	Readability (g)
1	81 g	0.00001 g
2	220 g	0.0001 g

Procedure

Calibration Guideline: EURAMET cp-18 v. 4.0 (11/2015)
METTLER TOLEDO Work Instruction: CPWA002/20

This calibration certificate contains measurements for As Found calibration. No As Left calibration was performed because the device was not modified after As Found calibration. Therefore, results for As Left correspond to As Found.

The sensitivity/span of the weighing instrument was checked before calibration with a built-in weight.

In accordance with EURAMET cp-18 (11/2015), the test loads were selected to reflect the specific use of the weighing device or to accommodate specific calibration conditions.

	Temperature	Humidity
As Found	Start: 22.4 °C End: 22.4 °C	Start: 47.5 % End: 48.2 %

As Found Calibration Date: 09-May-2022

Calibrator:

As Left Calibration Date: N/A

Suwit Chotnok

Issue Date: 09-May-2022

Approved Signatory:

Technical Manager / Head of Calibration Center

Software Version: 1.23.0.269
 Report Version: 2.15.15
 Form Number: F103C

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Page 1 of 5

เอกสารไม่ควบคุม

Calibration Certificate ID
 TH0558-043-050822-ACC-TH

METTLER TOLEDO Service

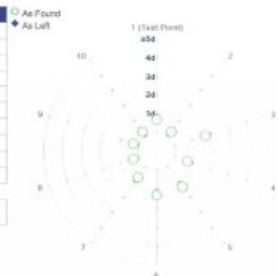
Measurement Results

Repeatability

Test Load: 70 g

	As Found	As Left
1	70.00005 g	N/A
2	70.00006 g	N/A
3	70.00004 g	N/A
4	70.00005 g	N/A
5	70.00007 g	N/A
6	70.00007 g	N/A
7	70.00005 g	N/A
8	70.00006 g	N/A
9	70.00006 g	N/A
10	70.00006 g	N/A

Standard Deviation	0.000039 g	N/A
--------------------	------------	-----



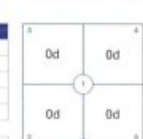
The "A" in the graph represents the repeatability of the range/interval in which the test was performed.
 The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

Test Load: 100 g

Position	As Found	As Left
1	100.0000 g	N/A
2	100.0000 g	N/A
3	100.0000 g	N/A
4	100.0000 g	N/A
5	100.0000 g	N/A

Maximum Deviation	0.0000 g	N/A
-------------------	----------	-----



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

Software Version: 1.23.0.269
 Report Version: 2.15.15
 Form Number: F103C

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Page 2 of 5

เอกสารไม่ควบคุม

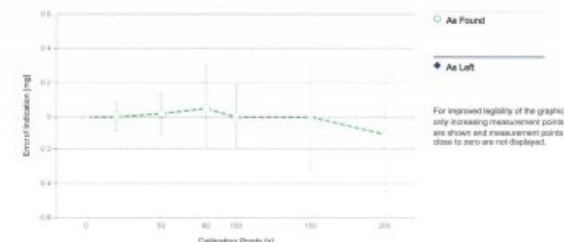
Calibration Certificate ID
 TH0558-043-050822-ACC-TH

METTLER TOLEDO Service

Error of Indication

As Found	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.05000 g	0.05000 g	0.00000 g	0.020 mg	2
2	0.05000 g	0.05001 g	0.00001 g	0.023 mg	2
3	0.10001 g	0.10001 g	0.00000 g	0.025 mg	2
4	1.00000 g	1.00001 g	0.00001 g	0.034 mg	2
5	5.00001 g	5.00001 g	0.00000 g	0.049 mg	2
6	20.00003 g	20.00002 g	0.00002 g	0.082 mg	2
7	50.00000 g	50.00002 g	0.00002 g	0.12 mg	2
8	80.00004 g	80.00009 g	0.00005 g	0.25 mg	2
9	100.00000 g	100.00000 g	0.00000 g	0.20 mg	2
10	150.00000 g	150.00000 g	0.00000 g	0.31 mg	2
11	200.00000 g	199.99999 g	-0.00001 g	0.35 mg	2

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



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

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

Test Equipment

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

Weight Set 1: OIML E2

Weight Set No.: W554 **Date of Issue:** 17-May-2020
Certificate Number: 170240 **Calibration Due Date:** 15-May-2022

Thermo Hygrometer

Equipment No.: IN161 **Date of Issue:** 14-Jun-2021
Certificate Number: 21H1220 **Calibration Due Date:** 01-Jun-2022

Software Version: 1.23.0.269
 Report Version: 2.15.15
 Form Number: F103C

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Page 3 of 5

เอกสารไม่ควบคุม

Remarks

FACT adjustment functionality activated
Equipment condition: Good
Calibration after installation
Next calibration according to customer's procedure
Calibration data not delete by calibration laboratory

End of Accredited Section

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

เอกสารไม่ควบคุม

Measurement Uncertainty of the Weighing Instrument in Use

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

Temperature coefficient for the evaluation of the measurement uncertainty in use: $1.5 \cdot 10^{-6} / K$
Temperature range on site for the evaluation of the measurement uncertainty in use: $3 K$

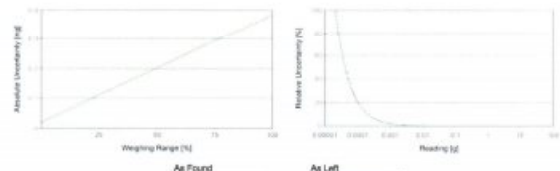
Linearization of Uncertainty Equation

Range	#	Mass	As Found	As Left
1	0.00051 g	81 g	$U_1 = 0.021 \text{ mg} + 0.00450 \text{ mg/g} \cdot R$	N/A
2	0.0001 g	220 g	$U_2 = 0.06 \text{ mg} + 0.0048 \text{ mg/g} \cdot R$	N/A

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

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

Net Indication	As Found	As Left
0.0020 g	0.021 mg	0.95%
0.0200 g	0.021 mg	0.98%
0.2000 g	0.022 mg	0.0100%
2.2000 g	0.031 mg	0.0014%
220.0000 g	1.0 mg	0.00348%



The weighing range shown in the absolute uncertainty graph refers to the first interval/range of the device.

เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES J. EQUIPMENT CALIBRATION AND TESTING SERVICES
53/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL: 0-2717-3000-27 FAX: 0-2719-9484



Cert. No.: 22TM1490
Page : 1 of 3

Certificate of Calibration

Equipment : Hot Air Oven
Manufacturer : Memmert
Model : UF 55
Serial No. : B216.1666
ID No. : UAE.WAO.0272559
Submitted by : United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udonmaek 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Lab Floor 2
Received Order : 19 October 2022
Calibration Date : 19 October 2022
Ambient Temperature : $(26 \pm 10) ^\circ C$
Relative Humidity : $(50 \pm 30) \%$
Calibrated by : Preecha Hahib
Approved by :
() Pornthippa Tameyakul
() Malee Butkrues
(✓) Suwit Imjai
Issue Date : 31 October 2022

The Uncertainties are for a confidence probability of approximately 95%

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เอกสารไม่ควบคุม

A 0046800



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2210-05750C-1

Cert. No.: 22TM1490
Page : 2 of 3

Procedure Used :-

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Delta 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) Delta Acquisition	34970A	MY41021843	22LM4	10 Jan 2023

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

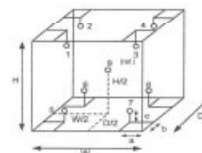
3. This certification is traceable to the International System of Unit.

Result of Calibration :-

(*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



Probe Installation Details :
a = 5.0 cm
b = 5.0 cm
c = 5.0 cm
Dimension of Chamber :
D = 0.33 m
W = 0.40 m
H = 0.40 m
Capacity ~ 0.093 m³

Environment during calibration		
	Beginning	Finished
Tamp. (°C)	29	30
REL Humid. (%)	47	40
AC Supply (Volt)	221	220

Ref. Std. ID No.: 08 Calibration Point		
Position	(104) °C	(140,180) °C
1	18-04RTD-01	21-04TC-01
2	18-04RTD-02	21-04TC-02
3	18-04RTD-03	21-04TC-03
4	18-04RTD-04	21-04TC-04
5	18-04RTD-05	21-04TC-05
6	18-04RTD-06	21-04TC-06
7	18-04RTD-07	21-04TC-07
8	18-04RTD-08	21-04TC-08
9 (ref.)	18-04RTD-09	21-04TC-09

เอกสารไม่ควบคุม

a 1133252



Equipment : Hot Air Oven
 Condition As-Received : Used Item
 Reference : 2210-0575OC-1
 Result of Calibration : (*) Without Adjustment
 Function of UUC* : Temperature Source
 Fresh air setting : Close

Cert. No.: 22TM1490
 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
104.0	104.0	104.0	0.061	1.3	1.7	0.42	2
140.0	140.0	140.0	0.14	2.3	2.4	1.1	2
180.0	180.0	180.0	0.21	3.5	3.6	1.3	2

Calibration Point (°C)	Measured Temperature (°C)								
	1	2	3	4	5	6	7	8	9 (ref.)
104.0	103.076	103.876	103.777	104.124	104.667	104.426	104.012	103.928	104.370
140.0	138.199	139.189	138.808	139.550	140.286	139.622	139.293	139.385	140.389
180.0	177.930	179.267	178.643	179.753	181.011	180.093	179.496	179.743	181.278

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 1133251



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



Calibration Certificate

Certificate No.: 2203120-001-01
 Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
 Address: 3 Soi Udomsuk 41, Sukhumvit Road, Bangchack, Prakhnong, 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.: 2203120

Operation No.: 2203120-001

Date of Receipt: 1 June 2022

Date of Calibration: 1 June 2022

Calibrated by Mr. Taveesak Seitan
 Scientist

Approved by (Mr. Pheraphat Tuanjit)
 Manager, Division of Calibration Laboratory

Date of Issue: 7 June 2022

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.

FCS-009 Revision: 01 Date: 20-04-65

22008 ๒๒๐๐๘ ๒๒๐๐๘ ๒๒๐๐๘ ๒๒๐๐๘ ๒๒๐๐๘ ๒๒๐๐๘ ๒๒๐๐๘ ๒๒๐๐๘ ๒๒๐๐๘
 2008 Soi 36, Aun Amarn Road, Bang Yi Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand
 Tel: +66(0) 2462 8588, Fax: +66(0) 2462 8545

เอกสารไม่ควบคุม



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



Calibration Report

Certificate No.: 2203120-001-01
 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

Date of Calibration: 1 June 2022 Page 2 of 3

Environment Condition: Ambient Temperature: 19.9 ± 0.3 °C Relative Humidity: 45 ± 1.5 %

Place of Calibration: 108, Balance Room, UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method 01-04-001 In-House Method based on UKAS L4: 2019

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1-500mg	8306064554	TCS	M20101005	6 January 2023
Standard Weight Class E2	1-100g	8306064178	TCS	M20101015	6 January 2023
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	PONPE 490	NFL8TH 010/18	Quality Return	Q422-0350	19 February 2023

3. This certificate 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	0.000048
200	0.000052

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)
49.9999	49.9999	49.9999	49.9999	49.9999	49.9999	0.0001

FCS-012 Revision: 01 Date: 20-04-65

เอกสารไม่ควบคุม

22008 ๒๒๐๐๘ ๒๒๐๐๘ ๒๒๐๐๘ ๒๒๐๐๘ ๒๒๐๐๘ ๒๒๐๐๘ ๒๒๐๐๘ ๒๒๐๐๘ ๒๒๐๐๘
 2008 Soi 36, Aun Amarn Road, Bang Yi Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand
 Tel: +66(0) 2462 8588, Fax: +66(0) 2462 8545



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



Calibration Report

Certificate No.: 2203120-001-01
 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

Date of Calibration: 1 June 2022 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
Unlabeled	0.00000	0.0000	0.0000	0.000000	2.95
0.01	0.01000	0.0100	0.0000	0.000000	2.95
0.05	0.05000	0.0499	0.0001	0.000000	2.95
0.1	0.10000	0.1000	0.0000	0.000000	2.95
0.2	0.20000	0.2000	0.0000	0.000000	2.95
0.5	0.50000	0.5000	0.0000	0.000000	2.95
1	1.00000	0.9999	0.0001	0.000000	2.95
2	2.00000	1.9999	0.0001	0.000000	2.95
5	5.00000	5.0000	0.0000	0.000000	2.95
10	9.99996	9.9999	0.0001	0.000002	2.95
20	19.99999	19.9999	0.0001	0.000004	2.95
30	49.99990	49.9999	0.0000	0.00012	2.95
70	69.99989	69.9998	0.0001	0.00014	2.95
150	199.00001	99.9998	0.0001	0.00012	1.95
150	149.99991	149.9997	0.0002	0.00022	2.95
200	200.00007	199.9998	0.0003	0.00030	2.95

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: 01 Date: 20-04-65

เอกสารไม่ควบคุม

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 Tel: +66(0) 2462 8588, Fax: +66(0) 2462 8545





TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
1344 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL: 0-2710-3009-27 FAX: 0-2719-9484



Cert. No.: 22TM90
Page: 1 of 3

Certificate of Calibration

Equipment : BOD Incubator
Manufacturer : Arco
Model : UC4-1320
Serial No. : 13URC4S013201
ID No. : UAE.WAO.015/2561
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 February 2022
Calibration Date : 17 February 2022
Ambient Temperature : $(26 \pm 10) ^\circ\text{C}$
Relative Humidity : $(50 \pm 30) \%$
Calibrated by : Kunchit Promrat
Approved by :
() Ponthipha Tameyakul
(x) Malee Butkruss
() Suwit Imjai

Issue Date : 22 February 2022

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม
A 0038099



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2202-0446OC-1
Procedure Used :-

Cert. No.: 22TM90
Page: 2 of 3

Calibration were conducted using calibration procedure GP-QT02 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	MY44035217	21LM30	23 Dec 2022

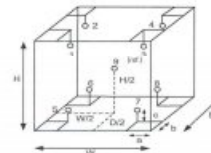
2. This certificate is valid only to the item calibrated on date and place of calibration.

