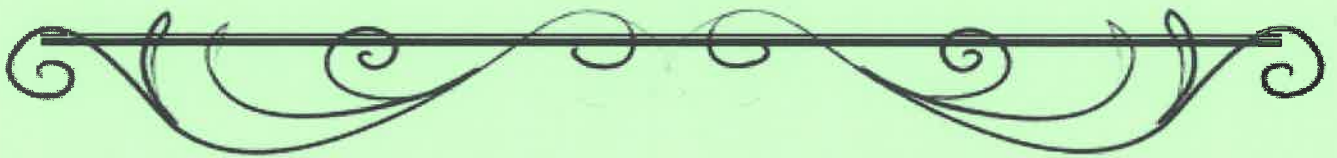


ภาคผนวก ง
มาตรฐาน



ภาคผนวก ง1

มาตรฐานควบคุมการระบายน้ำทิ้งจากอาคารประเภทหอพัก
ตามประกาศกระทรวงทรัพยากรธรรมชาติและสิ่งแวดล้อม เรื่องกำหนด
มาตรฐานควบคุมการระบายน้ำทิ้งจากอาคารบางประเภท
และบางขนาด



ประกาศกระทรวงทรัพยากรธรรมชาติและสิ่งแวดล้อม

เรื่อง กำหนดมาตรฐานควบคุมการระบายน้ำทิ้งจากอาคารบางประเภทและบางขนาด พ.ศ. ๒๕๖๗

โดยที่เป็นการสมควรปรับปรุงการกำหนดมาตรฐานควบคุมการระบายน้ำทิ้งจากอาคาร ให้เหมาะสม ตามความก้าวหน้าในทางวิทยาศาสตร์ เทคโนโลยี และความเปลี่ยนแปลงทางเศรษฐกิจ สังคม ของประเทศ และให้สอดคล้องกับสภาพการในปัจจุบัน

อาศัยอำนาจตามความในมาตรา ๕๕ แห่งพระราชบัญญัติส่งเสริมและรักษาคุณภาพสิ่งแวดล้อมแห่งชาติ พ.ศ. ๒๕๓๕ รัฐมนตรีว่าการกระทรวงทรัพยากรธรรมชาติและสิ่งแวดล้อมจึงแต่งตั้ง โดยคำแนะนำของคณะกรรมการควบคุมมลพิษ และโดยความเห็นชอบของคณะกรรมการสิ่งแวดล้อมแห่งชาติ จึงออกประกาศไว้ ดังต่อไปนี้

ข้อ ๑ ให้ยกเลิกประกาศกระทรวงทรัพยากรธรรมชาติและสิ่งแวดล้อม เรื่อง กำหนดมาตรฐานควบคุมการระบายน้ำทิ้งจากอาคารบางประเภทและบางขนาด ฉบับลงวันที่ ๗ พฤศจิกายน พ.ศ. ๒๕๔๘

ข้อ ๒ ในประกาศนี้

“อาคาร” หมายความว่า อาคารที่ก่อสร้างขึ้น ไม่ว่าจะมียุทธศาสตร์เป็นอาคารสิ่งเดียวหรือเป็นกลุ่มของอาคารซึ่งตั้งอยู่ภายในพื้นที่ซึ่งเป็นบริเวณเดียวกัน และไม่ว่าจะมีท่อระบายน้ำท่อเดียวหรือมีหลายท่อที่เชื่อมติดต่อกันระหว่างอาคารหรือไม่ก็ตาม

“น้ำทิ้ง” หมายความว่า น้ำที่เกิดจากกิจกรรมของอาคารที่ระบายหรือจะระบายลงสู่แหล่งน้ำ สาธารณะหรือออกสู่สิ่งแวดล้อม

ข้อ ๓ ให้แบ่งอาคาร ออกเป็น ๓ ชนิด คือ

ชนิดที่ ๑ อาคารอยู่อาศัย หมายถึง อาคารที่มีวัตถุประสงค์ให้เป็นที่พักอาศัยของบุคคล

ทั้งการอยู่อาศัยอย่างถาวรหรือชั่วคราว ได้แก่

- (๑) อาคารชุด ตามกฎหมายว่าด้วยอาคารชุด
- (๒) หอพัก ตามกฎหมายว่าด้วยหอพัก
- (๓) หอพัก ห้องเช่า ห้องแบ่งเช่า หรือกิจการอื่นในตนเองเดียวกันตามกฎหมายว่าด้วยการสาธารณสุข

- (๔) สถานรับเลี้ยงเด็ก ตามกฎหมายว่าด้วยคุ้มครองเด็ก
- (๕) สถานดูแลผู้สูงอายุหรือผู้พิการ ตามกฎหมายว่าด้วยสถานประกอบการเพื่อสุขภาพ
- (๖) ที่พักอาศัยสำหรับลูกจ้างประเภทกรรมกรก่อสร้าง ตามกฎหมายว่าด้วยการคุ้มครองแรงงาน

ชนิดที่ ๒ อาคารพาณิชย์ หมายถึง อาคารที่ใช้ประโยชน์ในการพาณิชย์กรรม หรือบริการธุรกิจ

อย่างเดียหรือหลายอย่าง ได้แก่

- (๑) โรงแรม ตามกฎหมายว่าด้วยโรงแรม

- (๒) ศูนย์การค้าหรือห้างสรรพสินค้า
- (๓) ตลาด ตามกฎหมายว่าด้วยการสาธารณสุข
- (๔) สถานบริการประเภทสถานอาบน้ำ นวดหรืออบตัว ตามกฎหมายว่าด้วยสถานบริการ
- (๕)ภัตตาคารหรือร้านอาหาร
- (๖) อาคารที่ทำการของทางราชการ รัฐวิสาหกิจ หรือองค์การระหว่างประเทศและของเอกชน
- (๗) อาคารโรงเรียนเอกชน ตามกฎหมายว่าด้วยโรงเรียนเอกชน โรงเรียนของทางราชการ

อาคารสถาบันอุดมศึกษาของเอกชน ตามกฎหมายว่าด้วยสถาบันอุดมศึกษาของเอกชนและสถาบันอุดมศึกษาของทางราชการ

ชนิดที่ ๓ อาคารสถานพยาบาล หมายถึง สถานพยาบาล ตามกฎหมายว่าด้วยสถานพยาบาล

ประเภทที่รับผู้ป่วยไว้ค้างคืน

ข้อ ๔ ให้แบ่งขนาดของอาคาร ออกเป็น ๔ ประเภท ดังต่อไปนี้

ประเภทอาคาร	หน่วย	อาคารประเภท ก.	อาคารประเภท ข.	อาคารประเภท ค.	อาคารประเภท ง.
๑. อาคารอยู่อาศัย					
อาคารชุด	ห้องชุด	ตั้งแต่ ๕๐๐ ขึ้นไป	ตั้งแต่ ๑๐๐ แต่ไม่ถึง ๕๐๐	ไม่ถึง ๑๐๐	-
หอพัก	ห้อง	-	ตั้งแต่ ๕๐๐ ขึ้นไป	ตั้งแต่ ๕๐ แต่ไม่ถึง ๒๕๐	ไม่ถึง ๕๐
หอพัก ห้องเช่า ห้องแบ่งเช่า หรือกิจการอื่นในท้องเดียวกัน ตามกฎหมายว่าด้วยการสาธารณสุข	ห้อง	-	ตั้งแต่ ๒๕๐ ขึ้นไป	ตั้งแต่ ๕๐ แต่ไม่ถึง ๒๕๐	ไม่ถึง ๕๐
สถานรับเลี้ยงเด็ก	-	-	-	-	ทุกขนาด
สถานดูแลผู้สูงอายุหรือผู้พิการซึ่งพึ่งพิงอาศัยสำหรับลูกจ้าง	-	-	-	-	ทุกขนาด
ประเภทกิจการม่อสร้าง	-	-	-	-	ทุกขนาด
๒. อาคารพาณิชย์					
โรงแรม	ห้อง	ตั้งแต่ ๒๐๐ ขึ้นไป	ตั้งแต่ ๖๐ แต่ไม่ถึง ๒๐๐	ไม่ถึง ๖๐	-
สถานบริการประเภทสถานอาบน้ำ นวดหรืออบตัว	ตารางเมตร	-	ตั้งแต่ ๕,๐๐๐ ขึ้นไป	ตั้งแต่ ๑,๐๐๐ แต่ไม่ถึง ๕,๐๐๐	ไม่ถึง ๑,๐๐๐
โรงเรียนเอกชน โรงเรียนของทางราชการ สถาบันอุดมศึกษาของเอกชนหรือสถาบันอุดมศึกษาของทางราชการ		ตั้งแต่ ๒๕,๐๐๐ ขึ้นไป	ตั้งแต่ ๕,๐๐๐ แต่ไม่ถึง ๒๕,๐๐๐	-	ไม่ถึง ๕,๐๐๐

ประเภทอาคาร	หน่วย	อาคาร ประเภท ก.	อาคาร ประเภท ข.	อาคาร ประเภท ค.	อาคาร ประเภท ง.
อาคารที่ทำการของทาง ราชการ รัฐวิสาหกิจ หรือ องค์กรระหว่างประเทศและ ของเอกชน		ตั้งแต่ ๕๕,๐๐๐ ขึ้นไป	ตั้งแต่ ๑๐,๐๐๐ แต่ไม่ถึง ๕๕,๐๐๐	ตั้งแต่ ๕,๐๐๐ แต่ไม่ถึง ๑๐,๐๐๐	ไม่ถึง ๕,๐๐๐
ศูนย์การค้า หรือห้างสรรพสินค้า		ตั้งแต่ ๒๕,๐๐๐ ขึ้นไป	ตั้งแต่ ๕,๐๐๐ แต่ไม่ถึง ๒๕,๐๐๐	-	ไม่ถึง ๕,๐๐๐
ตลาด		ตั้งแต่ ๒,๕๐๐ ขึ้นไป	ตั้งแต่ ๑,๕๐๐ แต่ไม่ถึง ๒,๕๐๐	ตั้งแต่ ๑,๐๐๐ แต่ไม่ถึง ๑,๕๐๐	ไม่ถึง ๑,๐๐๐
ภัตตาคารหรือร้านอาหาร		ตั้งแต่ ๒,๕๐๐ ขึ้นไป	ตั้งแต่ ๕๐๐ แต่ไม่ถึง ๒,๕๐๐	ตั้งแต่ ๒๕๐ แต่ไม่ถึง ๕๐๐	ไม่ถึง ๒๕๐
๓. อาคารสถานพยาบาล	เตียง	ตั้งแต่ ๓๐ ขึ้นไป	ตั้งแต่ ๑๐ แต่ไม่ถึง ๓๐	-	ไม่ถึง ๑๐