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 = 0.62 m
W = 1.2 m
H = 1.2 m
Capacity = 0.89 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	28	28
REL Humid. (%)	68	75
AC Supply (Volt)	226	226

Position :	Ref. Std. ID No.:
1	18-10RTD-01
2	18-10RTD-02
3	18-10RTD-03
4	18-10RTD-04
5	18-10RTD-05
6	22-10RTD-10
7	18-10RTD-07
8	18-10RTD-08
9 (ref.)	18-10RTD-09

เอกสารไม่ควบคุม
a 1096042



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2202-0446OC-1
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Not Available

Cert. No.: 22TM90
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	19.4	0.30	0.58	1.0	0.55	2

Calibration Point (°C)	Measured Temperature (°C)								
	1	2	3	4	5	6	7	8	9 (ref.)
20.0	20.154	20.013	20.356	19.939	19.834	19.761	19.817	19.824	19.922

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 %.

-o00-

เอกสารไม่ควบคุม
a 1096041



DQE Services Co., Ltd.

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CERTIFICATE OF CALIBRATION

Certificate No. : SP22-007

Page 1 of 5

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

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

Bangkok 10260

Location of calibration : Laboratory 315

Equipment : UV-Vis Spectrophotometer

Manufacturer : Hitachi

Model : U-1900

Serial No. : 2021-064

ID No. : UAE.WAS.006/2552

Received Date : 20 January 2022

Calibration Date : 20 January 2022

Issue Date : 24 January 2022

Condition Instrument : Good

Calibrated by :

(Mr. Tanawat Rintach)

Technical Manager

Approved by :

(Mr. Chuanthithee Sangsri)

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

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DQE Services Co., Ltd.
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REPORT OF CALIBRATION

Certificate No. : SP22-007 Page 2 of 5

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

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

Certified Reference Materials :

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

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

PM-708-02 R01 1/11/2021

เอกสารไม่ควบคุม

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

REPORT OF CALIBRATION

Certificate No. SP22-007 Page 3 of 5

Calibration Results : Without adjustment

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor 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

PM-708-02 R01 1/11/2021

เอกสารไม่ควบคุม

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

REPORT OF CALIBRATION

Certificate No. : SP22-007 Page 4 of 5

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor 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

PM-708-02 R01 1/11/2021

เอกสารไม่ควบคุม

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

REPORT OF CALIBRATION

Certificate No. : SP22-007 Page 5 of 5

Wavelength Accuracy :

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor 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 -

PM-708-02 R01 1/11/2021

เอกสารไม่ควบคุม

DQE Services Co., Ltd.
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 Phone : +66 (0)2 538 2054, Email : dqeserviceinfo@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 Udonruek 41, Sukhumvit Road, Bangsuek, Phrakhamong,
 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 Rittichuch) (Ms. Chonfichia Sangprern)
 Technical Manager Quality Manager

The calibration results 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 used 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.

PM-708-02 R01 1/11/2021

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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.

PM-708-02 R01 1/11/2021

เอกสารไม่ควบคุม

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

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	0.0000	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
	0.0000	0.000	0.0000	0.0028	2.00
440	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
	0.0000	0.000	0.0000	0.0028	2.00
	0.5236	0.521	0.0026	0.0030	2.00
465	0.9634	0.962	0.0014	0.0029	2.00
	1.9763	1.970	0.0063	0.0070	2.00
	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
546.1	1.9987	1.992	0.0067	0.0084	2.00
	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
590	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
	0.0000	0.000	0.0000	0.0028	2.00
635	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
	0.0000	0.000	0.0000	0.0028	2.00
	0.5601	0.560	0.0001	0.0031	2.00

PM-708-02 R01 1/11/2021

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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

PM-708-02 R01 1/11/2021

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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

REMARKS : - 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 new TSI accredited

- End of Certificate -

FM-708-02 R01 3/11/2003

เอกสารไม่ควบคุม

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2008 Soi 36, Anuram Road, Bang Yi Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand
Tel : +66 (0) 2-232 8688 Fax : +66 (0) 2-232 8545 Website : www.nfi.or.th E-mail : cal@nfi.or.th

Verification Certificate

Certificate No.: 2202361-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road, Bangchack, Prakhong, Bangkok 10260

Page 1 of 4

Equipment: HEATING BLOCK DIGESTION
Manufacturer: FOSS
Model: 2520
Serial No.: 91794469
ID No.: UAE.WAS.011/2560
Order No.: 2202361
Operation No.: 2202361-001
Date of Receipt: 4 April 2022
Date of Calibration: 4-6 April 2022

Calibrated by Mr.Nuttapol Niyomchat Specialist Approved by (Mr.Pheraphat Tunsit) Manager, Division of Calibration Laboratory Responsible for the Technical Management Team

Date of Issue: 11 April 2022

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.

P-CS-009 Revision: 00 Date: 14-12-61

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Tel : +66 (0) 2-232 8688 Fax : +66 (0) 2-232 8545 Website : www.nfi.or.th E-mail : cal@nfi.or.th

Verification Report

Certificate No.: 2202361-001-01
Equipment: HEATING BLOCK DIGESTION
Model: 2520 Serial No.: 91794469
Resolution: 1 °C ID No.: UAE.WAS.011/2560
Manufacturer: FOSS
Date of Calibration: 4-6 April 2022 Page 2 of 4

Location: Laboratory Room, NATIONAL FOOD INSTITUTE
Environment Conditions: 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	MY4045576/1001194453	TC21/0041	24-Apr-2022	N.F.I. Technical Center Laboratory

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
UUC* Description
Time of Record : Hour 30 Minute At 380 °C

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

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

เอกสารไม่ควบคุม

National Food Institute, Ministry of Industry, Thailand
2008 Soi 36, Anuram Road, Bang Yi Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand
Tel : +66 (0) 2-232 8688 Fax : +66 (0) 2-232 8545 Website : www.nfi.or.th E-mail : cal@nfi.or.th

Verification Report

Certificate No.: 2202361-001-01
Equipment: HEATING BLOCK DIGESTION
Model: 2520 Serial No.: 91794469
Resolution: 1 °C ID No.: UAE.WAS.011/2560
Manufacturer: FOSS
Date of Calibration: 4-6 April 2022 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	380	0.13	376.48	1.5
2	380	380	0.12	376.58	1.5
3	380	380	0.12	376.51	1.5
4	380	380	0.14	376.70	1.6
5	380	380	0.18	376.81	1.6
6	380	380	0.12	377.23	1.6
7	380	380	0.12	377.37	1.5
8	380	380	0.13	376.68	1.5
9	380	380	0.14	376.72	1.5
10	380	380	0.18	378.97	1.6
11	380	380	0.25	378.79	1.6
12	380	380	0.11	377.14	1.6
13	380	380	0.19	379.65	1.6
14	380	380	0.16	379.61	1.6
15	380	380	0.16	378.66	1.6
16	380	380	0.15	379.18	1.6
17	380	380	0.23	377.39	1.6
18	380	380	0.11	377.71	1.6
19	380	380	0.22	376.64	1.6
20	380	380	0.16	376.56	1.6

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.: 2202301-001-01
 Equipment: HEATING BLOCK DIGESTION
 Model: 2520 Serial No.: 91794469
 Resolution: 1 °C ID No.: UAE.WAS.011/2560
 Manufacturer: FOSS
 Date of Calibration: 4-5 April 2022
 Calibration point: 380 °C
 Calibration result: Continued

Page 4 of 4

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



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 -----

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

เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
 CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
 534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
 TEL: 0-2717-3000-27 FAX: 0-2719-9484



Cert. No.: 22TM672
 Page: 1 of 3

Certificate of Calibration

Equipment : Incubator
 Manufacturer : Memmert
 Model : IPP 260
 Serial No. : V616.0066
 ID No. : UAE.MIC.032/2559
 Submitted by : United Analyst and Engineering Consultant Co., Ltd.
 3 Soi Udomauk 41, Guldhumvit Road,
 Bangchak, Phrakhanong,
 Bangkok 10260
 Location : Microbiology Laboratory (302)
 Received Order : 3 May 2022
 Calibration Date : 5 May 2022
 Ambient Temperature : $(26 \pm 10) ^\circ\text{C}$
 Relative Humidity : $(50 \pm 30) \%$
 Calibrated by : Preecha Hlahib
 Approved by :
 () Ponthippa Tameyakul
 (x) Malee Butkruea
 () Suwit Imjai

Issue Date : 11 May 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

เอกสารไม่ควบคุม



Equipment : Incubator
 Condition As-Received : Used Item
 Reference : 2205-0003OC-3

Cert. No.: 22TM672
 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	MY44067817	21LM10	20 Jul 2022

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

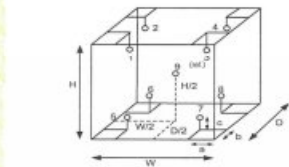
3. This certification is traceable to the International System of Unit

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available

Environment during calibration		
	Beginning	Finished
Temp. (°C)	25	23
REL Humid. (%)	62	57
AC Supply (Volt)	221	221



Probe Installation Details : Dimension of Chamber :
 a = 5.0 cm D = 0.50 m
 b = 5.0 cm W = 0.80 m
 c = 5.0 cm H = 0.80 m
 Capacity = 0.24 m³

Position :	Ref. Std. ID No.:
1	19-15RTD-01
2	19-15RTD-02
3	19-15RTD-03
4	19-15RTD-04
5	19-15RTD-05
6	21-15RTD-06
7	19-15RTD-07
8	19-15RTD-08
9 (ref.)	19-15RTD-09

เอกสารไม่ควบคุม



Equipment : Incubator
 Condition As-Received : Used Item
 Reference : 2205-0003OC-3
 Result of Calibration :- (*) Without Adjustment
 Function of UUC* : Temperature Source
 Fresh air setting : Not Available

Cert. No.: 22TM672
 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
25.0	25.0	25.0	0.021	0.16	24.933	25.017	25.047
36.0	36.0	36.0	0.077	0.96	36.845	36.630	36.761

Calibration Point (°C)	Measured Temperature (°C)								
	1	2	3	4	5	6	7	8	9 (ref.)
25.0	25.221	25.146	25.127	25.113	24.968	24.986	24.933	25.017	25.047
36.0	35.637	35.238	36.130	36.515	36.928	36.845	36.630	36.761	36.113

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



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2202-0444OC-3
Procedure Used :-

Cert. No.: 22TM333
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	34970A	MY44067817	21LM10	20 Jul 2022

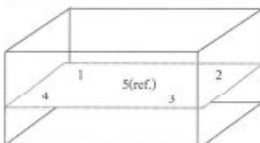
2. This certificate is valid only to the item calibrated on date and place of calibration.

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	21	65	229
Finished of Calibration	22	58	230



Front

Position :	Ref. Std. ID No.:
1	70RC143
2	70RC144
3	70RC145
4	70RC146
5(ref.)	70RC147

เอกสารไม่ควบคุม



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2202-0444OC-3
Result of Calibration :- (°) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 22TM333
Page.: 3 of 3

Calibration point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Average* Standard Reading (°C)				
			Position				
			1	2	3	4	5 (ref.)
44.5	44.5	44.5	44.498	44.481	44.482	44.518	44.534

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Uncertainty (± °C)	Coverage Factor k
44.5	0.13	0.057	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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เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
334/4 PATTANAKARN ROAD SOI 16, SUANLUANG, SUANLUANG BANGKOK 10250
TEL: 0-2717-3006-37 FAX: 0-2719-9484



Cert. No.: 22TM334
Page.: 1 of 3

Certificate of Calibration

Equipment : Water Bath
Manufacturer : Memmert
Model : WNE 14
Serial No. : L416.0612
ID No. : UAE.MIC.003/2590
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Microbiology Laboratory
Received Order : 17 February 2022
Calibration Date : 17 February 2022
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Suwit Imjai
Approved by :
() Pornthippa Tamayakul
() Malee Butkrus
Issue Date : 22 February 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.

เอกสารไม่ควบคุม

A 0038095



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2202-0444OC-4
Procedure Used :-

Cert. No.: 22TM334
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	34970A	MY44067817	21LM10	20 Jul 2022

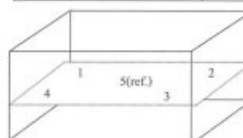
2. This certificate is valid only to the item calibrated on date and place of calibration.

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	21	65	229
Finished of Calibration	22	57	230



Front

Position :	Ref. Std. ID No.:
1	70RC143
2	70RC144
3	70RC145
4	70RC146
5(ref.)	70RC147

เอกสารไม่ควบคุม

a 1096055



Equipment : Water Bath

Condition As-Received : Used Item

Reference : 2202-0444OC-4

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Cert. No.: 22TM334

Page: 3 of 3

Calibration point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Average* Standard Reading (°C)				
			1	2	3	4	5 (ref.)
44.5	44.5	44.5	44.572	44.514	44.507	44.530	44.565

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Uncertainty (± °C)	Coverage Factor k
44.5	0.10	0.042	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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เอกสารไม่ควบคุม

1096054

Calibration Certificate ID
TH-0358-086-040722-ACC-TH

Mettler-Toledo (Thailand) Ltd.
346/4 - 346/5 Lassaie Rd., Bangna Tai Sub-Station
Bangna District, Bangkok 10260
+66 2729 0382
MT-TH.ServiceSupport@mt.com



Accuracy Calibration Certificate

Customer

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

Address: 3 Soi Udon Suk 41, Sukhumvit Rd., Bang Chak

City: Phra Khanong

Zip / Postal: 10260

State / Province: Bangkok

Order Number: 

Contact: Suwit Chotayok

Weighing Device

Manufacturer: Mettler Toledo

Model: ME60350/1

Serial No.: 8007910311

Building: N/A

Floor: 2

Room: Balance Room (238)

Instrument Type: Weighing Instrument

Asset Number: UAE.MC.038/2553

Terminal Model: N/A

Terminal Serial No.: N/A

Terminal Asset No.: N/A

Range	Max. Capacity	Readability (d)
1	620 g	0.001 g

Procedure

Calibration Guideline: EURAMET cg-18 v. 4.0 (11/2015)

METTLER TOLEDO Work Instruction: CPW002/20

This calibration certificate contains measurements for As Found calibration. No As Left calibration was performed because the device was not modified after As Found calibration. Therefore, results for As Left correspond to As Found.

The sensitivity/pan of the weighing instrument was adjusted before calibration with a built-in weight.

In accordance with EURAMET cg-18 (11/2015), the test loads were selected to reflect the specific use of the weighing device or to accommodate specific calibration conditions.

	Temperature		Humidity	
As Found	Start 22.8 °C	End 23.0 °C	Start 49.9 %	End 58.3 %

As Found Calibration Date: 07-Apr-2022

As Left Calibration Date: N/A

Issue Date: 08-Apr-2022

Calibration: 

Approved Signatory: 

Software Version: 1.23.0.268

Report Version: 2.16.13

Form Number: F103C

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Page 1 of 5

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Calibration Certificate ID
TH-0358-086-040722-ACC-TH



Measurement Results

Repeatability

Test Load: 200 g

	As Found	As Left
1	200.0011 g	N/A
2	200.0011 g	N/A
3	200.0011 g	N/A
4	200.0011 g	N/A
5	200.0011 g	N/A
6	200.0003 g	N/A
7	200.0011 g	N/A
8	200.0011 g	N/A
9	200.0003 g	N/A
10	200.0011 g	N/A

Standard Deviation: 0.0004 g N/A



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

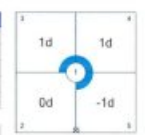
The results of this graph are based upon the absolute values of the difference from the mean value.

Eccentricity

Test Load: 200 g

Position	As Found	As Left
1	200.0011 g	N/A
2	200.0011 g	N/A
3	200.0002 g	N/A
4	200.0002 g	N/A
5	200.0003 g	N/A

Maximum Deviation: 0.0001 g N/A



As Found

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

เอกสารไม่ควบคุม

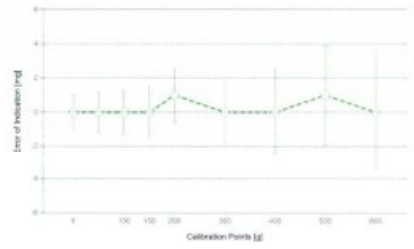
Calibration Certificate ID
TH-0358-086-040722-ACC-TH



Error of Indication

As Found

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.000 g	0.000 g	0.000 g	1.0 mg	2
2	0.500 g	0.500 g	0.000 g	1.2 mg	2
3	1.000 g	1.000 g	0.000 g	1.2 mg	2
4	50.000 g	50.000 g	0.000 g	1.2 mg	2
5	100.000 g	100.000 g	0.000 g	1.3 mg	2
6	150.000 g	150.000 g	0.000 g	1.5 mg	2
7	200.000 g	200.001 g	0.001 g	1.6 mg	2
8	300.001 g	300.001 g	0.000 g	2.0 mg	2
9	400.001 g	400.001 g	0.000 g	2.5 mg	2
10	500.001 g	500.002 g	0.001 g	2.9 mg	2
11	600.001 g	600.001 g	0.000 g	3.4 mg	2



As Found

As Left

For improved legibility of the graphics only increasing measurement points are shown and measurement points close to zero are not displayed.

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

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

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Test Equipment

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

Weight Set 1: OIML F1

Weight Set No.: W555 Date of Issue: 09-Jul-2021
Certificate Number: CCM-0137-21-C Calibration Due Date: 07-Jul-2022

Weight Set 2: OIML E2

Weight Set No.: W580 Date of Issue: 25-Feb-2022
Certificate Number: C205511831 Calibration Due Date: 14-Aug-2023

Thermo Hygrometer

Equipment No.: IN161 Date of Issue: 14-Jun-2021
Certificate Number: Z1H1225 Calibration Due Date: 01-Jun-2022

Remarks

FACT adjustment functionality activated
Equipment condition: Good
Next calibration according to customer's procedure
Calibration data not decide by calibration laboratory

End of Accredited Section

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

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Measurement Uncertainty of the Weighing Instrument in Use

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

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

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

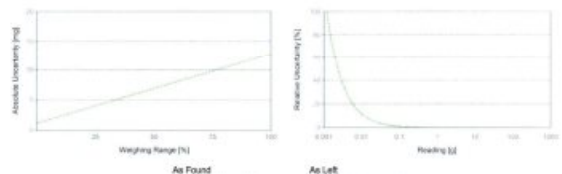
Linearization of Uncertainty Equation

Range	As Found	As Left
d	U ₁ = 1.2 mg + 0.0186 mg/g · R	N/A
Max		

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

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

Net Indication	As Found	As Left
0.002 g	1.2 mg	1.0%
0.020 g	1.2 mg	0.20%
0.200 g	1.3 mg	0.021%
0.200 g	2.4 mg	0.0038%
0.200 g	13 mg	0.0021%



เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert. No.: 22TM681
Page.: 1 of 3

Certificate of Calibration

Equipment : Autoclave
Manufacturer : ALP
Model : CL-40L
Serial No. : 808763
ID No. : UAE.MIC.026/2563
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Microbiology Laboratory (301)
Received Order : 27 May 2022
Calibration Date : 27 May 2022
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Preecha Hiahb
Approved by :
Approved Signatory
{ } Pongthippa Tameyakul
{ } Malee Butkrusa
{ } Suwit Imjai

Issue Date : 2 June 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

เอกสารไม่ควบคุม



Equipment : Autoclave
Condition As-Received : Used Item
Reference : 2205-0764QC-2

Cert. No.: 22TM681
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

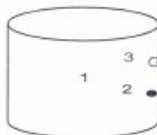
The temperature scale used was based on ITS-90.

Condition of this result of calibration

- Reference standard instrument:-
- Instrument Model Serial No. Cert. No. Due Date
- 1) Data Acquisition 34970A MY44060450 22LM46 28 Mar 2023
- This certificate is valid only to the item calibrated on date and place of calibration.
- This certification is traceable to the International System of Unit.
- 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.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source



	Environmental		
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	27	56	220
Finished of Calibration	27	59	221

Position	Description	Ref. Std. ID No.:
1 =	Center of chamber	22-14TC-01
2 =	Temperature sensor	22-14TC-02
3 =	Exhaust port	22-14TC-03

เอกสารไม่ควบคุม



Equipment : Autoclave
Condition As-Received : Used Item
Reference : 2205-0764OC-2

Cert. No.: 22TM681
Page.: 3 of 3

Result of Calibration :- (*) Without Adjustment

Operating parameter Set : Temperature = 115.0 °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>
115.0	115.0	1	115.553	0.4	0.06	0.82	2
		2	115.582				
		3	115.325				

Operating parameter Set : Temperature = 121 °C

Sterilization period = 30 minute

UUC* Setting (°C)	UUC* Reading (°C)	Position	Average* Standard Reading (°C)	Stability (± °C)	Pressure Reading (MPa)	Uncertainty (± °C)	Coverage Factor <i>k</i>
121.0	121.0	1	121.484	0.21	1.1	0.75	2
		2	121.581				
		3	121.311				

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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เอกสารไม่ควบคุม

Calibration Certificate

Certificate No.: 2301846-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address: 3 Soi Udomek 41, Sukhumvit Road,
Bangchack, Prakhonong, Bangkok 10260

Page 1 of 5

Equipment: pH Meter
Manufacturer: Mettler Toledo
Model: SevenEasy TM S20 pH
Serial No.: 1231155210
ID No.: UAE.WAT.0102553
Order No.: 2301846
Operation No.: 2301846-001
Date of Receipt: 17 February 2023
Date of Calibration: 24 February 2023

Calibrated by: Mr. Wongsak Gookong
Scientist
Approved by: N. Niyomchart
(Mr. Nuttapol Niyomchart)
Specialist, Division of Calibration Laboratory
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: 01 Date: 20-04-05

Calibration Report

Certificate No.: 2301846-001-01
Equipment: pH Meter
Resolution: 0.01 pH ; 1 mV
Manufacturer: Mettler Toledo
Model: SevenEasy TM S20 pH
Serial No.: 1231155210
Type: Bench top
ID No.: UAE.WAT.0102553
Date of Calibration: 24 February 2023

Page 3 of 5

1. Calibration of pH Meter (Manual Temperature Compensation at 25 °C)

Normal pH	DC Voltage Standard (mV)	Average Indicator Reading (mV)	Uncertainty (mV)	Coverage Factor (#)
0	414.120	414	0.08	2.00
2	295.814	295	0.08	2.00
4	177.464	178	0.08	2.00
6	59.163	59	0.08	2.00
7	0.000	0	0.08	2.00
8	-80.136	-80	0.08	2.00
10	-177.466	-177	0.08	2.00
12	-295.811	-296	0.08	2.00
14	-414.117	-414	0.08	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.: 9016311
ID No.: N/A
Performance of Electrode system (Three-Point Calibration at pH 4, pH 7 and pH 10)

Certified Value @25 °C (pH)	Average Indicator Reading		Relative Slope (%)	Uncertainty (± pH)	Coverage Factor (#)
	pH	mV			
4.008	4.01	190	-	0.0071	2.00
6.865	6.90	10	97.68	0.0075	2.00
10.008	10.01	-100	97.29	0.0066	2.00
6.865	6.89	15	-	0.0062	2.00