ข้อ ๕ กำหนดมาตรฐานควบคุมการระบายน้ำที่จากอาคารไว้ ดังต่อไปนี้

พารามิเตอร์	ค่ามาตรฐาน				
	อาคาร ประเภท ก.	อาคาร ประเภท ข.	อาคาร ประเภท ค.	อาคาร ประเภท ง.	
๑. ความเป็นกรดและด่าง (pH)	๕.๕ - ๘.๐	๕.๕ - ๘.๐	๕.๕ - ๘.๐	๕.๕ - ๘.๐	๕.๕ - ๘.๐
๒. บีโอดี (Biochemical Oxygen Demand)	ไม่เกิน ๒๐ มิลลิกรัมต่อลิตร	ไม่เกิน ๓๐ มิลลิกรัมต่อลิตร	ไม่เกิน ๔๐ มิลลิกรัมต่อลิตร	ไม่เกิน ๕๐ มิลลิกรัมต่อลิตร	ไม่เกิน ๕๐ มิลลิกรัมต่อลิตร
๓. ของแข็งแขวนลอยทั้งหมด (Total Suspended Solids)	ไม่เกิน ๓๐ มิลลิกรัมต่อลิตร	ไม่เกิน ๔๐ มิลลิกรัมต่อลิตร	ไม่เกิน ๕๐ มิลลิกรัมต่อลิตร	ไม่เกิน ๖๐ มิลลิกรัมต่อลิตร	ไม่เกิน ๖๐ มิลลิกรัมต่อลิตร
๔. ของแข็งละลายทั้งหมด (Total Dissolved Solids)	ไม่เกิน ๑,๐๐๐ มิลลิกรัมต่อลิตร	ไม่เกิน ๑,๐๐๐ มิลลิกรัมต่อลิตร	ไม่เกิน ๑,๓๐๐ มิลลิกรัมต่อลิตร	-	-

พารามิเตอร์	ค่ามาตรฐาน				
	อาคาร ประเภท ก.	อาคาร ประเภท ข.	อาคาร ประเภท ค.	อาคาร ประเภท ง.	
	สำหรับอาคารอยู่ อาศัยและอาคาร พาณิชย์	สำหรับอาคารอยู่ อาศัยและอาคาร พาณิชย์	สำหรับอาคารอยู่ อาศัยและอาคาร พาณิชย์	สำหรับอาคารอยู่ อาศัยและอาคาร พาณิชย์	
	เพิ่มขึ้นจาก ปริมาณในน้ำใช้ ปกติไม่เกิน ๑,๐๐๐	เพิ่มขึ้นจาก ปริมาณในน้ำใช้ ปกติไม่เกิน ๑,๐๐๐	-	-	-
๕. ซัลไฟด์ (Sulfide)	ไม่เกิน ๑.๐ มิลลิกรัมต่อลิตร	ไม่เกิน ๑.๐ มิลลิกรัมต่อลิตร	ไม่เกิน ๑.๐ มิลลิกรัมต่อลิตร	-	-
๖. ฟอสเฟต (Total Kjeldahl Nitrogen)	ไม่เกิน ๓๕ มิลลิกรัมต่อลิตร	ไม่เกิน ๓๕ มิลลิกรัมต่อลิตร	ไม่เกิน ๔๐ มิลลิกรัมต่อลิตร	-	-
๗. น้ำมันและไขมัน (Oil and Grease)	ไม่เกิน ๒๐ มิลลิกรัมต่อลิตร	ไม่เกิน ๒๐ มิลลิกรัมต่อลิตร	ไม่เกิน ๒๐ มิลลิกรัมต่อลิตร	ไม่เกิน ๒๐ มิลลิกรัมต่อลิตร	ไม่เกิน ๒๐ มิลลิกรัมต่อลิตร
๘. แบคทีเรียกลุ่มโคลิฟอร์มทั้งหมด (Total Coliform Bacteria) (สำหรับอาคารสถานพยาบาล)	ไม่เกิน ๕,๐๐๐ (เย็บพีเอ็มต่อ ๑๐๐ มิลลิลิตร)	ไม่เกิน ๕,๐๐๐ (เย็บพีเอ็มต่อ ๑๐๐ มิลลิลิตร)	-	-	-
๙. แบคทีเรียกลุ่มฟีคอลโคลิฟอร์ม (Fecal Coliform Bacteria) (สำหรับอาคารสถานพยาบาล)	ไม่เกิน ๑,๐๐๐ (เย็บพีเอ็มต่อ ๑๐๐ มิลลิลิตร)	ไม่เกิน ๑,๐๐๐ (เย็บพีเอ็มต่อ ๑๐๐ มิลลิลิตร)	-	-	-
๑๐. คลอรีนอิสระ (Free Chlorine) (สำหรับอาคารสถานพยาบาล)	ไม่เกิน ๑.๐ มิลลิกรัมต่อลิตร	ไม่เกิน ๑.๐ มิลลิกรัมต่อลิตร	-	-	-

ข้อ ๖ การตรวจสอบมาตรฐานความถูกต้องของรายงานที่ส่งจากอาคารให้วิธีการ ดังต่อไปนี้

๖.๑ ความเป็นกรดและด่าง ให้ใช้เครื่องวัดความเป็นกรดและด่างของน้ำ (pH Meter)

ที่มีความละเอียดไม่ต่ำกว่า ๐.๑ หน่วย

๖.๒ ปีโอที ให้ใช้วิธีบ่มตัวอย่างที่อุณหภูมิ ๒๐ องศาเซลเซียส เป็นเวลา ๕ วันติดต่อกัน และหาค่าออกซิเจนละลายด้วยวิธีแอไซด์มอดิฟิเคชัน (Azide Modification) หรือวิธีเอนเมเบรนอิเล็กโทรด (Membrane Electrode) หรือวิธีออปติคัลโพรบ (Optical Probe)

๖.๓ ของแข็งแขวนลอยทั้งหมด ให้ใช้วิธีการกรองผ่านกระดาษกรองใยแก้ว (Glass Fiber Filter) และอบแห้งที่อุณหภูมิ ตั้งแต่ ๑๐๓ ถึง ๑๐๕ องศาเซลเซียส เป็นเวลาอย่างน้อย ๑ ชั่วโมง

๖.๔ ของแข็งละลายน้ำทั้งหมด ให้ใช้วิธีระเหยด้วยอ่างที่กรองผ่านกระดาษกรองใยแก้ว (Glass Fiber Filter) และอบแห้งที่อุณหภูมิ ๑๘๐ องศาเซลเซียส เป็นเวลาอย่างน้อย ๑ ชั่วโมง

๖.๕ ซัลไฟด์ ให้ใช้วิธีไอโอดิเมทริก (Iodometric Method) หรือวิธีเมทิลีนบลู (Methylene Blue Method)

๖.๖ ที่เคเอ็น ให้ใช้วิธีเจลดาล์ท (Kjeldahl)

๖.๗ น้ำมันและไขมัน ให้ใช้วิธีสกัดด้วยตัวทำละลายแล้วแยกน้ำมันก่อนน้ำมันและไขมัน

๖.๘ แบคทีเรียกลุ่มโคลิฟอร์มทั้งหมดและแบคทีเรียกลุ่มฟีคอลโคลิฟอร์ม ให้ใช้วิธีมัลติเทิล ทิวบ์ เพอร์เมเนชั่น เทคนิค (Multiple Tube Fermentation Technique)

๖.๙ คลอรีนอิสระ ให้ใช้วิธีไทเทรต (Titrimetric method) หรือวิธีเทียนสี (Colorimetric method) หรือวิธีไอโอดิเมทริก อีเล็กโทรด (Iodometric Electrode Technique)

ข้อ ๗ การคิดคำนวณขนาดของอาคารตามข้อ ๔ ให้เป็นไปตามวิธีการที่คณะกรรมการควบคุมมลพิษกำหนด โดยประกาศในราชกิจจานุเบกษา

ข้อ ๘ การตรวจสอบค่ามาตรฐานน้ำทิ้งตามข้อ ๖ ต้องเป็นไปตามคู่มือวิเคราะห์น้ำและน้ำเสียของสมาคมวิศวกรรมสิ่งแวดล้อมแห่งประเทศไทย หรือ Standard Methods for the Examination of Water and Wastewater ซึ่ง American Public Health Association, American Water Works Association และ Water Environment Federation ของประเทศสหรัฐอเมริกากำหนดฉบับล่าสุด หรือตามที่คณะกรรมการควบคุมมลพิษประกาศในราชกิจจานุเบกษา

ข้อ ๙ การเก็บตัวอย่างน้ำทิ้งเพื่อการตรวจสอบมาตรฐานควบคุมการระบายน้ำทิ้งตามข้อ ๕ ให้เป็น ดังต่อไปนี้

๙.๑ ให้เก็บในจุดระบายทิ้งลงสู่แหล่งน้ำสาธารณะหรือออกสู่สิ่งแวดล้อมหรือจุดอื่นที่สามารถใช้เป็นตัวแทนของน้ำทิ้งที่ระบายออกจากอาคาร ในกรณีมีการระบายทิ้งหลายจุดให้เก็บทุกจุด

๙.๒ วิธีการเก็บตัวอย่างน้ำทิ้ง ณ จุดเก็บตัวอย่างตามข้อ ๙.๑ ให้เก็บแบบจ้วง (Grab Sampling)

ข้อ ๑๐ ประกาศนี้ให้ใช้บังคับตั้งแต่วันถัดจากวันประกาศในราชกิจจานุเบกษาเป็นต้นไป

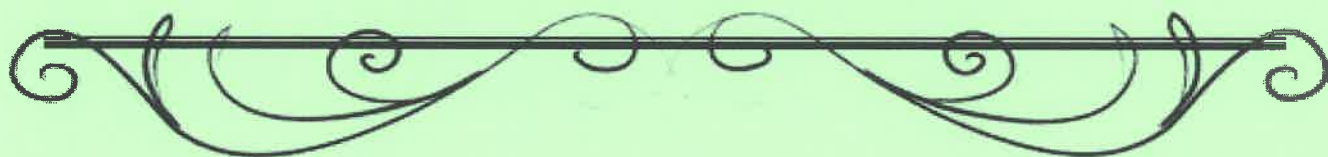
ประกาศ ณ วันที่ ๒๘ มิถุนายน พ.ศ. ๒๕๖๗

พลตำรวจเอก พัชรวาท วงษ์สุวรรณ

รัฐมนตรีว่าการกระทรวงทรัพยากรธรรมชาติและสิ่งแวดล้อม

ภาคผนวก ง2

ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 24 (พ.ศ. 2547) เรื่อง
กำหนดมาตรฐานคุณภาพอากาศในบรรยากาศโดยทั่วไป
ประกาศในราชกิจจานุเบกษา เล่ม 121 ตอนพิเศษ 104 ง
วันที่ 22 กันยายน พ.ศ. 2547





ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ
ฉบับที่ ๒๔ (พ.ศ. ๒๕๔๗)
เรื่อง กำหนดมาตรฐานคุณภาพอากาศในบรรยากาศโดยทั่วไป

อาศัยอำนาจตามความในมาตรา ๓๒ และมาตรา ๓๔ แห่งพระราชบัญญัติส่งเสริมและรักษาคุณภาพสิ่งแวดล้อมแห่งชาติ พ.ศ. ๒๕๓๕ อันเป็นพระราชบัญญัติที่มีบทบัญญัติบางประการเกี่ยวกับการจกักัดสิทธิและเสรีภาพของบุคคล ซึ่งมาตรา ๒๙ ประกอบกับมาตรา ๓๕ มาตรา ๔๔ มาตรา ๕๐ และมาตรา ๕๑ ของรัฐธรรมนูญแห่งราชอาณาจักรไทยบัญญัติให้กระทำได้โดยอาศัยอำนาจตามบทบัญญัติแห่งกฎหมาย คณะกรรมการสิ่งแวดล้อมแห่งชาติ จึงได้มีมติในคราวการประชุมครั้งที่ ๒/๒๕๔๗ เมื่อวันที่ ๒๔ กุมภาพันธ์ ๒๕๔๗ ให้ปรับปรุงแก้ไขมาตรฐานคุณภาพอากาศในบรรยากาศโดยทั่วไป ดังต่อไปนี้

ข้อ ๑ ให้ยกเลิกความใน (๔) ของข้อ ๒ แห่งประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ ๑๐ (พ.ศ. ๒๕๓๕) ออกตามความในพระราชบัญญัติส่งเสริมและรักษาคุณภาพสิ่งแวดล้อมแห่งชาติ พ.ศ. ๒๕๓๕ เรื่อง กำหนดมาตรฐานคุณภาพอากาศในบรรยากาศโดยทั่วไป และให้ใช้ความต่อไปนี้แทน

“(๔) ค่าเฉลี่ยของก๊าซซัลเฟอร์ไดออกไซด์ ในเวลา ๒๔ ชั่วโมง จะต้องไม่เกิน ๐.๑๒ ส่วนในล้านส่วน หรือไม่เกิน ๐.๓๐ มิลลิกรัมต่อลูกบาศก์เมตร และค่ามัธยฐานเลขคณิต (Arithmetic Mean) ในเวลา ๑ ปี จะต้องไม่เกิน ๐.๐๔ ส่วนในล้านส่วน หรือไม่เกิน ๐.๑๐ มิลลิกรัมต่อลูกบาศก์เมตร”
ข้อ ๒ ให้ยกเลิกความใน (๒) และ (๓) ของข้อ ๔ แห่งประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ ๑๐ (พ.ศ. ๒๕๓๕) ออกตามความในพระราชบัญญัติส่งเสริมและรักษาคุณภาพสิ่งแวดล้อมแห่งชาติ พ.ศ. ๒๕๓๕ เรื่อง กำหนดมาตรฐานคุณภาพอากาศในบรรยากาศโดยทั่วไป และให้ใช้ความต่อไปนี้แทน

“(๒) ค่าเฉลี่ยของฝุ่นละอองขนาดไม่เกิน ๑๐ ไมครอน ในเวลา ๒๔ ชั่วโมง จะต้องไม่เกิน ๐.๑๒ มิลลิกรัมต่อลูกบาศก์เมตร และค่ามัธยฐานเลขคณิต (Arithmetic Mean) ในเวลา ๑ ปี จะต้องไม่เกิน ๐.๐๕ มิลลิกรัมต่อลูกบาศก์เมตร

(๓) ค่าเฉลี่ยของฝุ่นละอองรวมหรือฝุ่นละอองขนาดไม่เกิน ๑๐๐ ไมครอน ในเวลา ๒๔ ชั่วโมง จะต้องไม่เกิน ๐.๓๓ มิลลิกรัมต่อลูกบาศก์เมตร และค่ามัธยฐานเลขคณิต (Arithmetic Mean) ในเวลา ๑ ปี จะต้องไม่เกิน ๐.๑๐ มิลลิกรัมต่อลูกบาศก์เมตร”

ประกาศ ณ วันที่ ๙ สิงหาคม พ.ศ. ๒๕๔๗

(ลงนาม) จาตุรนต์ ฉายแสง
(นายจาตุรนต์ ฉายแสง)
รองนายกรัฐมนตรี

ปฏิบัติหน้าที่ประธานคณะกรรมการสิ่งแวดล้อมแห่งชาติ

ราชกิจจานุเบกษา ฉบับประกาศทั่วไป เล่ม ๑๒๑ ตอนพิเศษ ๑๐๔ ง วันที่ ๒๒ กันยายน ๒๕๔๗

ภาคผนวก ง3

ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 21 (พ.ศ. 2544) ออกตามความในพระราชบัญญัติส่งเสริมและรักษาคุณภาพสิ่งแวดล้อมแห่งชาติ พ.ศ. 2535 เรื่อง กำหนดมาตรฐานค่าก๊าซซัลเฟอร์ไดออกไซด์ในบรรยากาศ โดยทั่วไปในเวลา 1 ชั่วโมง ประกาศในราชกิจจานุเบกษา เล่ม 118 ตอนพิเศษ 39 ง วันที่ 30 เมษายน พ.ศ. 2544





ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ

ฉบับที่ ๒๑ (พ.ศ. ๒๕๔๔)

ออกตามความในพระราชบัญญัติส่งเสริมและรักษาคุณภาพสิ่งแวดล้อมแห่งชาติ

พ.ศ. ๒๕๓๕

เรื่อง กำหนดมาตรฐานค่าก๊าซซัลเฟอร์ไดออกไซด์ในบรรยากาศโดยทั่วไป

ในเวลา ๑ ชั่วโมง

อาศัยอำนาจตามความในมาตรา ๓๒ และมาตรา ๓๔ แห่งพระราชบัญญัติส่งเสริมและรักษาคุณภาพสิ่งแวดล้อมแห่งชาติ พ.ศ. ๒๕๓๕ คณะกรรมการสิ่งแวดล้อมแห่งชาติ จึงปรับปรุงแก้ไขมาตรฐานค่าก๊าซซัลเฟอร์ไดออกไซด์ในบรรยากาศโดยทั่วไปในเวลา ๑ ชั่วโมงไว้ดังต่อไปนี้

(๑) ให้ยกเลิกข้อ ๒ แห่งประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ ๑๒ (พ.ศ. ๒๕๓๘) ออกตามความในพระราชบัญญัติส่งเสริมและรักษาคุณภาพสิ่งแวดล้อมแห่งชาติ พ.ศ. ๒๕๓๕ เรื่อง กำหนดมาตรฐานค่าก๊าซซัลเฟอร์ไดออกไซด์ในบรรยากาศโดยทั่วไปในเวลา ๑ ชั่วโมง

(๒) ให้ยกเลิกความในข้อ ๓ และข้อ ๕ แห่งประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ ๑๒ (พ.ศ. ๒๕๓๘) ออกตามความในพระราชบัญญัติส่งเสริมและรักษาคุณภาพสิ่งแวดล้อมแห่งชาติ พ.ศ. ๒๕๓๕ เรื่อง กำหนดมาตรฐานค่าก๊าซซัลเฟอร์ไดออกไซด์ในบรรยากาศโดยทั่วไปในเวลา ๑ ชั่วโมง และให้ใช้ความต่อไปนี้แทน

“ข้อ ๓ ค่าเฉลี่ยความเข้มข้นของก๊าซซัลเฟอร์ไดออกไซด์ในบรรยากาศโดยทั่วไปในเวลา ๑ ชั่วโมง จะต้องไม่เกิน ๐.๓๐ ส่วนในล้านส่วน (ppm) หรือไม่เกิน ๙๘๐ ไมโครกรัมต่อลูกบาศก์เมตร”

“ข้อ ๕ การวัดหาค่าเฉลี่ยความเข้มข้นของก๊าซซัลเฟอร์ไดออกไซด์ในบรรยากาศโดยทั่วไปในเวลา ๑ ชั่วโมง ตามข้อ ๓ ให้ใช้เครื่องวัดระบบ ยูวี ฟลูออเรสเซน หรือระบบอื่นที่กรมควบคุมมลพิษประกาศในราชกิจจานุเบกษา”

ประกาศ ณ วันที่ ๕ เมษายน พ.ศ. ๒๕๔๔

(นายเดช บุญ-หลง)

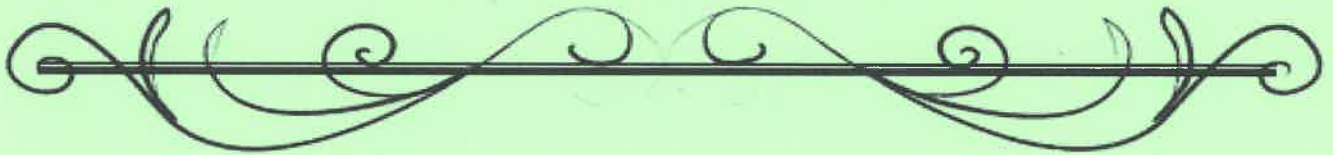
รองนายกรัฐมนตรี ปฏิบัติหน้าที่

ประธานคณะกรรมการสิ่งแวดล้อมแห่งชาติ

(ประกาศในราชกิจจานุเบกษา เล่ม ๑๑๘ ตอนพิเศษ ๓๕ ง ลงวันที่ ๓๐ เมษายน ๒๕๔๔)