F-CS-012 Revision: 01 Date: 20-04-05

Calibration Report

Certificate No.: 2301846-001-01
Equipment: pH Meter
Resolution: 0.01 pH ; 1 mV
Manufacturer: Mettler Toledo
Model: SevenEasy TM S20 pH
Serial No.: 1231155210
Type: Bench top
ID No.: UAE.WAT.0102553
Date of Calibration: 24 February 2023

Page 2 of 5

Location: Chemical Calibration Laboratory, National Food Institute
Environment Condition: Ambient Temperature: (25.1 ± 1.5) °C Relative Humidity: (55 ± 5) %
Condition of Equipment: Good Condition

Condition of this Results of Calibration

1. Calibration Method: In house method: W-CC-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
0.1 DC Voltage Calibrator	5998007	Fuka	7581666	17 June 2024
2.2 Digital Thermometer	2799007	Fuka	CC 656577-01	30 October 2023
2.3 Thermo-Hygro-Meter	NPI.BTH 88718	PONPE 490	CR22-0895	26 April 2023
Certified Reference Material				
Lot No.	Manufacturer	Ref. No.	Expiry Date	
2.4 pH buffer 4.008 (Primary pH buffer Solution)	832006	CPAchem	PH216.LS	8 August 2024
2.5 pH buffer 6.865 (Primary pH buffer Solution)	832007	CPAchem	PH217.LS	8 August 2024
2.6 pH buffer 10.01 (Primary pH buffer Solution)	832009	CPAchem	PH220.LS	8 August 2023
2.7 pH buffer 7.00 (Standard pH buffer Solution)	832010	CPAchem	PH107.LS	8 August 2023

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

- 3.1 Instruments No 2.1 through NSC-TIS-TS 17025 Laboratory Accreditation of Calibration No.8908
- 3.2 Instruments No 2.2 through NSC-TIS-TS 17025 Laboratory Accreditation of Calibration No.9001
- 3.3 Instruments No 2.3 through NSC-TIS-TS 17025 Laboratory Accreditation of Calibration No.9292
- 3.4 Certified Reference Material No. 2.4 to 2.6 traceable to Primary measurement method: Primary cell using calibrated thermometer, barometer, and microanalyzer. The Standard Solution preparation and certified by CPAchem Ltd is accredited to ISO 17034 and ISO/IEC 17025
- 3.5 Certified Reference Material No.2.7 traceable to BSM Ref H-27 Lot# 04.06.2021; BSM Ref H-26 Lot# 28.05.2021; BSM Ref H-27 Lot# 04.06.2021; BSM Ref H-28 Lot# 28.05.2021, 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: 01 Date: 20-04-05

Calibration Report

Certificate No.: 2301846-001-01
Equipment: Digital Thermometer with RTD
Resolution: 0.1 °C
Model: SevenEasy TM S20 pH
Serial No.: 1231155210
ID No.: UAE.WAT.0102553
Manufacturer: Mettler Toledo
Date of Calibration: 24 February 2023

Page 4 of 5

Location: Chemical Calibration Laboratory, National Food Institute
Environment Condition: Ambient Temperature: 25 °C ± 1 °C
Relative Humidity: 48 % ± 3 %

Condition of this results of Calibration:

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

2. Reference Standard Instrument:

Instrument	Model	Serial No.	Certificate No.	Due Date	Through
HANDHELD THERMOMETER	1523	2118154	PSL-T 0673/65	07-Jun-23	TISTR
Platinum Resistance Thermometer (PRT)	5627A	877332			

Support Equipment: - Low Temperature Bath (Micro Bath), Model: 7103, S/N: A39538,AN65 A85181.

- 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: 01 Date: 20-04-05

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



Calibration Report

Certificate No.: 2301846-001-01
Equipment: Digital Thermometer with RTD
Resolution: 0.1 °C Model: SevenEasy TM 520 pH
Serial No.: 1231155210 ID No.: UAE.WAT.010/2553
Manufacturer: Mettler Toledo
Date of Calibration: 24 February 2023 Page 3 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 120 mm.
- Description of probe, model : S/N : -
- Dimension of probe : Diameter 9 mm., Length 120 mm.,
- Sheath material : Stainless Steel

UUC [®] Reading (°C)	Standard Temperature (°C)	Correction Value (°C)	Uncertainty ± (°C)
15.1	15.015	- 0.1	0.11
25.0	25.014	0.0	0.11
35.1	35.016	- 0.1	0.11

Note
- UUC[®] : Unit Under Calibration

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

----- End -----

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

32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230
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DQE Services Co., Ltd.

DQE Services

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



CERTIFICATE OF CALIBRATION

Certificate No. : SP23-007

Page 1 of 5

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

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

Location of calibration : Laboratory 315

Equipment : UV-Vis Spectrophotometer

Manufacturer : Hitachi

Model : U-1900

Serial No. : 7021-064

ID No. : UAE.WAS.006/2552

Received Date : 6 January 2023

Calibration Date : 6 January 2023

Issue Date : 10 January 2023

Condition Instrument : Used

Calibrated by :
(Mr. Tanawut Rittidach)
Technical Manager

Approved by :
(Ms. Chonticha Sangngem)
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.

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FM-708-02 R01 1/11/2021



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REPORT OF CALIBRATION

Certificate No. : SP23-007

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	25737	93929	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

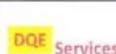
Scan Interval of UUC : 0.1 nm.

Resolution of UUC : Photometric 0.001 Abs.

Wavelength 0.1 nm.

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FM-708-02 R01 1/11/2021



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REPORT OF CALIBRATION

Certificate No. : SP23-007

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	0.575	0.0037	0.0031	2.00
	1.0490	1.044	0.0050	0.0029	2.00
	2.1900	2.181	0.0090	0.0080	2.00
440	0.0000	0.000	0.0000	0.0028	2.00
	0.5607	0.558	0.0027	0.0034	2.00
	1.0247	1.021	0.0037	0.0035	2.00
	2.1229	2.115	0.0079	0.0081	2.00
465	0.0000	0.000	0.0000	0.0028	2.00
	0.5236	0.520	0.0036	0.0030	2.00
	0.9634	0.961	0.0024	0.0029	2.00
	1.9763	1.968	0.0083	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	1.993	0.0057	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	2.031	0.0081	0.0080	2.00
635	0.0000	0.000	0.0000	0.0028	2.00
	0.5601	0.562	-0.0019	0.0032	2.00
	1.0512	1.052	-0.0008	0.0030	2.00
	1.9294	1.923	0.0064	0.0075	2.00

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FM-708-02 R01 1/11/2021

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REPORT OF CALIBRATION

Certificate No. : SP23-007
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	0.743	0.0048	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	0.639	0.0058	0.0055	2.00

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FM-708-02 R01 1/11/2021

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REPORT OF CALIBRATION

Certificate No. : SP23-007
Page 5 of 5

Wavelength Accuracy :

CRMs Value (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	417.8	0.68	0.21	2.00
446.70	445.9	0.80	0.18	2.00
453.20	452.5	0.70	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	637.1	0.84	0.18	2.00
440.74	440.0	0.74	0.18	2.00
472.22	471.5	0.72	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	574.0	0.60	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	740.0	0.27	0.20	2.00
748.28	747.5	0.78	0.18	2.00
807.16	806.5	0.66	0.18	2.00
879.70	879.0	0.70	0.18	2.00

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

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FM-708-02 R01 1/11/2021

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CERTIFICATE OF CALIBRATION

Certificate No. : SP23-008
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 : 6 January 2023

Calibration Date : 6 January 2023

Issue Date : 10 January 2023

Condition Instrument : Used

Calibrated by : _____ Approved by : _____
(Mr.Tanawut Rittidach) (Ms.Chonchicha Sangnern)
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.

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REPORT OF CALIBRATION

Certificate No. : SP23-008
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.

DQE Services Co.,Ltd.

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REPORT OF CALIBRATION

Certificate No. : SP23-008

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	0.574	0.0047	0.0031	2.00
	1.0490	1.044	0.0050	0.0029	2.00
	2.1900	2.182	0.0080	0.0080	2.00
440	0.0000	0.000	0.0000	0.0028	2.00
	0.5607	0.558	0.0027	0.0034	2.00
	1.0247	1.021	0.0037	0.0035	2.00
	2.1229	2.114	0.0089	0.0079	2.00
465	0.0000	0.000	0.0000	0.0028	2.00
	0.5236	0.520	0.0036	0.0030	2.00
	0.9634	0.960	0.0034	0.0029	2.00
	1.9763	1.969	0.0073	0.0070	2.00
546.1	0.0000	0.000	0.0000	0.0028	2.00
	0.5191	0.516	0.0031	0.0031	2.00
	1.0003	0.997	0.0033	0.0033	2.00
	1.9987	1.991	0.0077	0.0084	2.00
590	0.0000	0.000	0.0000	0.0028	2.00
	0.5523	0.550	0.0023	0.0030	2.00
	1.0809	1.078	0.0029	0.0030	2.00
	2.0391	2.032	0.0071	0.0080	2.00
635	0.0000	0.000	0.0000	0.0028	2.00
	0.5601	0.558	0.0021	0.0031	2.00
	1.0512	1.049	0.0022	0.0030	2.00
	1.9294	1.922	0.0074	0.0079	2.00

FM-708-02 R01 1/11/2021

DQE Services Co.,Ltd.

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REPORT OF CALIBRATION

Certificate No. : SP23-008

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	0.744	0.0038	0.0057	2.00
257	0.0000	0.000	0.0000	0.0050	2.00
	0.8686	0.863	0.0056	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	0.639	0.0058	0.0055	2.00

FM-708-02 R01 1/11/2021

nfi

มูลนิธิเพื่อการพัฒนาอาหาร

Foundation for Industrial Development National Food Institute

Food Industrial Laboratory Service Center

Verification Certificate

Certificate No.:

Client name:

Address:

2302413-001-01

UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakhonong, Bangkok 10260

Equipment:

Manufacturer:

Model:

Serial No.:

ID No.:

Order No.:

Operation No.:

Date of Receipt:

Date of Calibration:

HEATING BLOCK DIGESTION

FOSS

2520

91794469

UAE.WAS.011/2560

2302413

2302413-001

28 March 2023

30-31 March 2023

Calibrated by

Specialist

Approved by

Manager, Division of Calibration Laboratory

Responsible for the Technical Management Team

Mr.Nuttapol Niyomchat

(Mr.Pharaphat Tuanjit)

Date of Issue:

10 April 2023

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.

PCS-009 Revision: 01 Date: 20-04-65

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 TSI accredited
- End of Certificate -

FM-708-02 R01 1/11/2021

360 หมู่ 5 ถนนลาดพร้าว แขวงลาดพร้าว เขตลาดพร้าว กรุงเทพมหานคร 10230

2008 Soi 36, Aun Aun Road, Bang Yi Khan, Suckarot, Bang Prue District, Bangkok 10110, Thailand

Tel : +66(0) 2-402 8500 Fax : +66(0) 2-402 8540

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เอกสารไม่ควบคุม

เอกสารไม่ควบคุม

Location: Laboratory Room, 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:

1. 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	HY44048378/HY4139453	TC22/0044	5-May-2023	N.M. Technical Center Laboratory
	Type R	TC181-180 / CH165-180			

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

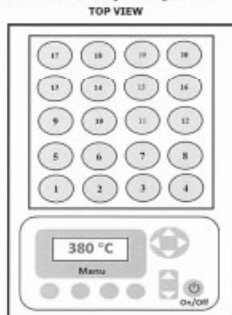
UUC* Description				
Time of Record	- Hour	30 Minute	At	380 °C

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

F-CS-009 Revision: 01 Date: 20-04-95

Certificate No.:	2302413-001-01		
Equipment:	HEATING BLOCK DIGESTION		
	Model: 2520	Serial No.: 91794469	
	Resolution: 1 °C	ID No.: UAE.WAS.01.1/2560	
	Manufacturer: FOSS		
Date of Calibration:	30-31 March 2023		
Calibration point:	380 °C		
Calibration result:	Continued		

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



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 %.

F-C5-009 Revision: 01 Date: 20-04-85

Certificate No.:	2302413-001-01		
Equipment:	HEATING BLOCK DIGESTION		
	Model: 2520	Serial No:	91794469
	Resolution: 1	°C	ID No.: UAE.WAS.011/2560
	Manufacturer: FOSS		
Date of Calibration:	30-31 March 2023		
Calibration point:	380 °C		

Calibration point:

Calibration result:

Reporting of Temperature

Block No.	UUC* Setting (°C)	UUC* Reading (°C)	Stability (±°C)	Standard Thermometer (°C)	Uncertainty (±°C)
1	380	380	0.96	377.74	2.1
2	380	380	0.40	377.28	2.1
3	380	380	1.18	377.82	2.1
4	380	380	0.44	377.19	1.6
5	380	380	0.11	377.30	1.6
6	380	380	0.14	377.90	1.6
7	380	380	1.17	373.85	2.1
8	380	380	0.33	376.96	2.1
9	380	380	0.14	374.18	2.1
10	380	380	0.96	378.56	2.0
11	380	380	1.04	378.34	2.0
12	380	380	0.35	378.06	2.0
13	380	380	0.48	377.05	1.6
14	380	380	0.38	379.19	1.6
15	380	380	0.50	377.48	1.6
16	380	380	0.48	378.33	1.7
17	380	380	0.71	377.60	1.7
18	380	380	0.35	376.77	1.7
19	380	380	0.84	377.06	1.8
20	200	200	0.43	277.29	1.9

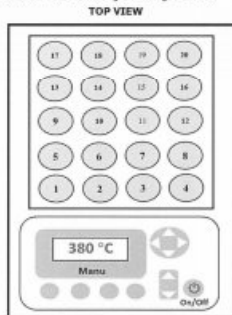
Notes:

- 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.

ECS-008 Revision: Fri Date: 20-04-65

Certificate No.:	2302413-001-01		
Equipment:	HEATING BLOCK DIGESTION		
	Model: 2520	Serial No.: 91794469	
	Resolution: 1 °C	ID No.: UAE.WAS.01.1/2560	
	Manufacturer: FOSS		
Date of Calibration:	30-31 March 2023		
Calibration point:	380 °C		
Calibration result:	Continued		

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



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 %.

F-C5-009 Revision: 01 Date: 20-04-85

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
5344 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-29 FAX. 0-2719-9484

Cert. No.: 23TM728
Page : 1 of 3

Certificate of Calibration

Equipment : Incubator

Manufacturer : Memmert

Model : IPP 260

Serial No. : V616.0066

ID No. : UAE.MIC.032/2559

Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10200

Location : Microbiology Laboratory (302)

Received Order : 27 April 2023

Calibration Date : 27 - 28 April 2023

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Tawatchai Pama

Approved by : 

Approved Signatory

() Ponthippa Tameyakul
(✓) Mailee Bufruea
() Suwit Imjai

Issue Date : 11 May 2023

The Uncertainties are for a confidence probability of approximately 95%

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Equipment : Incubator
Condition As-Received : Used Item
Reference : 2304-04610C-6
Result of Calibration : (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 23TM728
Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
25.0	25.0	25.0	0.020	0.81	1.2	2
36.0	36.0	36.0	0.15	1.1	1.6	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
25.0	25.541	25.354	25.388	25.278	24.341	24.349	24.379	24.455	24.747	0.30
36.0	35.275	35.351	35.768	35.941	36.543	36.590	36.653	36.728	36.232	0.39

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



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2304-04610C-6

Cert. No.: 23TM728
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	34972A	MY57013711	22LM93	02 Jul 2023

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

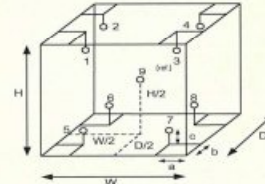
3. This certification is traceable to the International System of Unit.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close

Environment during calibration		
	Beginning	Finished
Temp. (°C)	25	22
REL.Humid. (%)	76	83
AC Supply (Volt)	231	231



Probe Installation Details :

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

Dimension of Chamber :

D =	0.50	m
W =	0.64	m
H =	0.80	m
Capacity =	0.26	m ³

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

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
55/41 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-29 FAX. 0-2719-6484



Cert. No.: 23TM729
Page : 1 of 3

Certificate of Calibration

Equipment : Incubator
Manufacturer : Memmert
Model : IPP 280
Serial No. : V618.0033
ID No. : UAE.MIC.021/2561
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangrak, Phrakhanong,
Bangkok 10260
Location : Microbiology Laboratory (302)
Received Order : 27 April 2023
Calibration Date : 27 April 2023
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Tawatchai Pama

Approved by :
() Pornthippa Tameyakul
(✓) Malise Butkrues
() Suwit Imjai

Issue Date : 11 May 2023

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

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

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Equipment : Incubator
Condition As-Received : Used Item
Reference : 2304-04610C-7

Cert. No.: 23TM729
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	34972A	MY57013711	22LM93	02 Jul 2023

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

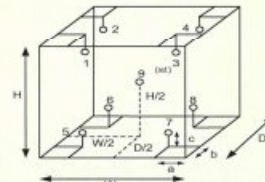
3. This certification is traceable to the International System of Unit.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close

Environment during calibration		
	Beginning	Finished
Temp. (°C)	20	21
REL.Humid. (%)	72	77
AC Supply (Volt)	230	231



Probe Installation Details :

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

Dimension of Chamber :

D =	0.50	m
W =	0.64	m
H =	0.80	m
Capacity =	0.26	m ³

Position :	Ref. Std. ID No.:
1	18-18RTD-01
2	18-18RTD-02
3	18-18RTD-03
4	18-18RTD-04
5	18-18RTD-05
6	18-18RTD-10
7	18-18RTD-07
8	22-18RTD-08
9 (ref.)	18-18RTD-09

เอกสารไม่ควบคุม



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2304-0461OC-7
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 23TM729
Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
22.0	22.0	22.0	0.058	0.11	0.19	2
44.0	44.0	44.0	0.065	0.50	0.87	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (±°C)
	1	2	3	4	5	6	7	8	9 (ref.)	
22.0	22.009	22.038	21.971	22.005	22.004	22.009	21.941	21.959	22.022	0.30
44.0	44.393	44.447	44.029	44.204	43.899	43.895	43.637	44.085	0.30	

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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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-29 FAX. 0-2710-9484



Cert. No.: 23TM193
Page : 1 of 3

Certificate of Calibration

Equipment : Water Bath
Manufacturer : Memmert
Model : WNE 14
Serial No. : L416.0606
ID No. : UAE.MIC.002/2560
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Microbiology Laboratory
Received Order : 15 February 2023
Calibration Date : 15 February 2023
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Suwit Imjai

Approved by : 
Approved Signatory

() Ponthippa Tameyakul
(/) Malee Butkrues

Issue Date : 24 February 2023

The Uncertainties are for a confidence probability of approximately 95%

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เอกสารไม่ควบคุม



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2302-0295OC-2
Procedure Used :-

Cert. No.: 23TM193
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	MY59003411	22LM165	26 Nov 2023

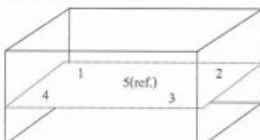
2. This certificate is valid only to the item calibrated on date and place of calibration.

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.)	
Beginning of Calibration	22	65	231
Finished of Calibration	23	61	231



Front

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

เอกสารไม่ควบคุม



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2302-0295OC-2
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 23TM193
Page : 3 of 3

Calibration point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Average* Standard Reading (°C)				
			1	2	3	4	5 (ref.)
44.5	44.5	44.5	44.453	44.437	44.428	44.477	44.458

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Uncertainty (± °C)	Coverage Factor k
44.5	0.079	0.038	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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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 13, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-29 FAX. 0-2719-9484



Cert. No.: 23TM194
Page : 1 of 3

Certificate of Calibration

Equipment : Water Bath
Manufacturer : Memmert
Model : WNE 14
Serial No. : L416.0612
ID No. : UAE.MIC.003/2560
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Microbiology Laboratory
Received Order : 15 February 2023
Calibration Date : 15 February 2023
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Suwit Imjai
Approved by :
() Pamthippa Tameyakul
(✓) Malee Butkrues
Issue Date : 24 February 2023

The Uncertainties are for a confidence probability of approximately 95%

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Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2302-0295OC-3
Procedure Used :-

Cert. No.: 23TM194
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:-

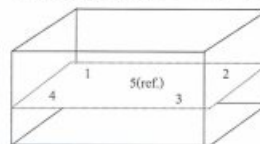
Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34972A	MY59003411	22LM165	26 Nov 2023

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	22	65	231
Finished of Calibration	22	63	230



Front

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

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Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2302-0295OC-3
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 23TM194
Page : 3 of 3

Calibration point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Average* Standard Reading (°C)				
			Position				
44.5	44.5	44.6	1	2	3	4	5 (ref.)
			44.520	44.509	44.498	44.552	44.530

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Uncertainty (± °C)	Coverage Factor k
44.5	0.077	0.037	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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Calibration Certificate ID
TH0038-036-040723-ACC-TH

METTLER TOLEDO

Mettler-Toledo (Thailand) Ltd.
846/4 - 846/5 Laxaville Rd., Bangna Tai Sub-District
Bangna District, Bangkok 10260
+66 2729 0062
MT-TH.ServiceSupport@mt.com



Accuracy Calibration Certificate

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

Weighing Device

Manufacturer:	Mettler Toledo	Instrument Type:	Weighing Instrument
Model:	MS003501	Asset Number:	UAE.MIC.003/2553
Serial No.:	8007010311	Terminal Model:	N/A
Building:	N/A	Terminal Serial No.:	N/A
Floor:	2	Terminal Asset No.:	N/A
Room:	Balance Room (208)		

Range	Max. Capacity	Readability (g)
1	620 g	0.001 g

Procedure

Calibration Guideline: EURAMET cp-18 v. 4.0 (11/2015)
METTLER TOLEDO Work Instruction: CPW002/00
This calibration certificate contains measurements for As Found calibration. No As Left calibration was performed because the device was not modified after As Found calibration. Therefore, results for As Left correspond to As Found.
The sensitivity/span of the weighing instrument was adjusted before calibration with a built-in weight.
In accordance with EURAMET cp-18 (11/2015), the test loads were selected to reflect the specific use of the weighing device or to accommodate specific calibration conditions.

As Found	Temperature	Humidity
Start: 22.8 °C	End: 23.0 °C	Start: 49.9 %
		End: 58.3 %

As Found Calibration Date: 07-Apr-2022
As Left Calibration Date: N/A
Issue Date: 08-Apr-2022
Calibrator:
Approved Signatory:
Kassakon Tassanachaisakul
Santi Jitvijorn
Sornchai Sukkale

Software Version: 1.23.0.298
Report Version: 2.18.13
Form Number: F100C

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written permission of the issuing calibration laboratory.

Page 1 of 3

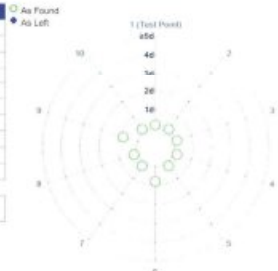
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Measurement Results

Repeatability

Test Load: 200 g

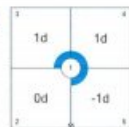
	As Found	As Left
1	200.001 g	N/A
2	200.001 g	N/A
3	200.001 g	N/A
4	200.001 g	N/A
5	200.001 g	N/A
6	200.000 g	N/A
7	200.001 g	N/A
8	200.001 g	N/A
9	200.000 g	N/A
10	200.001 g	N/A
Standard Deviation	0.0004 g	N/A



Eccentricity

Test Load: 200 g

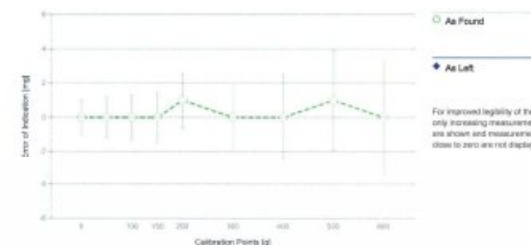
Position	As Found	As Left
1	200.001 g	N/A
2	200.001 g	N/A
3	200.002 g	N/A
4	200.002 g	N/A
5	200.000 g	N/A
Maximum Deviation	0.001 g	N/A



Error of Indication

As Found

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.000 g	0.000 g	0.000 g	1.0 mg	2
2	0.500 g	0.500 g	0.000 g	1.2 mg	2
3	1.000 g	1.000 g	0.000 g	1.2 mg	2
4	50.000 g	50.000 g	0.000 g	1.2 mg	2
5	100.000 g	100.000 g	0.000 g	1.3 mg	2
6	150.000 g	150.000 g	0.000 g	1.5 mg	2
7	200.000 g	200.001 g	0.001 g	1.6 mg	2
8	300.001 g	300.001 g	0.000 g	2.0 mg	2
9	400.001 g	400.001 g	0.000 g	2.5 mg	2
10	500.001 g	500.002 g	0.001 g	2.9 mg	2
11	600.001 g	600.001 g	0.000 g	3.4 mg	2