ภาคผนวก ง4

ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 33 (พ.ศ. 2552) เรื่อง
กำหนดมาตรฐานค่าก๊าซไนโตรเจนไดออกไซด์ในบรรยากาศโดยทั่วไป
ประกาศในราชกิจจานุเบกษา เล่ม 126 ตอนพิเศษ 114 ง
วันที่ 14 สิงหาคม พ.ศ. 2552



โดยที่เป็นการสมควรกำหนดมาตรฐานค่าก๊าซไนโตรเจนไดออกไซด์ในบรรยากาศโดยทั่วไป เพื่อเป็นเกณฑ์ทั่วไปสำหรับการส่งเสริมและรักษาคุณภาพสิ่งแวดล้อมตามพระราชบัญญัติส่งเสริมและรักษาคุณภาพสิ่งแวดล้อมแห่งชาติ พ.ศ. ๒๕๓๕

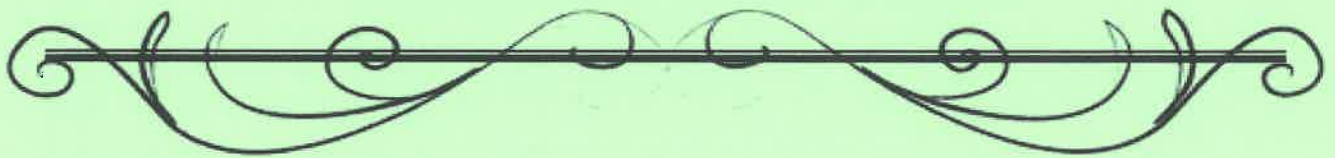
อาศัยอำนาจตามความในมาตรา ๓๒ (๔) และมาตรา ๓๔ แห่งพระราชบัญญัติส่งเสริมและรักษาคุณภาพสิ่งแวดล้อมแห่งชาติ พ.ศ. ๒๕๓๕ อันเป็นพระราชบัญญัติที่มีบทบัญญัติบางประการเกี่ยวกับการจำกัดสิทธิและเสรีภาพของบุคคล ซึ่งมาตรา ๒๕ ประกอบกับมาตรา ๓๓ มาตรา ๓๔ มาตรา ๔๑ และมาตรา ๔๓ ของรัฐธรรมนูญแห่งราชอาณาจักรไทย บัญญัติให้กระทำได้โดยอาศัยอำนาจตามบทบัญญัติแห่งกฎหมาย คณะกรรมการสิ่งแวดล้อมแห่งชาติจึงออกประกาศกำหนดมาตรฐานค่าก๊าซไนโตรเจนไดออกไซด์ในบรรยากาศโดยทั่วไปไว้ ดังต่อไปนี้

ข้อ ๑ ในประกาศนี้
“เครื่องมือวัดระบบเคมีลูมิเนสเซนซ์” (Chemiluminescence) หมายความว่า เครื่องวัดค่าก๊าซไนโตรเจนไดออกไซด์ที่ใช้ก๊าซไอโซนทำปฏิกิริยากับก๊าซไนตริกออกไซด์ซึ่งถูกเปลี่ยนมาจากก๊าซไนโตรเจนไดออกไซด์แล้ววัดความเข้มของแสงซึ่งเกิดจากปฏิกิริยานั้น ณ ที่ความยาวคลื่นที่สูงกว่า ๖๐๐ นาโนเมตร (Nanometer)

ข้อ ๒ ให้ยกเลิก
(๑) ความใน (๒) ของข้อ ๒ แห่งประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ ๑๐ (พ.ศ. ๒๕๓๔) ออกตามความในพระราชบัญญัติส่งเสริมและรักษาคุณภาพสิ่งแวดล้อมแห่งชาติ พ.ศ. ๒๕๓๕ เรื่อง กำหนดมาตรฐานคุณภาพอากาศในบรรยากาศโดยทั่วไป
(๒) ความใน (๑) ของข้อ ๖ แห่งประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ ๑๐ (พ.ศ. ๒๕๓๔) ออกตามความในพระราชบัญญัติส่งเสริมและรักษาคุณภาพสิ่งแวดล้อมแห่งชาติ พ.ศ. ๒๕๓๕ เรื่อง กำหนดมาตรฐานคุณภาพอากาศในบรรยากาศโดยทั่วไป แก้ไขเพิ่มเติมโดยประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ ๒๘ (พ.ศ. ๒๕๕๐) เรื่อง กำหนดมาตรฐานคุณภาพอากาศในบรรยากาศโดยทั่วไป

ภาคผนวก ง5

ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 10 (พ.ศ. 2538) ออกตามความในพระราชบัญญัติส่งเสริมและรักษาคุณภาพสิ่งแวดล้อมแห่งชาติ พ.ศ. 2535 เรื่อง กำหนดมาตรฐานคุณภาพอากาศในบรรยากาศโดยทั่วไป
ประกาศในราชกิจจานุเบกษา เล่ม 112 ตอนที่ 42 ง
วันที่ 25 พฤษภาคม พ.ศ. 2538





ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ

ฉบับที่ ๑๐ (พ.ศ. ๒๕๓๘)

ออกตามความในพระราชบัญญัติส่งเสริมและรักษาคุณภาพสิ่งแวดล้อมแห่งชาติ

พ.ศ. ๒๕๓๕

เรื่อง กำหนดมาตรฐานคุณภาพอากาศในบรรยากาศโดยทั่วไป

อาศัยอำนาจตามความในมาตรา ๓๒ แห่งพระราชบัญญัติส่งเสริมและรักษาคุณภาพสิ่งแวดล้อมแห่งชาติ พ.ศ. ๒๕๓๕ คณะกรรมการสิ่งแวดล้อมแห่งชาติกำหนดมาตรฐานคุณภาพอากาศในบรรยากาศโดยทั่วไป ไว้ดังต่อไปนี้

ข้อ ๑ ในประกาศนี้

“เครื่องมือวัด ระบบนับดิสเปอร์สัฟ อินฟราเรด ดิสเพอร์ส (Non-dispersive Infrared Detection)” หมายความว่า เครื่องมือวัดค่าก๊าซคาร์บอนมอนอกไซด์โดยใช้รังสีอินฟราเรด

“เครื่องมือวัดระบบเคมีลูมิเนสเซน (Chemiluminescence)” หมายความว่า

(๑) เครื่องมือวัดค่าก๊าซไนโตรเจนไดออกไซด์โดยใช้ก๊าซโอโซนทำปฏิกิริยากับก๊าซไนตริกออกไซด์ ซึ่งถูกเปลี่ยนมาจากก๊าซไนโตรเจนไดออกไซด์แล้ววัดความเข้มของแสงซึ่งเกิดจากปฏิกิริยานั้น ณ ที่ความยาวคลื่นที่สูงกว่า ๖๐๐ นาโนเมตร (Nanometer) หรือ

(๒) เครื่องมือวัดค่าก๊าซโอโซนโดยใช้ก๊าซอีเทนทำปฏิกิริยากับก๊าซโอโซนแล้ววัดความเข้มของแสงซึ่งเกิดจากปฏิกิริยานั้น ณ ที่ความยาวคลื่นระหว่าง ๓๕๐ ถึง ๕๕๐ นาโนเมตร

“ระบบพาราโรซานิลีน (Pararosaniline)” หมายความว่า การวัดค่าก๊าซซัลเฟอร์ไดออกไซด์ โดยการดูดอากาศผ่านสารละลายโพตัสเซียม เตตราคลอโรโบเมอควาเรต (Potassium Tetrachloromercurate) เกิดเป็นสารไดคลอโรซัลไฟไดเมอควิเรต คอมเพลกซ์

๒๔๓

(Dichlorosulfito Mercurate Complex) ทำปฏิกิริยากับสารพาราโรซานิลีนและฟอร์มาลดีไฮด์ (Pararosaniline and Formaldehyde) เกิดเป็นสีของพาราโรซานิลีนเมทิล ซัลโฟนิค เอซิด (Pararosaniline Methyl Sulfonic Acid) ซึ่งจะดูดวัดความยาวในการดูดซึมแสง ณ ที่ช่วงคลื่น ๕๔๔ นาโนเมตร

“เครื่องมือวัดระบบอะตอมมิค แอปซอร์พชัน สเปกโตรมิเตอร์ (Atomic Absorption Spectrometer)” หมายความว่า เครื่องมือวัดปริมาณของตะกั่ว โดยใช้เปลวไฟอะเซทิลีน (Acetylene Flame) ที่ความยาวคลื่น ๒๘๓.๓ หรือ ๒๑๘ นาโนเมตร

“ระบบกราวิมेटริก (Gravimetric)” หมายความว่า การวัดค่าฝุ่นละอองโดยดูดอากาศผ่านแผ่นกรอง ซึ่งมีประสิทธิภาพในการกรองฝุ่นละอองขนาด ๐.๓ ไมครอน (Micron) ได้ร้อยละ ๙๙ แล้วหาน้ำหนักฝุ่นละอองจากแผ่นกรองนั้น

ข้อ ๒ ค่าก๊าซในบรรยากาศโดยทั่วไปในช่วงเวลาหนึ่งเวลาใดให้เป็นไปดังต่อไปนี้

(๑) ค่าเฉลี่ยของก๊าซคาร์บอนมอนอกไซด์ในเวลา ๑ ชั่วโมง จะต้องไม่เกิน ๓๐ ส่วนในล้านส่วน (ppm) หรือไม่เกิน ๓.๔.๒ มิลลิกรัมต่อลูกบาศก์เมตรและในเวลา ๘ ชั่วโมง จะต้องไม่เกิน ๙ ส่วนในล้านส่วน หรือไม่เกิน ๑๐.๒.๖ มิลลิกรัมต่อลูกบาศก์เมตร

(๒) ค่าเฉลี่ยของก๊าซไนโตรเจนไดออกไซด์ในเวลา ๑ ชั่วโมง จะต้องไม่เกิน ๐.๑๗ ส่วนในล้านส่วน หรือไม่เกิน ๐.๓๒ มิลลิกรัมต่อลูกบาศก์เมตร

(๓) ค่าเฉลี่ยของก๊าซโอโซนในเวลา ๑ ชั่วโมง จะต้องไม่เกิน ๐.๑๐ ส่วนในล้านส่วน หรือไม่เกิน ๐.๒๐ มิลลิกรัมต่อลูกบาศก์เมตร

(๔) ค่าเฉลี่ยของก๊าซซัลเฟอร์ไดออกไซด์ในเวลา ๒๔ ชั่วโมง จะต้องไม่เกิน ๐.๑๒ ส่วนในล้านส่วน หรือไม่เกิน ๐.๓๐ มิลลิกรัมต่อลูกบาศก์เมตร และค่ามัธยฐานเรขาคณิต (Geometric Mean) ในเวลา ๑ ปี จะต้องไม่เกิน ๐.๐๔ ส่วนในล้านส่วน หรือไม่เกิน ๐.๑๐ มิลลิกรัมต่อลูกบาศก์เมตร

ข้อ ๓ การคำนวณค่าความเข้มข้นของก๊าซแต่ละชนิดในบรรยากาศโดยทั่วไปให้คำนวณเทียบที่ความดัน ๑ บรรยากาศ และอุณหภูมิ ๒๕ องศาเซลเซียส

ข้อ ๔ ค่าสารในบรรยากาศโดยทั่วไป ในช่วงเวลาหนึ่งเวลาใดให้เป็นไปดังต่อไปนี้

(๑) ค่าเฉลี่ยของตะกั่วในเวลา ๑ เดือน จะต้องไม่เกิน ๑.๕ ไมโครกรัมต่อลูกบาศก์เมตร

(๒) ค่าเฉลี่ยของฝุ่นละอองขนาดไม่เกิน ๑๐ ไมครอน ในเวลา ๒๔ ชั่วโมง จะต้องไม่เกิน ๐.๑๒ มิลลิกรัมต่อลูกบาศก์เมตร และค่ามัธยฐานเรขาคณิตของสารดังกล่าวในเวลา ๑ ปี จะต้องไม่เกิน ๐.๑๕ มิลลิกรัมต่อลูกบาศก์เมตร

๒๔๔

(๓) ค่าเฉลี่ยของฝุ่นละอองรวมหรือฝุ่นละอองขนาดเล็กไม่เกิน ๑๐๐ ไมครอน ในเวลา ๒๔ ชั่วโมง จะต้องไม่เกิน ๐.๓๓ มิลลิกรัมต่อลูกบาศก์เมตร และค่าดัชนีภูมิอากาศของสารดังกล่าวในเวลา ๑ ปี จะต้องไม่เกิน ๐.๑๐ มิลลิกรัมต่อลูกบาศก์เมตร

ข้อ ๕ การวัดค่าเฉลี่ยของก๊าซคาร์บอนมอนอกไซด์ในเวลา ๑ ชั่วโมงหรือในเวลา ๘ ชั่วโมง ให้ใช้เครื่องมือวัดระบบนิรนดีสเปอร์ซัพ อินฟราเรด ดีทกชั่น หรือระบบอื่นที่กรมควบคุมมลพิษให้ความเห็นชอบ

ข้อ ๖ การวัดค่าเฉลี่ยของก๊าซไนโตรเจนไดออกไซด์หรือก๊าซโอโซนในเวลา ๑ ชั่วโมง ให้ใช้เครื่องมือวัดระบบเคมีลูมินสเซน หรือระบบอื่นที่กรมควบคุมมลพิษให้ความเห็นชอบ

ข้อ ๗ การวัดค่าเฉลี่ยของก๊าซซัลเฟอร์ไดออกไซด์ในเวลา ๒๔ ชั่วโมง หรือในเวลา ๑ ปี ให้ใช้วิธีการวัดตามระบบพาวโรซานิสติน หรือระบบอื่นที่กรมควบคุมมลพิษให้ความเห็นชอบ

ข้อ ๘ การวัดค่าเฉลี่ยของตะกั่วในเวลา ๑ เดือน ให้เก็บอากาศผ่านแผ่นกรองในเครื่องเก็บตัวอย่างอากาศชนิดไฮโดรลัม (High Volume-Air Sampler) สักัดตะกั่วออกจากแผ่นกรองโดยใช้กรดดินประสิวและกรดเกลือ แล้วนำไปวัดค่าของตะกั่วโดยใช้เครื่องวัดระบบอะตอมมิค แอบซอร์พชั่น สเปกโตรมิเตอร์ หรือระบบอื่นที่กรมควบคุมมลพิษให้ความเห็นชอบ

ข้อ ๙ การวัดค่าเฉลี่ยของฝุ่นละอองรวมหรือฝุ่นละอองขนาดเล็กไม่เกิน ๑๐ ไมครอน ในเวลา ๒๔ ชั่วโมง หรือในเวลา ๑ ปี ให้ใช้วิธีการวัดตามระบบกราวิมेटริก หรือระบบอื่นที่กรมควบคุมมลพิษให้ความเห็นชอบ

ข้อ ๑๐ การวัดค่าเฉลี่ยของก๊าซหรือสารอย่างหนึ่งอย่างใดตามข้อ ๕ ถึงข้อ ๗ ให้ทำในบรรยากาศทั่วๆ ไป และต้องสูงจากพื้นดินอย่างน้อย ๓ เมตร แต่ไม่เกิน ๖ เมตร

การวัดค่าเฉลี่ยของตะกั่วและฝุ่นละอองตามข้อ ๘ และข้อ ๙ ให้ทำในบรรยากาศทั่วๆ ไป และต้องสูงจากพื้นดินอย่างน้อย ๑.๕๐ เมตร แต่ไม่เกิน ๖ เมตร

ประกาศ ณ วันที่ ๑๗ เมษายน พ.ศ. ๒๕๓๘
ชวน หลีกภัย
นายกรัฐมนตรี

ประธานคณะกรรมการสิ่งแวดล้อมแห่งชาติ

(ประกาศในราชกิจจานุเบกษา เล่ม ๑๑๒ ตอนที่ ๔๒ ง วันที่ ๒๕ พฤษภาคม ๒๕๓๘)

แก้คำผิด

ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ
ฉบับที่ ๑๐ (พ.ศ. ๒๕๓๘) ออกตามความในพระราชบัญญัติส่งเสริมและรักษา
คุณภาพสิ่งแวดล้อมแห่งชาติ พ.ศ. ๒๕๓๕

เรื่อง กำหนดมาตรฐานคุณภาพอากาศในบรรยากาศโดยทั่วไป
ซึ่งประกาศในราชกิจจานุเบกษา

ฉบับประกาศทั่วไป เล่ม ๑๑๒ ตอนที่ ๔๒ ง ลงวันที่ ๒๕ พฤษภาคม ๒๕๓๘

หน้า ๕๑ บรรทัดที่ ๑๕ คำว่า

“ไม่เกิน ๐.๑๕ มิลลิกรัม” ให้แก้เป็น

“ไม่เกิน ๐.๐๕ มิลลิกรัม”

(ประกาศในราชกิจจานุเบกษา เล่ม ๑๑๒ ตอนที่ ๗๑ ง วันที่ ๕ กันยายน ๒๕๓๘)

ภาคผนวก ง6

มาตรฐานตามประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติฉบับที่ 15
(พ.ศ. 2540) เรื่อง กำหนดมาตรฐานระดับเสียงโดยทั่วไป ประกาศในราช
กิจจานุเบกษา เล่ม 114 ตอนที่ 27 ง วันที่ 3 เมษายน พ.ศ. 2540





ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ

ณ วันที่ ๑๕ (พ.ศ. ๒๕๕๐)

เรื่อง กำหนดมาตรฐานระดับเสียงโดยทั่วไป

อาศัยอำนาจตามความในมาตรา ๓๒ (๕) แห่งพระราชบัญญัติส่งเสริมและรักษาคุณภาพสิ่งแวดล้อมแห่งชาติ พ.ศ. ๒๕๓๕ คณะกรรมการสิ่งแวดล้อมแห่งชาติกำหนดมาตรฐานระดับเสียงโดยทั่วไปไว้ดังต่อไปนี้

ข้อ ๑ ในประกาศนี้

“ระดับเสียงโดยทั่วไป” หมายความว่า ระดับเสียงที่เกิดขึ้นในสิ่งแวดล้อมโดยรอบ
“ค่าระดับเสียงสูงสุด” หมายความว่า ค่าระดับเสียงสูงสุดที่เกิดขึ้นในขณะใดขณะหนึ่งระหว่างการตรวจวัดระดับเสียง โดยมีหน่วยเป็นเดซิเบลเอ หรือ dB (A)

“ค่าระดับเสียงเฉลี่ย ๒๔ ชั่วโมง” หมายความว่า ค่าระดับเสียงที่มีพลังงานเทียบเท่าระดับเสียงที่เกิดขึ้นจริง ซึ่งมีระดับเสียงเปลี่ยนแปลงตามเวลาในช่วง ๒๔ ชั่วโมง (๒๔ hours A-weighted Equivalent Continuous Sound Level) ซึ่งเรียกโดยย่อว่า Leq ๒๔ hr โดยมีหน่วยเป็นเดซิเบลเอ หรือ dB (A)

“มาตรฐานระดับเสียง” หมายความว่า เครื่องวัดระดับเสียงซึ่งปฏิบัติตามมาตรฐาน IEC ๖๕๑ หรือ IEC ๘๐๔ ของคณะกรรมการว่าด้วยการระหวางประเทศว่าด้วยเทคนิคไฟฟ้า (International Electrotechnical Commission, IEC)

ข้อ ๒ ให้กำหนดมาตรฐานระดับเสียงโดยทั่วไปไว้ดังต่อไปนี้

- (๑) ค่าระดับเสียงสูงสุด ไม่เกิน ๑๑๕ เดซิเบลเอ
- (๒) ค่าระดับเสียงเฉลี่ย ๒๔ ชั่วโมง ไม่เกิน ๗๐ เดซิเบลเอ

ข้อ ๓ การตรวจวัดระดับเสียงโดยทั่วไป ให้ดำเนินการดังต่อไปนี้

- (๑) การตรวจวัดค่าระดับเสียงสูงสุด ให้ใช้มาตรระดับเสียงตรวจวัดระดับเสียงในบริเวณที่มีคนอยู่หรืออาศัยอยู่
- (๒) การตรวจวัดค่าระดับเสียงเฉลี่ย ๒๔ ชั่วโมง ให้ใช้มาตรระดับเสียงตรวจวัดระดับเสียงอย่างต่อเนื่องตลอดเวลา ๒๔ ชั่วโมงใดๆ
- (๓) การตั้งไมโครโฟนของมาตรระดับเสียงที่บริเวณภายนอกอาคารให้ตั้งสูงจากพื้นไม่น้อยกว่า ๑.๒๐ เมตร โดยในรัศมี ๓.๕๐ เมตร ตามแนวราบรอบไมโครโฟนต้องไม่มีกำแพงหรือสิ่งอื่นใดที่มีคุณสมบัติในการสะท้อนเสียงกีดขวางอยู่
- (๔) การตั้งไมโครโฟนของมาตรระดับเสียงที่บริเวณภายในอาคารให้ตั้งสูงจากพื้นไม่น้อยกว่า ๑.๒๐ เมตร โดยในรัศมี ๑.๐๐ เมตร ตามแนวราบรอบไมโครโฟนต้องไม่มีกำแพงสิ่งอื่นใดที่มีคุณสมบัติในการสะท้อนเสียงกีดขวางอยู่และต้องห่างจากช่องหน้าต่างหรือช่องทางที่เป็ออกนอกอาคารอย่างน้อย ๑.๕๐ เมตร