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

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

Test Equipment

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

Weight Set 1: OIML F1

Weight Set No.:	W555	Date of Issue:	09-Jul-2021
Certificate Number:	CCM-0137-21-C	Calibration Due Date:	07-Jul-2022

Weight Set 2: OIML E2

Weight Set No.:	W580	Date of Issue:	23-Feb-2022
Certificate Number:	C200581031	Calibration Due Date:	14-Aug-2023

Thermo Hygrometer

Equipment No.:	104161	Date of Issue:	14-Jun-2021
Certificate Number:	21H1220	Calibration Due Date:	01-Jun-2022

Remarks

FACT adjustment functionality activated
Equipment condition: Good
Next calibration according to customer's procedure
Calibration data not decide by calibration laboratory

End of Accredited Section

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

Measurement Uncertainty of the Weighing Instrument in Use

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

Temperature coefficient for the evaluation of the measurement uncertainty in use: $3.0 \cdot 10^{-4} / K$

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

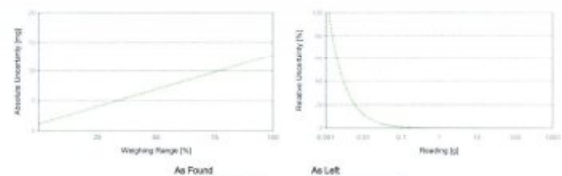
Linearization of Uncertainty Equation

Range	As Found	As Left
1	0.001 g	620 g
	$U_1 = 1.2 \text{ mg} + 0.0180 \text{ mg/g} \cdot R$	N/A

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

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

Net Indication	As Found	As Left
0.002 g	1.2 mg	1.9%
0.020 g	1.2 mg	0.20%
0.200 g	1.3 mg	0.021%
0.200 g	2.4 mg	0.0038%
0.200 g	13 mg	0.0021%





TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-29 FAX. 0-2719-9884



Cert. No.: 23TM763
Page : 1 of 3

Certificate of Calibration

Equipment : Autoclave
Manufacturer : ALP
Model : CL-40L
Serial No. : 808763
ID No. : UAE.MIC.026/2563
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Microbiology Laboratory (301)
Received Order : 27 April 2023
Calibration Date : 27 April 2023
Ambient Temperature : $(26 \pm 10) ^\circ\text{C}$
Relative Humidity : $(50 \pm 30) \%$
Calibrated by : Praecha Hiahb
Approved by :
() Pomthippa Tameyakul
() Malon Rukhrua
() Suwit Imjai
Issue Date : 11 May 2023

The Uncertainties are for a confidence probability of approximately 95%

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

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A 0053944



Equipment : Autoclave
Condition As-Received : Used Item
Reference : 2304-04610C-2
Procedure Used :-

Cert. No.: 23TM763
Page : 2 of 3

Calibration were conducted using in-house calibration procedure CP-OT03 according to direct measurement method with Data Acquisition which connected with thermocouple type 1
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	MY59003411	22LM165	26 Nov 2023

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.

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.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source



	Environmental		
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	27	60	220
Finished of Calibration	27	58	220

Position	Description	Ref. Std. ID No.:
1 =	Center of chamber	18-20TC-04
2 =	Temperature sensor	18-20TC-05
3 =	Exhaust port	18-20TC-06

เอกสารไม่ควบคุม

a 1159968



Equipment : Autoclave
Condition As-Received : Used Item
Reference : 2304-04610C-2
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 23TM763
Page : 3 of 3

Operating parameter Set : Temperature = $115.0 ^\circ\text{C}$

Sterilization period = 15 minute

UUC* Setting (°C)	UUC* Reading (°C)	Position	Average* Standard Reading (°C)	Stability (± °C)	Pressure Reading (MPa)	Uncertainty (± °C)	Coverage Factor k
115.0	115.0	1	115.213	0.22	0.08	0.75	2
		2	115.166				
		3	115.260				

Operating parameter Set : Temperature = $121.0 ^\circ\text{C}$

Sterilization period = 30 minute

UUC* Setting (°C)	UUC* Reading (°C)	Position	Average* Standard Reading (°C)	Stability (± °C)	Pressure Reading (MPa)	Uncertainty (± °C)	Coverage Factor k
121.0	121.0	1	121.260	0.29	1.1	0.75	2
		2	121.224				
		3	121.284				

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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เอกสารไม่ควบคุม

a 1159967



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-29 FAX. 0-2719-9884



Cert.No.: 23MM113
Page: 1 of 3

Certificate of Calibration

Equipment : Electronic Balance
Manufacturer : Mettler Toledo
Model : XSR205
Serial No. : C210685394
ID No. : UAE.WAO.010/2565
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Balance Room
Received order : 26 April 2023
Calibration Date : 26 April 2023
Ambient Temperature : $15 ^\circ\text{C}$ to $40 ^\circ\text{C}$
Relative Humidity : 30 % to 90 %
Calibrated by : Man Pattanapongpaiboon
Approved by :
() Pomthippa Tameyakul
() Malon Rukhrua
() Suwit Imjai
Issue Date : 2 May 2023

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม

Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2304-0459OC-2
Procedure used :-

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

Condition of this result of calibration

1. Reference standard instruments:-

Instruments	Model	Serial No.	ID No.	Test report No.	Due date
1) Standard Weight Set (E2)	15884	24053	70RC007	MM-0010-22	20 Jan 2024

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

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

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

Before Adjustment :

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (± mg)	Coverage Factor (k)
80	79.99992	+0.00008	0.15	2.00
200	199.9995	+0.0005	0.29	2.00

After Adjustment :

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

Applied Weight (g)	Standard Deviation of Reading (g)
80	0.000007
200	0.00004

เอกสารไม่ควบคุม

Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2304-0459OC-2
Result of calibration

2. Effect of off center loading

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

Position 1 (g)	Position 2 (g)	Position 3 (g)	Position 4 (g)	Position 5 (g)	Maximum difference between off-center and central loading (g)
-0.0001	-0.0001	0.0000	-0.0001	-0.0001	0.0001

3. Departure from nominal value

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (± mg)	Coverage Factor (k)
Unload	0.00000	0.00000	0.014	2.11
0.05	0.04999	+0.00001	0.015	2.09
0.1	0.09999	+0.00001	0.015	2.07
1	1.00000	0.00000	0.018	2.04
5	5.00000	0.00000	0.026	2.00
20	20.00002	-0.00002	0.045	2.00
50	50.00002	-0.00002	0.080	2.00
80	80.00002	-0.00002	0.15	2.00
100	100.00000	0.00000	0.17	2.00
150	150.00000	0.00000	0.29	2.00
200	199.9999	+0.0001	0.29	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 %.

เอกสารไม่ควบคุม

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
516/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3801-37 FAX. 0-2719-0464

Cal. No. : 227M1490
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.
35/4 Udomsuk 41, Sukhumvit Road,
Bangkok, Phrakhanong,
Bangkok 10260

Location : Lab Floor 2

Received Order : 19 October 2022
Calibration Date : 19 October 2022
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %

Calibrated by : Preecha Hishib

Approved by : 
Approved Signatory

() Pornthippa Tameyakul
() Malee Butkras
(✓) Suwit Imjai

Issue Date : 31 October 2022

The Uncertainties are for a confidence probability of approximately 95%
This certificate may not be reproduced other than in full, except with the prior written approval of the head of Corporate Services & Equipment Calibration and Testing Services.

เอกสารไม่ควบคุม

Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2210-0575OC-1
Procedure Used :-

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Delta 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.	Cal. No.	Due Date
1) Data Acquisition	34970A	MY41021843	22LM4	10 Jan 2023

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.

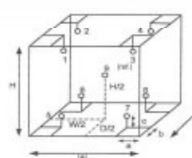
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Environment during calibration

	Beginning	Finished
Temp. (°C)	29	30
REL Humid. (%)	47	40
AC Supply (Volt)	221	220

Ref. Std. ID No. : 22LM4

Position :	(104) °C	(140, 180) °C
1	18-04RTD-01	21-04TC-01
2	18-04RTD-02	21-04TC-02
3	18-04RTD-03	21-04TC-03
4	18-04RTD-04	21-04TC-04
5	18-04RTD-05	21-04TC-05
6	18-04RTD-06	21-04TC-06
7	18-04RTD-07	21-04TC-07
8	18-04RTD-08	21-04TC-08
9 (ref.)	18-04RTD-09	21-04TC-09

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 = 0.093 m³

เอกสารไม่ควบคุม



Cert. No.: 23TM249
Page : 1 of 3

Certificate of Calibration

Equipment : BOD Incubator
Manufacturer : Arco
Model : UC4-1320
Serial No. : 13URC45013201
ID No. : UAE.WAO.015/2561
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 : 15 February 2023
Calibration Date : 15 February 2023
Ambient Temperature : $(26 \pm 10) ^\circ\text{C}$
Relative Humidity : $(50 \pm 30) \%$
Calibrated by : Prascha Hahib
Approved by :
() Ponthippa Tameyakul
(/) Mahee Bulkruea
() Suwit Imjai

Issue Date : 24 February 2023

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม

A 0051476



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2302-0297OC-1

Cert. No.: 23TM249
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	34972A	MY57013711	22LM93	02 Jul 2023

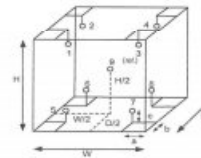
2. This certificate is valid only to the item calibrated on date and place of calibration.

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 = 0.62 m
W = 1.2 m
H = 1.2 m
Capacity = 0.89 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	29	31
REL.HUMID. (%)	63	67
AC Supply (Volt)	220	220

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

เอกสารไม่ควบคุม

A 1149517



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2302-0297OC-1
Result of Calibration : (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Not Available

Cert. No.: 23TM249
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	20.0	19.3	0.32	0.57	1.0	0.60	2
Measured Temperature (°C)							
Calibration Point (°C)	Position						
	1	2	3	4	5	6	7
20.0	20.066	19.916	20.386	19.976	19.973	19.838	19.837

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

Temperature stability : One-half of the greatest standard 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 1149512



Cert. No.: 23TM375
Page : 1 of 3

Certificate of Calibration

Equipment : BOD Incubator
Manufacturer : ARCO
Model : UR-1320
Serial No. : -
ID No. : UAE.WAO.018/2551
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 : 11 April 2023
Calibration Date : 12 April 2023
Ambient Temperature : $(26 \pm 10) ^\circ\text{C}$
Relative Humidity : $(50 \pm 30) \%$
Calibrated by : Krisda Malee
Approved by :
() Ponthippa Tameyakul
(/) Mahee Bulkruea
() Suwit Imjai
Issue Date : 24 April 2023

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 0053360



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2304-0156DC-2

Cert. No.: 23TM375
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	34972A	MY59003411	22LM165	26 Nov 2023

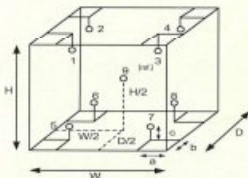
2. This certificate is valid only to the item calibrated on date and place of calibration.