ข้อ ๔ การคำนวณค่าระดับเสียงจะต้องเป็นไปตามวิธีการที่องค์การระหว่างประเทศว่าด้วยมาตรฐาน (International Organization for Standardization, ISO) กำหนด ซึ่งกรมควบคุมมลพิษจะประกาศในราชกิจจานุเบกษา

ประกาศ ณ วันที่ ๑๒ มีนาคม พ.ศ. ๒๕๕๐

พลเอก ชวทิศ ขงใจยุทธ

นายกรัฐมนตรี

ประธานคณะกรรมการสิ่งแวดล้อมแห่งชาติ

(ประกาศในราชกิจจานุเบกษา เล่ม ๑๑๔ ตอนที่ ๒๗ ง วันที่ ๓ เมษายน ๒๕๕๐)

ภาคผนวก ง7

มาตรฐานตามประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 29
(พ.ศ. 2550) เรื่อง ค่าระดับเสียงรบกวน ประกาศในราชกิจจานุเบกษา
เล่ม 124 ตอนพิเศษ 98 ง วันที่ 16 สิงหาคม พ.ศ. 2550



ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ

ฉบับที่ ๒๕ (พ.ศ. ๒๕๕๐)

เรื่อง ค่าระดับเสียงรบกวน

โดยที่เป็นการสมควร ปรับปรุงค่ามาตรฐานระดับเสียงรบกวน ให้เหมาะสมกับกฎเกณฑ์และหลักฐานทางวิทยาศาสตร์ โดยคำนึงถึงความเป็นไปได้ในเชิงเศรษฐกิจสังคมและเทคโนโลยีที่เกี่ยวข้อง อาศัยอำนาจตามความในมาตรา ๓๔ แห่งพระราชบัญญัติส่งเสริมและรักษาคุณภาพสิ่งแวดล้อมแห่งชาติ พ.ศ. ๒๕๓๕ และคำสั่งสำนักนายกรัฐมนตรี ที่ ๗๑/๒๕๕๐ คณะกรรมการสิ่งแวดล้อมแห่งชาติ จึงออกประกาศกำหนดค่าระดับเสียงรบกวน ไว้ดังต่อไปนี้

ข้อ ๑ ให้ยกเลิกประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ ๑๗ (พ.ศ. ๒๕๔๓) ลงวันที่ ๖ มิถุนายน ๒๕๔๓ เรื่อง ค่าระดับเสียงรบกวน

ข้อ ๒ ให้กำหนดระดับเสียงรบกวนเท่ากับ ๑๐ เดซิเบลเอ

หากระดับการรบกวนที่คำนวณได้มีค่ามากกว่าระดับเสียงรบกวนตามวรรคแรก ให้ถือว่าเป็นเสียงรบกวน

ข้อ ๓ วิธีการตรวจวัดระดับเสียงพื้นฐาน ระดับเสียงขณะไม่มีการรบกวน การตรวจวัด และคำนวณระดับเสียงขณะมีการรบกวน การคำนวณค่าระดับการรบกวน และแบบบันทึกการตรวจวัดเสียงรบกวนให้เป็นไปตามที่ คณะกรรมการควบคุมมลพิษประกาศในราชกิจจานุเบกษา

ประกาศ ณ วันที่ ๒๕ มิถุนายน พ.ศ. ๒๕๕๐

โสมิต ปิ่นเปี่ยมราษฎร์

รองนายกรัฐมนตรี

ประธานกรรมการสิ่งแวดล้อมแห่งชาติ

ภาคผนวก ง8

มาตรฐานความสันสะท้อนเพื่อป้องกันผลกระทบต่ออาคาร
ตามประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 37
ประกาศในราชกิจจานุเบกษา เล่มที่ 127 ตอนพิเศษ 69 ง
ลงวันที่ 2 มิถุนายน พ.ศ. 2553 อาคารประเภทที่ 2



ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ

ฉบับที่ ๓๗ (พ.ศ. ๒๕๕๓)

เรื่อง กำหนดมาตรฐานความสะอาดเพื่อป้องกันผลกระทบต่ออาคาร

โดยที่เป็นการสมควรกำหนดมาตรฐานความสะอาดเพื่อป้องกันผลกระทบต่ออาคาร เพื่อเป็นเกณฑ์ทั่วไปสำหรับการส่งเสริมและรักษาคุณภาพสิ่งแวดล้อมตามพระราชบัญญัติส่งเสริมและรักษาคุณภาพสิ่งแวดล้อมแห่งชาติ พ.ศ. ๒๕๓๕

อาศัยอำนาจตามความในมาตรา ๓๒ (๕) แห่งพระราชบัญญัติส่งเสริมและรักษาคุณภาพสิ่งแวดล้อมแห่งชาติ พ.ศ. ๒๕๓๕ อันเป็นพระราชบัญญัติที่มีบทบัญญัติบางประการเกี่ยวกับการจัดสิทธิและเสรีภาพของบุคคล จึงมาตรา ๒๕ ประกอบกับมาตรา ๓๓ มาตรา ๓๔ มาตรา ๔๑ และมาตรา ๔๓ ของรัฐธรรมนูญแห่งราชอาณาจักรไทย บัญญัติให้กระทำได้โดยอาศัยอำนาจตามบทบัญญัติแห่งกฎหมาย คณะกรรมการสิ่งแวดล้อมแห่งชาติ จึงออกประกาศไว้ ดังต่อไปนี้

ข้อ ๑ ในประกาศนี้

“อาคารประเภทที่ ๑” หมายความว่า

(๑) อาคารที่ใช้เป็นโรงงานตามกฎหมายว่าด้วยโรงงาน

(๒) อาคารพาณิชย์ อาคารสำนักงาน อาคารคลังสินค้า อาคารพิเศษ อาคารขนาดใหญ่ ตามกฎหมายว่าด้วยการควบคุมอาคาร

(๓) อาคารอื่นใดที่มีการใช้ประโยชน์ในอาคารเช่นเดียวกับอาคารตาม (๑) และ (๒)

“อาคารประเภทที่ ๒” หมายความว่า

(๑) อาคารอยู่อาศัย อาคารอยู่อาศัยรวม ห้องแถว ตึกแถว บ้านแถว บ้านแฝด ตามกฎหมายว่าด้วยการควบคุมอาคาร

(๒) อาคารชุดตามกฎหมายว่าด้วยอาคารชุด

(๓) หอพักตามกฎหมายว่าด้วยหอพัก

(๔) อาคารที่ใช้เป็นสถานพยาบาลตามกฎหมายว่าด้วยสถานพยาบาล และอาคารที่ใช้เป็นโรงพยาบาลของราชการ

(๕) อาคารที่ใช้เป็นสถานที่ศึกษาตามกฎหมายว่าด้วยโรงเรียนเอกชน อาคารที่ใช้เป็นโรงเรียนของทางราชการ อาคารที่ใช้เป็นสถานที่ศึกษาของสถาบันอุดมศึกษาของเอกชนตามกฎหมายว่าด้วยสถาบันอุดมศึกษาเอกชน และอาคารที่ใช้เป็นสถานที่ศึกษาของสถาบันอุดมศึกษาของทางราชการ

(๖) อาคารที่ใช้ประโยชน์เพื่อกิจกรรมทางศาสนา

(๗) อาคารอื่นใดที่มีลักษณะของการใช้ประโยชน์ในอาคารเช่นเดียวกันกับอาคารตาม (๑) (๒) (๓) (๔) (๕) และ (๖)

“อาคารประเภทที่ ๓” หมายความว่า

(๑) โบราณสถานตามกฎหมายว่าด้วยโบราณสถาน โบราณวัตถุ ศิลปวัตถุ และพิพิธภัณฑสถานแห่งชาติ

(๒) อาคารหรือสิ่งปลูกสร้างในลักษณะอื่นใดที่มีลักษณะไม่มั่นคงแข็งแรงแต่มีคุณค่าทางวัฒนธรรม

“ความเร็วอนุภาคสูงสุด (Peak Particle Velocity: PPV, V_{max})” หมายความว่า ค่าความเร็วของความสั่นสะเทือนในแนวแกนนอน (แกน X หรือ แกน Y) หรือแนวแกนตั้ง (แกน Z) ที่มีค่าสูงสุด

“ความสั่นสะเทือนกรณีที่ ๑” หมายความว่า ความสั่นสะเทือนที่ไม่ทำให้เกิดการถล่มและการสั่นพ้องของโครงสร้างอาคาร

“ความสั่นสะเทือนกรณีที่ ๒” หมายความว่า ความสั่นสะเทือนที่ทำให้เกิดการถล่มหรือการสั่นพ้องของโครงสร้างอาคาร

“การสั่นพ้อง (Resonance) ของโครงสร้างอาคาร” หมายความว่า ปรากฏการณ์ใดๆ ที่ก่อให้เกิดการสั่นสะเทือนในลักษณะที่มีค่าเท่ากับความถี่ธรรมชาติ (Natural Frequency) ของโครงสร้างอาคารนั้น

“ความถี่ธรรมชาติ (Natural Frequency) ของโครงสร้างอาคาร” หมายความว่า ความถี่ในการสั่นสะเทือนของโครงสร้างอาคารหรือส่วนประกอบของอาคารแต่ละอาคารที่มีลักษณะเฉพาะภายใต้การสั่นแบบอิสระ

“โครงสร้างอาคาร” หมายความว่า ส่วนของอาคารที่เป็นเสา คาน ดง พื้นหรือส่วนอื่นซึ่งโดยสภาพถือได้ว่าเป็นความสำคัญต่อความมั่นคงแข็งแรงของอาคารนั้น

“ส่วนประกอบของอาคาร” หมายความว่า ส่วนของอาคารที่นอกเหนือจากโครงสร้างอาคารที่มีการยึดอย่างมั่นคงกับโครงสร้างอาคาร

ข้อ ๒ กำหนดมาตรฐานความถี่เสียงเพื่อป้องกันผลกระทบต่อการจัดตั้ง

อาคารประเภทที่	จุดตรวจวัด	ความถี่ (เฮิรตซ์)	ความเร็วอนุภาคสูงสุดไม่เกิน (มิลลิเมตรต่อวินาที)	
			ความถี่เสียงที่ ๑	ความถี่เสียงที่ ๒
๑	๑.๑ ฐานรากหรือชั้นล่างของอาคาร	$f \leq ๑๐$	๒๐	
		$๑๐ < f \leq ๕๐$	$๐.๕ f + ๑๕$	
		$๕๐ < f \leq ๑๐๐$	$๐.๒ f + ๓๐$	
		$f > ๑๐๐$	๕๐	
๒	๑.๒ ชั้นบนสุดของอาคาร	ทุกความถี่	๔๐	๑๐
		ทุกความถี่	๒๐	๑๐
	๑.๓ พื้นอาคารในแต่ละชั้น	$f \leq ๑๐$	๕	
		$๑๐ < f \leq ๕๐$	$๐.๒๕ f + ๒.๕$	
๓	๒.๑ ฐานรากหรือชั้นล่างของอาคาร	$๕๐ < f \leq ๑๐๐$	$๐.๑ f + ๑๐$	
		$f > ๑๐๐$	๒๐	
	๒.๒ ชั้นบนสุดของอาคาร	ทุกความถี่	๑๕	๕
		ทุกความถี่	๒๐	๑๐
๓	๓.๑ ฐานรากหรือชั้นล่างของอาคาร	$f \leq ๑๐$	๓	
		$๑๐ < f \leq ๕๐$	$๐.๑๒๕ f + ๑.๒๕$	
		$๕๐ < f \leq ๑๐๐$	$๐.๐๔ f + ๖$	
		$f > ๑๐๐$	๑๐	
	๓.๒ ชั้นบนสุดของอาคาร	ทุกความถี่	๘	๒.๕
		ทุกความถี่	๒๐	๑๐

หมายเหตุ

- ๑) f = ความถี่ของคลื่นเสียง
- ๒) n = เวลาที่มีความเร็วอนุภาคสูงสุดมีหน่วยเป็นเฮิรตซ์
- ๓) * = ถ้าหนดมาตรฐานไว้เฉพาะค่าความเร็วอนุภาคสูงสุดในแกนอน
- ๔) ** = ถ้าหนดมาตรฐานไว้เฉพาะค่าความเร็วอนุภาคสูงสุดในแกนตั้ง
- ๕) การวัดค่าความถี่เสียงสูงสุดสำหรับความถี่เสียงที่ ๒ ตามข้อ ๑.๒, ๒.๒ และ ๓.๒ ให้วัดที่ชั้นบนสุดของอาคารหรือชั้นอื่นซึ่งมีค่าความถี่เสียงสูงสุด
- ๖) การวัดค่าความถี่เสียงที่พื้นอาคารในแต่ละชั้นตามข้อ ๑.๓, ๒.๓ และ ๓.๓ ให้ดำเนินการวัดฐานรากหรือชั้นล่างของอาคาร

ข้อ ๓ หลักเกณฑ์ และวิธีตรวจวัดความถี่เสียง เพื่อให้เป็นไปตามรายละเอียดในภาคผนวกท้ายประกาศนี้

ข้อ ๔ ประกาศนี้ให้ใช้ตั้งแต่วันที่ออกวันประกาศในราชกิจจานุเบกษาเป็นต้นไป

ประกาศ ณ วันที่ ๒๖ เมษายน พ.ศ. ๒๕๕๓

อภิสิทธิ์ เวชชาชีวะ

นายกรัฐมนตรี

ประธานกรรมการสิ่งแวดล้อมแห่งชาติ

ภาคผนวก

ท้ายประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ

ฉบับที่ ๓๗ (พ.ศ. ๒๕๕๓)

เรื่อง กำหนดมาตรฐานความสั่นสะเทือนเพื่อป้องกันผลกระทบต่ออาคาร

ข้อ ๑ บทนิยาม

"มาตรฐานความสั่นสะเทือน" หมายความว่า เครื่องวัดความสั่นสะเทือนตามมาตรฐาน DIN ๔๕๖๖๙-๑ ของประเทศเยอรมัน (Deutsches Institut für Normung) หรือเครื่องวัดความสั่นสะเทือนอื่นที่มีคุณสมบัติเทียบเท่าตามที่กรมควบคุมมลพิษเห็นชอบ

ข้อ ๒ ก่อนทำการตรวจวัดความสั่นสะเทือนทุกครั้งจะต้องปรับเทียบความถูกต้องของมาตรฐานความสั่นสะเทือนหรือตรวจสอบการใช้งานของมาตรฐานความสั่นสะเทือนให้เป็นไปตามคู่มือการใช้งานที่ผู้ผลิตกำหนดไว้

ข้อ ๓ การติดตั้งหัววัดความสั่นสะเทือน ให้ติดตั้งหัววัดแกน X และแกน Y ในลักษณะที่ท่ามุมฉากต่อกัน โดยให้แกนใดแกนหนึ่งขนานไปกับผนังอาคารด้านที่หันหน้าไปทางแหล่งกำเนิดความสั่นสะเทือน และให้แกน Z อยู่ในแนวตั้งในลักษณะที่ท่ามุมฉากกับแกน X และแกน Y โดยมีลักษณะการติดตั้งในแต่ละพื้นที่ดังนี้

(๑) การติดตั้งหัววัดบนพื้นดิน ให้ติดตั้งหัววัดบนลิ้นชักดอกลงบนพื้นดิน และให้ตอกลิ้ม

จมมิดลงในดิน

(๒) การติดตั้งหัววัดที่พื้นอาคาร ให้ติดตั้งหัววัดโดยยึดหัววัดกับพื้นด้วยขึงเหนียวหรือการ

(๓) การติดตั้งหัววัดที่ผนังอาคารหรือกำแพง ให้ติดตั้งหัววัดบนลิ้นชักซึ่งจะขึงเหนียวผนังอาคารหรือกำแพงหรือยึดหัววัดกับผนังอาคารหรือกำแพงด้วยวัสดุอื่นในลักษณะที่มั่นคง

ข้อ ๔ การตรวจวัดความสั่นสะเทือนกรณีที่ ๑ ให้ดำเนินการดังนี้

(๑) การติดตั้งหัววัดความสั่นสะเทือนให้ดำเนินการตามข้อ ๓ โดยมีจุดตรวจวัด

ความสั่นสะเทือนกรณีที่ ๑ ดังภาพที่ ๑

(๓) การตรวจวัดความสั่นสะเทือนบริเวณฐานรากหรือชั้นล่างของอาคาร ให้ติดตั้งหัววัดบริเวณอาคารด้านที่หันหน้าไปทางแหล่งกำเนิดความสั่นสะเทือน โดยติดตั้งหัววัดบนพื้นอาคารชั้นล่างบริเวณใกล้ฐานกำแพงนอกสุดของอาคารหรือบนผนังอาคารที่กำแพงนอกสุดของอาคารหรือช่องเปิดบนผนังอาคารหรือกำแพงนอกสุดของอาคาร และตำแหน่งหัววัดต้องอยู่สูงจากพื้นอาคารหรือพื้นดินไม่เกิน ๐.๕ เมตร สำหรับอาคารซึ่งมีชั้นล่างเป็นบริเวณกว้าง ให้ตรวจวัดหลายๆ ตำแหน่งๆ กัน

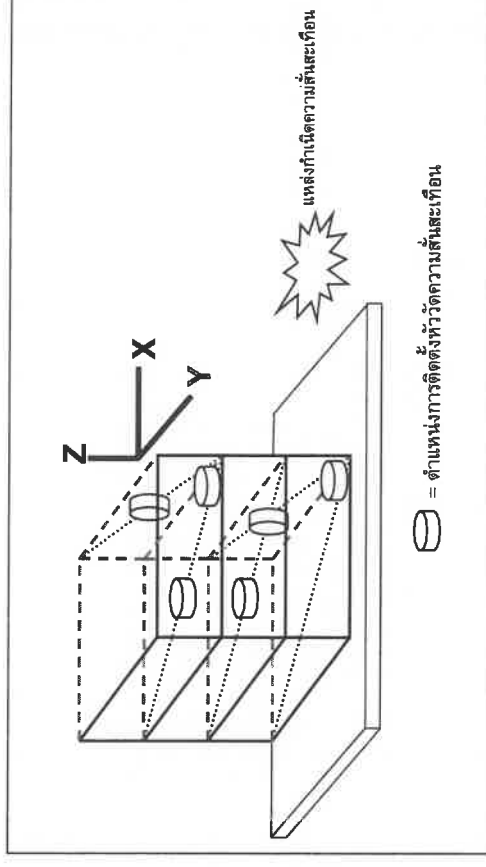
(๒) การตรวจวัดความสั่นสะเทือนบริเวณชั้นบนสุดของอาคาร ให้ติดตั้งหัววัดเข้ากับพื้นอาคารบริเวณที่ใกล้ผนังอาคารหรือกำแพงหรือบนผนังอาคารหรือกำแพงที่ชั้นบนสุดของอาคาร

(๓) การตรวจวัดความสั่นสะเทือนบริเวณพื้นอาคารในแต่ละชั้น ให้ติดตั้งหัววัดบริเวณ

ที่กลางพื้นอาคารในแต่ละชั้นยกเว้นฐานรากหรือชั้นล่างของอาคาร

(๑) ช่วงเวลาในการตรวจวัด ต้องครอบคลุมถึงระยะเวลาที่เกิดความสั่นสะเทือนที่ต้องการประเมินผล