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 = 0.62 m
W = 1.2 m
H = 1.2 m
Capacity = 0.89 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	28	27
REL Humid. (%)	42	45
AC Supply (Volt)	219	220

Position :	Ref. Std. ID No.:
1	20RTD-2/1
2	20RTD-2/2
3	20RTD-2/3
4	20RTD-2/4
5	20RTD-2/5
6	20RTD-2/6
7	20RTD-2/7
8	20RTD-2/8
9 (ref.)	20RTD-2/9

Melu

เอกสารไม่ควบคุม

a 1158259



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2304-0156DC-2

Cert. No.: 23TM375
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)	Coverage Factor
20.0	20.0	20.0	0.48	0.42	1.2	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
20.0	20.040	20.170	20.263	20.093	19.749	19.704	19.920	20.191	20.020	0.66

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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Melu

เอกสารไม่ควบคุม

a 1158258

ภาคผนวก ช
เอกสารการสอบเทียบเครื่องมือ





ที่ ธก ๐๓๑๐(๑)/ ๖ ๐ ๒ ๘

กรมโรงงานอุตสาหกรรม
เลขที่ระบายน้ำ ๖ เขตอุตสาหกรรม
เขตราชบุรี กรุงเทพฯ ๑๐๔๐๐

๒ ๒ มีนาคม ๒๕๖๖

เรื่อง เปลี่ยนแปลงบุคลากรและสารเคมีวิเคราะห์

เรียน กรรมการผู้ตรวจการ บริษัท ปูนซีเมนต์ แอนด์ เอ็นจิเนียริ่ง คอนสตรัคชั่น จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุใบเปลี่ยนแปลงบุคลากร และสารเคมีของห้องปฏิบัติการวิเคราะห์ภายใน
ลงวันที่ ๓๐ มกราคม ๒๕๖๖

สิ่งที่ส่งมาด้วย เอกสารแนบท้ายหนังสือเปลี่ยนแปลงบุคลากรและสารเคมีวิเคราะห์

บริษัท ปูนซีเมนต์ แอนด์ เอ็นจิเนียริ่ง คอนสตรัคชั่น จำกัด จำนวน ๒ แผ่น

ตามหนังสือที่อ้างถึง บริษัท ปูนซีเมนต์ แอนด์ เอ็นจิเนียริ่ง คอนสตรัคชั่น จำกัด
ห้องปฏิบัติการวิเคราะห์ภายใน เลขทะเบียน ๖-๑๕๕ สถานที่เลขที่ ๓ ซอยอุดมสุข ๔๑ ถนนสุขุมวิท
แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร ขอเปลี่ยนแปลงบุคลากรและสารเคมีวิเคราะห์ที่วิเคราะห์
ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว มีความเห็นดังนี้

๑. ให้อยกเลิกเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๒ ราย

๑) นายวิมล ตูวรรณการ ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๓๖

๒) นายพิพัฒน์ สันตกุล ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๓๗

๒. ให้เพิ่มเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๑ ราย

๑) นางสาวกรรณิศา ประสานศรี ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๓๘

๒) นายนพดล เมื่อน้อย ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๓๙

๓) นายสุภากร สอนศรี ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๔๐

๔) นายคมพล ศิวานนท์ ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๔๑

๕) นายโรจน์ พุ่มไธสง ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๔๒

๖) นายณวัช คุ้มบ้านเกษม ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๔๓

๗) นายธีรวัฒน์ อรรณพารักษ์ ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๔๔

๘) นายณัฐพงศ์ ขนุกุล ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๔๕

๙) นางสาวณัฐกานดา พงษ์ภักดิ์ ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๔๖

๑๐) นางสาวพรนิจา พงษ์สุระ ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๔๗

๑๑) นางสาวพรวิภา จงระโนด ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๔๘

๓. ให้เพิ่มบุคลากรและสารเคมีวิเคราะห์ในใบวิเคราะห์ดังนี้



ดำเนินการถูกต้อง

ธษ.

อนึ่ง หนังสือฉบับนี้จะมีผลใช้บังคับเมื่อพ้นกำหนดสิบวันนับแต่วันพ้นการพิจารณาของคณะกรรมการ
ที่ ธก ๐๓๑๐(๑)/๑๘๗๗ ลงวันที่ ๕ กุมภาพันธ์ ๒๕๖๕ คือในวันที่ ๒ กุมภาพันธ์ ๒๕๖๕ ทั้งนี้ สามารถยื่นคำขอ
ผ่านระบบอิเล็กทรอนิกส์ได้ทั้งในวันหยุดทำการโรงงานอุตสาหกรรม ตาม QR Code ที่แนบมาด้วย

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

๖๖๖

(นายประจักษ์ อัครพรชัย)
ผู้อำนวยการสำนักนโยบายและแผนโรงงาน
อุตสาหกรรมและสิ่งแวดล้อม



ยื่นคำขอผ่านระบบอิเล็กทรอนิกส์

กรมส่งเสริมการค้าระหว่างประเทศ

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบและประเมินห้องปฏิบัติการ

โทร. ๐ ๒๕๓๖ ๒๓๒๖ ต่อ ๒๓๓๓-๕ โทรสาร ๐ ๒๕๓๖ ๒๓๒๖ ต่อ ๒๓๓๓-๕

ไปรษณีย์อิเล็กทรอนิกส์ sarabangdiw@mail.go.th



ดำเนินการถูกต้อง



อุตสาหกรรมบริการไทย ประสิทธิภาพก้าวไกล ร่วมกันพัฒนาอุตสาหกรรมสีเขียว



เอกสารแนบท้ายหนังสือเปลี่ยนแปลงบุคลากรและสารเคมีวิเคราะห์

บริษัท ปูนซีเมนต์ แอนด์ เอ็นจิเนียริ่ง คอนสตรัคชั่น จำกัด เลขทะเบียน ๖-๑๕๕

ที่ ธก ๐๓๑๐(๑)/ ๖ ๐ ๒ ๘

ลงวันที่ ๒ ๒ มีนาคม ๒๕๖๖

ขอประชาสัมพันธ์ที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๑๖ รายการ

สืบ จำนวน 16 รายการ

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

ดำเนินการถูกต้อง

เอกสารอ้างอิง

เอกสารอ้างอิง

1. United States Environmental Protection Agency, Test Methods for Evaluation Solid
Waste Physical/Chemical Methods. Volatile Organic Compounds in Various Sample Matrices
Using Equilibrium Headspace Analysis, SW-846 Method 5021A, 2014.

2. United States Environmental Protection Agency, Test Methods for Evaluation Solid
Waste Physical/Chemical Methods. Volatile Organic Compounds by Gas Chromatography/
Mass Spectrometry, SW-846 Method 8260D, 2018. ๖๖๖



ดำเนินการถูกต้อง



ทพ.นิตยา เสาวฤทธิ์ 2-๕๕5-๕-๐๐๔๖
ทพ.นิตยา เสาวฤทธิ์ 2-๕๕5-๕-๐๐๔๗
ทพ.นิตยา เสาวฤทธิ์ 2-๕๕5-๕-๐๐๔๘
ทพ.นิตยา เสาวฤทธิ์ 2-๕๕5-๕-๐๐๔๙
ทพ.นิตยา เสาวฤทธิ์ 2-๕๕5-๕-๐๐๕๐



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95501-1000

อำนาจ
อำนาจปกครอง

๕. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑๐๒ นาย

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(นางจินดา เกษศรีภักดิ์)
ผู้อำนวยการกองนโยบายและแผน
สำนักงานคณะกรรมการอาหารและยา

៣៦) វាយបោកស្លាប់

LIAC
LOW COST AERIAL AND TERRESTRIAL
CONSULTANT COMPANY, INC.

สมัครสมาชิก


(นางจินดา เกษศรีภักดิ์)
ผู้อำนวยการกองนโยบายและแผน
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៣៦) វាយបោកស្លាប់

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ผู้สมัคร


 (นางสาว อรุณรัตน์ นาค)

៣២) ប្រតិបត្តិការ

- ๓๗) นายอิทธิพล ศรีสุข
- ๓๘) นางสาวกานดาฉัตร สีสิงห์
- ๓๙) นายอนุพงษ์ ภูมิคุ้ม
- ๔๐) นายพรหม คุ้มวงศ์
- ๔๑) นางสาวกัญญา ใจเพชร
- ๔๒) นายสุวิทย์ ศรีแก้ว
- ๔๓) นางสาวณัฏฐา ทวีวงศ์
- ๔๔) นางสาวณิชากร ใจสิงห์
- ๔๕) นางสาวกานดากรรณ ใจสิงห์
- ๔๖) นายพชรศักดิ์ ใจเพชร
- ๔๗) นายอิทธิพล ใจสุข
- ๔๘) นางสาวกานดา ใจเพชร
- ๔๙) นางสาวณิชากร ใจสิงห์
- ๕๐) นางสาวสิริกานา ใจเพชร
- ๕๑) นางสาวกานดา ใจเพชร
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- ๙๘) นางสาวกานดา ใจเพชร
- ๙๙) นางสาวกานดา ใจเพชร
- ๑๐๐) นายสุวิทย์ ใจสิงห์

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LAE
LABORATORY ANALYSIS
CONSULTANT COMPANY LIMITED

ด้าเนอาดูกตอ

นางจินดา เทชะเตีนาทรี
สมาชิกสภาผู้แทนราษฎร
พรรคประชาธิปัตย์

เอกสารแนบท้ายหนังสือรับส่งข้อมูลขึ้นทะเบียนข้อมูลวิธีการวิเคราะห์
บริษัท อีเอ็มเค แอแนลิติกส์ แอนด์ เอ็นจิเนียริ่ง คอมพิวเตอร์ จำกัด เลขทะเบียน ๖-๑๔๕
ที่ อก ๐๓๐๐(๑)/ ๑๘๗ ๕ ลงวันที่ ๑๔ กุมภาพันธ์ ๒๕๖๕
ขอแจ้งสารณณพินที่ขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๒๘๗ รายการ

น้ำดื่ม จำนวน 46 รายการ

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

16 o,p'-DDT...

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

36 Oil & Grease...

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

น้ำดื่ม จำนวน 126 รายการ

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

4 Anthracene...

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

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

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

30 Chlorodibromomethane...

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

42 Dibenz(a,h)anthracene...

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

58 Diethyl phthalate...

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

70 Heptachlor epoxide...

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

82 Manganese...

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

96 Polychlorinated Biphenyls...

ลำดับ	สารเคมี	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 ⁽¹⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽²⁾
97	Pentachlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
98	pH	Electrometric Method ⁽¹⁾
99	Phenanthrene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽²⁾
100	Phenol	1) Distillation, Chloroform Extraction Method ⁽¹⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽²⁾
101	Pyrene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽²⁾
102	Selenium	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ⁽¹⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽²⁾
103	Silver	Digestion, Inductively Coupled Plasma Method ⁽¹⁾
104	Styrene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
105	1,1,2,2-Tetrachloroethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
106	Tetrachloroethylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
107	Toluene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾

108 Toxaphene...

ลำดับ	สารเคมี	วิธีวิเคราะห์
108	Toxaphene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽²⁾
109	TPH (C ₃ - C ₆)	1) Purge and Trap, Gas Chromatographic Method ⁽¹⁾⁽²⁾ 2) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾⁽²⁾
110	TPH (C ₄ - C ₁₀)	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾⁽²⁾
111	TPH (C ₁₀ - C ₁₈)	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾⁽²⁾
112	1,2,4-Trichlorobenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
113	1,1,1-Trichloroethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
114	1,1,2-Trichloroethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
115	Trichloroethylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
116	2,4,5-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
117	2,4,6-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
118	1,3,5-Trimethylbenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
119	Vanadium	Digestion, Inductively Coupled Plasma Method ⁽¹⁾
120	Vinyl acetate	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
121	Vinyl chloride	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
122	m-Xylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
123	o-Xylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾

124 p-Xylene...

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

จากภาคพืช (ปศุสัตว์) จำนวน 25 รายการ

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

10 Dioxins/Furans...

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

สีปฏิกิริยา...

สีปฏิกิริยา/สีของน้ำในเข็มฉีดยา จำนวน 35 รายการ

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

3) Digestion,...

ลำดับ	สารเคมี	วิธีวิเคราะห์
9	Chromium (III)	3) Digestion, Flame Atomic Absorption Spectrometric Method ^(1,4) 4) Digestion, Inductively Coupled Plasma Method ^(2,3) 1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method; Waste Extraction, Colorimetric Method; Calculation ^(2,3,4,5) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method; Waste Extraction, Colorimetric Method; Calculation ^(2,3,4) 3) Digestion, Flame Atomic Absorption Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation ^(2,3,4) 4) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation ^(2,3,4)
10	Chromium (VI)	1) Waste Extraction, Colorimetric Method ^(2,3) 2) Alkaline Digestion, Colorimetric Method ^(2,3)
11	Cobalt	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,4,5) 2) Digestion, Inductively Coupled Plasma Method ^(2,3)
12	Copper	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(2,4,5) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,4,5) 3) Digestion, Flame Atomic Absorption Spectrometric Method ^(1,4) 4) Digestion, Inductively Coupled Plasma Method ^(2,3)
13	2,4-D	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,3,4) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(3,4,5)
14	DDO	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,3,4) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(3,4,5)

15 DDE...

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

3) Digestion...

ลำดับ	สารเคมี	วิธีวิเคราะห์
23	Methoxychlor	3) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽¹⁶⁾ 4) Digestion, Inductively Coupled Plasma Method ^(2,3,16) 5) Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method ⁽¹⁶⁾
24	Molybdenum	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,3,20) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(2,3,20)
25	Nickel	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,3,18) 2) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(2,3,14) 3) Digestion, Flame Atomic Absorption Spectrometric Method ^(2,3,14) 4) Digestion, Inductively Coupled Plasma Method ^(2,3,18)
26	Polychlorinated Biphenyls - Aroclor 1016 - Aroclor 1221 - Aroclor 1232 - Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1260 - 2-Chlorobiphenyl - 2,3-Dichlorobiphenyl - 2,2',3,4-Tetrachlorobiphenyl - 2,3',4,4'-Tetrachlorobiphenyl - 2,2',3,4,5'-Pentachlorobiphenyl	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,3,20) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(2,3,20) 3) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽¹⁶⁾ 4) Digestion, Inductively Coupled Plasma Method ^(2,3,16)

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

ลำดับ	สารเคมี	วิธีวิเคราะห์
27	- 2,2',4,5,5'-Pentachlorobiphenyl - 2,3,3',4,4',5'-Hexachlorobiphenyl - 2,2',3,4,4',5'-Hexachlorobiphenyl - 2,2',3,4,4',5'-Hexachlorobiphenyl - 2,2',3,3',4,4',5'-Heptachlorobiphenyl - 2,2',3,4,4',5,5'-Heptachlorobiphenyl - 2,2',3,4,4',5,5'-Heptachlorobiphenyl - 2,2',3,3',4,4',5,5'-Nonachlorobiphenyl Pentachlorophenol	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(2,3,21) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(2,3,21) 3) Digestion, Inductively Coupled Plasma Method ^(2,3,21)
28	pH	Electrometric Method ^(31,32)
29	Selenium	1) Waste Extraction, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(2,3,19) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,3,18) 3) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(2,3,19) 4) Digestion, Inductively Coupled Plasma Method ^(2,3,18)

30 Silver...

ลำดับ	สารเคมี	วิธีวิเคราะห์
30	Silver	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,3,18) 2) Digestion, Inductively Coupled Plasma Method ^(2,3,18)
31	Thallium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,3,18) 2) Digestion, Inductively Coupled Plasma Method ^(2,3,18)
32	Toxaphene	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(2,3,20) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(2,3,20)
33	Trichloroethylene	1) Waste Extraction, Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(2,3,22) 2) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(2,3,22)
34	Vanadium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,3,18) 2) Digestion, Inductively Coupled Plasma Method ^(2,3,18)
35	Zinc	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(2,3,14) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,3,18) 3) Digestion, Flame Atomic Absorption Spectrometric Method ^(2,3,14) 4) Digestion, Inductively Coupled Plasma Method ^(2,3,18)

สินค้าจำนวน 125 รายการ

ลำดับ	สารเคมี	วิธีวิเคราะห์
1	Acenaphthene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(2,3,23) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(2,3,23)
2	Acetone	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(2,3,24)

3 Aldrin...

ลำดับ	สารเคมี	วิธีวิเคราะห์
3	Aldrin	1) Ultrasonic Extraction, Gas Chromatographic Method ^{(1),(2)} 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^{(1),(2)}
4	Anthracene	1) Ultrasonic Extraction, Gas Chromatographic Method ^{(1),(2)} 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^{(1),(2)}
5	Antimony	Digestion, Inductively Coupled Plasma Method ^{(2),(3)}
6	Arsenic	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^{(2),(3)} 2) Digestion, Inductively Coupled Plasma Method ^{(2),(3)}
7	Atrazine	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^{(1),(2)}
8	Barium	Digestion, Inductively Coupled Plasma Method ^{(2),(3)}
9	Benz(a)anthracene	1) Ultrasonic Extraction, Gas Chromatographic Method ^{(1),(2)} 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^{(1),(2)}
10	Benzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^{(1),(2)}
11	Benzofluoranthene	1) Ultrasonic Extraction, Gas Chromatographic Method ^{(1),(2)} 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^{(1),(2)}
12	Benzop(a)anthracene	1) Ultrasonic Extraction, Gas Chromatographic Method ^{(1),(2)} 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^{(1),(2)}
13	Benzoic acid	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^{(1),(2)}
14	Benzofluorene	1) Ultrasonic Extraction, Gas Chromatographic Method ^{(1),(2)} 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^{(1),(2)}

15 Benzofluorene...

ลำดับ	สารเคมี	วิธีวิเคราะห์
15	Benzofluorene	1) Ultrasonic Extraction, Gas Chromatographic Method ^{(1),(2)} 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^{(1),(2)}
16	Beryllium	Digestion, Inductively Coupled Plasma Method ^{(2),(3)}
17	Bis(2-chloroethyl)ether	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^{(1),(2)}
18	Bis(2-ethylhexyl)phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^{(1),(2)}
19	Bromodichloromethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^{(1),(2)}
20	Bromoforn	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^{(1),(2)}
21	Butanol	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^{(1),(2)}
22	Butyl benzyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^{(1),(2)}
23	Cadmium	1) Digestion, Flame Atomic Absorption Spectrometric Method ^{(2),(3)} 2) Digestion, Inductively Coupled Plasma Method ^{(2),(3)}
24	Carbazole	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^{(1),(2)}
25	Carbon disulfide	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^{(1),(2)}
26	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^{(1),(2)}
27	Chlordane	1) Ultrasonic Extraction, Gas Chromatographic Method ^{(1),(2)} 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^{(1),(2)}
28	p-Chloroaniline	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^{(1),(2)}
29	Chlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^{(1),(2)}
30	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^{(1),(2)}

31 Chloroform...

ลำดับ	สารเคมี	วิธีวิเคราะห์
31	Chloroform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^{(1),(2)}
32	2-Chlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^{(1),(2)}
33	Chromium	1) Digestion, Flame Atomic Absorption Spectrometric Method ^{(2),(3)} 2) Digestion, Inductively Coupled Plasma Method ^{(2),(3)}
34	Chromium (III)	1) Digestion, Flame Atomic Absorption Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation ^{(2),(3),(4)} 2) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation ^{(2),(3),(4)}
35	Chromium (VI)	Alkaline Digestion, Colorimetric Method ^{(2),(3)}
36	Chrysene	1) Ultrasonic Extraction, Gas Chromatographic Method ^{(1),(2)} 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^{(1),(2)}
37	Cyanide	Extraction, Distillation, Colorimetric Method ^{(2),(3)}
38	2,4-D	Ultrasonic Extraction, Gas Chromatographic Method ^{(1),(2)}
39	DDO	1) Ultrasonic Extraction, Gas Chromatographic Method ^{(1),(2)} 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^{(1),(2)}
40	DDE	1) Ultrasonic Extraction, Gas Chromatographic Method ^{(1),(2)} 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^{(1),(2)}
41	DDT	1) Ultrasonic Extraction, Gas Chromatographic Method ^{(1),(2)} 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^{(1),(2)}
42	Dibenz(a,h)anthracene	1) Ultrasonic Extraction, Gas Chromatographic Method ^{(1),(2)} 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^{(1),(2)}

43 Di-n-butyl phthalate...

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

60 2,4-Dinitrophenol...

ลำดับ	สารเคมี	วิธีวิเคราะห์
60	2,4-Dinitrophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(16,20)
61	2,4-Dinitrotoluene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(16,20)
62	2,6-Dinitrotoluene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(16,20)
63	Di-n-Octyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(16,24)
64	Endosulfan	1) Ultrasonic Extraction, Gas Chromatographic Method ^(16,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(16,20)
65	Endrin	1) Ultrasonic Extraction, Gas Chromatographic Method ^(16,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(16,20)
66	Ethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(16,21)
67	Fluoranthene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(16,24) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(16,20)
68	Fluorene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(16,24) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(16,20)
69	Heptachlor	1) Ultrasonic Extraction, Gas Chromatographic Method ^(16,23) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(16,20)
70	Heptachlor epoxide	1) Ultrasonic extraction, Gas Chromatographic Method ^(16,20) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(16,20)

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71 Hexachlorobenzene...

ลำดับ	สารเคมี	วิธีวิเคราะห์
71	Hexachlorobenzene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(16,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(16,20)
72	Hexachloro-1,3-butadiene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(16,20)
73	n-Hexene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(16,20)
74	α-HCH	1) Ultrasonic Extraction, Gas Chromatographic Method ^(16,23) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(16,20)
75	β-HCH	1) Ultrasonic Extraction, Gas Chromatographic Method ^(16,23) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(16,20)
76	γ-HCH	1) Ultrasonic Extraction, Gas Chromatographic Method ^(16,23) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(16,20)
77	Hexachlorocyclopentadiene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(16,20)
78	Hexachloroethane	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(16,20)
79	Indeno(1,2,3-cd)pyrene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(16,24) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(16,20)
80	Isochlorone	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(16,20)
81	Lead	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 2) Digestion, Inductively Coupled Plasma Method ^(7,18)
82	Manganese	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 2) Digestion, Inductively Coupled Plasma Method ^(7,18)

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83 Mercury...

ลำดับ	สารเคมี	วิธีวิเคราะห์
83	Mercury	1) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^(7,8) 2) Digestion, Inductively Coupled Plasma Method ^(7,18) 3) Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method ^(7,8)
84	Methanol	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(16,20)
85	Methoxychlor	1) Ultrasonic Extraction, Gas Chromatographic Method ^(16,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(16,20)
86	Methyl bromide	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(16,23)
87	Methylene chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(16,23)
88	2-Methylphenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(16,20)
89	2-Methylnaphthalene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(16,24)
90	Methyl tert-butyl ether	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(16,23)
91	Naphthalene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(16,24) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(16,20)
92	Nickel	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,14) 2) Digestion, Inductively Coupled Plasma Method ^(7,18)
93	Nitrobenzene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(16,20)
94	N-Nitrosodipropylamine	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(16,20)
95	N-Nitrosodi-n-propylamine	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(16,20)

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96 Polychlorinated Biphenyls...

ลำดับ	สารเคมี	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 ^(16,23) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(16,20) Ultrasonic Extraction, Gas Chromatographic Method ^(16,23)

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

ลำดับ	สารเคมี	วิธีวิเคราะห์
97	- 2,2',3,4,5,5',6-Heptachlorobiphenyl - 2,2',3,5,4,4',5,5',6-Nontachlorobiphenyl Pentachlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,26)
98	Phenanthrene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(15,26) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,26)
99	Phenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,26)
100	Pyrene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(15,26) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,26)
101	Selenium	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(1,26) 2) Digestion, Inductively Coupled Plasma Method ^(1,26)
102	Silver	Digestion, Inductively Coupled Plasma Method ^(1,26)
103	Styrene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(15,26)
104	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(15,26)
105	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(15,26)
106	Toluene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(15,26)
107	Toxaphene	Ultrasonic Extraction, Gas Chromatographic Method ^(15,26)
108	TPH (C ₉ -C ₁₀)	1) Purge and Trap, Gas Chromatographic Method ^(15,26) 2) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(15,26)
109	TPH (C ₁₁ -C ₁₈)	Ultrasonic Extraction, Gas Chromatographic Method ^(15,26)
110	TPH (C ₁₉ -C ₂₈)	Ultrasonic Extraction, Gas Chromatographic Method ^(15,26)
111	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(15,26)

112 1,1,1-Trichloroethane...

ลำดับ	สารเคมี	วิธีวิเคราะห์
112	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(15,26)
113	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(15,26)
114	Trichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(15,26)
115	2,4,5-Trichlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,26)
116	2,4,6-Trichlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,26)
117	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(15,26)
118	Vanadium	Digestion, Inductively Coupled Plasma Method ^(1,26)
119	Vinyl acetate	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(15,26)
120	Vinyl chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(15,26)
121	m-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(15,26)
122	o-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(15,26)
123	p-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(15,26)
124	Xylene (Total)	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(15,26)
125	Zinc	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(1,26) 2) Digestion, Inductively Coupled Plasma Method ^(1,26)

เอกสารอ้างอิง

- กระทรวงอุตสาหกรรม, ประกาศกระทรวงอุตสาหกรรม, พ.ศ. 2549, เรื่อง กำหนดค่าปริมาณเคมีภัณฑ์ที่เป็นอันตรายจากโรงงานอุตสาหกรรม, ราชกิจจานุเบกษา, ๘ ธันวาคม 2549, เล่มที่ 123 หน้า 1-24.
- กระทรวงอุตสาหกรรม, ประกาศกระทรวงอุตสาหกรรม, พ.ศ. 2556, เรื่อง กำหนดค่าปริมาณเคมีภัณฑ์ที่เป็นอันตรายจากโรงงานอุตสาหกรรม, ราชกิจจานุเบกษา, 25 มกราคม 2556, เล่มที่ 124 หน้า 1-14.

3. สมาคมวิศวกรรม...

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