(๒) การบันทึกผล ให้บันทึกค่าความเร็วอนุภาคสูงสุดในแต่ละแกน



○ = ตำแหน่งการติดตั้งหัววัดความสั่นสะเทือน

ภาพที่ ๑

ตัวอย่างจุดตรวจวัดความสั่นสะเทือนกรณีที่ ๑

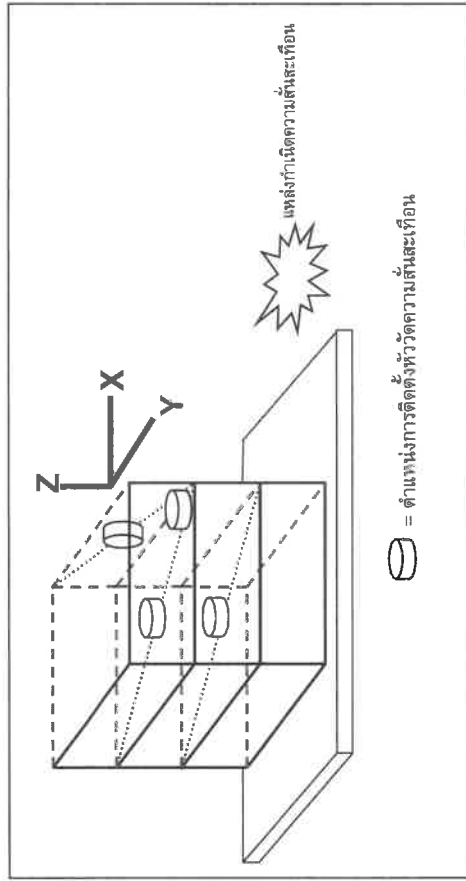
ข้อ ๕ การตรวจวัดความสั่นสะเทือนกรณีที่ ๒ ให้ดำเนินการดังนี้
(๑) การติดตั้งหัววัดความสั่นสะเทือนให้ดำเนินการตามข้อ ๓ โดยมีจุดติดตั้งหัววัดความสั่นสะเทือนกรณีที่ ๒ ดังภาพที่ ๒

(๓) การตรวจวัดบริเวณชั้นบนสุดของอาคารหรือบริเวณชั้นที่มีค่าความสั่นสะเทือนสูงสุด ให้ติดตั้งหัววัดเข้ากับพื้นอาคารบริเวณที่ใกล้ผนังอาคารหรือกำแพงหรือบนผนังอาคารหรือกำแพงที่ชั้นบนสุดของอาคารหรือบริเวณชั้นที่มีค่าความสั่นสะเทือนสูงสุด

(๒) การตรวจวัดบริเวณพื้นอาคารในแต่ละชั้น ให้ติดตั้งหัววัดบริเวณที่กลางพื้นอาคารในแต่ละชั้นยกเว้นฐานรากหรือชั้นล่างของอาคาร

(๒) ช่วงเวลาในการตรวจวัด ต้องครอบคลุมถึงระยะเวลาที่เกิดความสั่นสะเทือนที่ต้องการประเมินผล

(๓) การบันทึกผล ให้บันทึกค่าความเร็วอนุภาคสูงสุดในแต่ละแกน



ภาพที่ ๒

ตัวอย่างจุดตรวจวัดความสั่นสะเทือนกรณีที่ ๒

ข้อ ๖ การประเมินผลของความสั่นสะเทือนต่ออาคารที่ยามีขึ้นในอาคาร การติดตั้งห้วงวัดความสั่นสะเทือนไม่ดำเนินการตามข้อ ๓ โดยติดตั้งห้วงวัดที่พื้นดินบริเวณที่อาจมีอาคารในอาคารหรือฐานรากหรือชั้นล่างของอาคารใกล้เคียงโดยไม่คำนึงถึงระยะห่างกับแนวแกนหลักของอาคารที่ยามีขึ้นในอาคาร และได้รับผลกระทบจากความสั่นสะเทือน

ภาคผนวก จ
เอกสารเทียบเครื่องมือที่ใช้ในการตรวจวิเคราะห์



List of Instrument Certificates for Environmental Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*
1	Analyzer Balance	FAT OIL AND GREASE	Mettler Toledo	AB204-SF/ACT / 112061010	Technology Promotion Association (Thailand-Japan)	24M022	11 May 24	10 May 25
2	Analyzer Balance	TOTAL DISSOLVED SOLIDS	Mettler Toledo	XPR202DU / C21060324	National Food Institute Ministry of Industry, Thailand	2402283-002-01	2 Apr 24	1 Apr 25
3	Analyzer Balance	TOTAL SUSPENDED SOLIDS	Mettler Toledo	XPR202DU / C20601122	National Food Institute Ministry of Industry, Thailand	2402283-001-01	2 Apr 24	1 Apr 25
4	BOD Incubator	BIOCHEMICAL OXYGEN DEMAND	ANCO	UQA-1320 / 1021	Technology Promotion Association (Thailand-Japan)	24T01114	11 Jul 24	10 Jul 25
5	BOD Meter	BIOCHEMICAL OXYGEN DEMAND	YSI	5100 / 115 01983	Technology Promotion Association (Thailand-Japan)	24T005	21 Feb 24	20 Feb 25
6	Aplicator Dilution Unit	TOTAL KIELOH-L NITROGEN	Foss Tecator	UF55 / R212-0411	National Food Institute Ministry of Industry, Thailand	2402287-001-02	23 May 24	22 May 25
7	pH Meter	pH	Hanna	HI9141-PH10 / HANNA007	FOSS South East Asia Technology promotion association (Thailand-Japan)	9807	8 Feb 24	7 Feb 25

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

พรหมสารพิทักษ์บรรณารักษ์
เจ้าหน้าที่เทคนิคห้องปฏิบัติการ
เบอร์โทรศัพท์: 09-00000000

List of Instruments Certification for Environmental Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
1	Analyzer Balance (Precision 0.1 mg)	ANALYST BALANCE	Mettler Toledo	XPR202DU / C21060324	Technology Promotion Association (Thailand-Japan)	24M022	11 May 24	10 May 25	-

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

List of Instrument Certificates for Environmental Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration
1	Analyzer Balance	FAT OIL AND GREASE	Mettler Toledo	AB204-SF/ACT / 112061010	Technology Promotion Association (Thailand-Japan)	24M022	11 May 24	10 May 25
2	Analyzer Balance	TOTAL DISSOLVED SOLIDS	Mettler Toledo	XPR202DU / C21060324	National Food Institute Ministry of Industry, Thailand	2402283-002-01	2 Apr 24	1 Apr 25
3	Analyzer Balance	TOTAL SUSPENDED SOLIDS	Mettler Toledo	XPR202DU / C20007192	National Food Institute Ministry of Industry, Thailand	2402283-001-01	2 Apr 24	1 Apr 25
4	BOD Incubator	BIOCHEMICAL OXYGEN DEMAND	ANCO	LCA-1320 / 1021	Technology Promotion Association (Thailand-Japan)	24T01114	11 Jul 24	10 Jul 25
5	BOD Meter	BIOCHEMICAL OXYGEN DEMAND	YSI	5100 / 115 01983	Technology Promotion Association (Thailand-Japan)	24T005	21 Feb 24	20 Feb 25
6	Digestion Unit	TOTAL KIELOH-L NITROGEN	Foss Tecator	220 Jule / R173-040a	National Food Institute Ministry of Industry, Thailand	2402287-001-02	23 May 24	22 May 25
7	Aplicator Dilution Unit	TOTAL KIELOH-L NITROGEN	FOSS	Rohas 1100 / S1806053	FOSS South East Asia Technology promotion association (Thailand-Japan)	9807	8 Feb 24	7 Feb 25
8	pH Meter	pH	Hanna	LQA14-PH10 / HANNA007	Technology promotion association (Thailand-Japan)	24C0389	2 Apr 24	1 Apr 25

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

List of Instrument Certificates for Environmental Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration
1	Analyzer Balance	FAT OIL AND GREASE	Mettler Toledo	AB204-SF/ACT / 112061010	Technology Promotion Association (Thailand-Japan)	24M022	11 May 24	10 May 25
2	Analyzer Balance	TOTAL DISSOLVED SOLIDS	Mettler Toledo	XPR202DU / C21060324	National Food Institute Ministry of Industry, Thailand	2402283-002-01	2 Apr 24	1 Apr 25
3	Analyzer Balance	TOTAL SUSPENDED SOLIDS	Mettler Toledo	XPR202DU / C20007192	National Food Institute Ministry of Industry, Thailand	2402283-001-01	2 Apr 24	1 Apr 25
4	BOD Incubator	BIOCHEMICAL OXYGEN DEMAND	ANCO	LCA-1320 / 1021	Technology Promotion Association (Thailand-Japan)	24T01114	11 Jul 24	10 Jul 25
5	Hot Air Oven	TOTAL DISSOLVED SOLIDS	Mettler	UF55 / R212-0411	Technology Promotion Association (Thailand-Japan)	24T0069	1 Apr 24	31 Mar 25
6	Aplicator Dilution Unit	TOTAL KIELOH-L NITROGEN	FOSS	KTR / S1806053	FOSS South East Asia Technology promotion association (Thailand-Japan)	13038	5 Jul 24	4 Jul 25
7	pH Meter	pH	Hanna	LQA14-PH10 / HANNA007	Technology promotion association (Thailand-Japan)	24C0389	2 Apr 24	1 Apr 25

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

List of Instrument Certificates for Environmental Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*
1	Analytical Balance	FAT OIL AND GREASE	Master Tolu	AB204-SF/ACT / 113060109	United Analyst and Engineering Consultant Co., Ltd (UAE)	2504021 BL002.25	23/04/2025	25/04/2026
2	Analytical Balance	TOTAL DISSOLVED SOLIDS	Master Tolu	XP2050001 / C215965294	Naturel Food Institute, Ministry of Industry, Thailand	250224-002-01	26/09/2025	19/10/2026
3	Analytical Balance	TOTAL SUSPENDED SOLIDS	Master Tolu	XB2050001 / C008071872	Naturel Food Institute, Ministry of Industry, Thailand	250226-001-01	20/05/2025	19/05/2026
4	BOD Incubator	BIOCHEMICAL OXYGEN DEMAND	ANCO	UC-A-1201 / 1021	Technology Promotion Association (Thailand-Japan)	241W114	11/07/2024	10/07/2025
5	DO Meter	BIOCHEMICAL OXYGEN DEMAND	YSI	5100 / 118 10183	Technology Promotion Association (Thailand-Japan)	231709	19/03/2025	19/03/2026
6	Hydro Distillation Unit	TOTAL NITROGEN	FOGS	KTY 61905293	FOGS South East Asia	12875	31/07/2024	07/07/2025
7	pH Meter	pH	Hanna	LAQUA PH211 / H4040007	Technology promotion association (Thailand-Japan)	25C1832	20/02/2025	19/02/2026

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

List of Instrument Certificates for Environmental Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*
1	Analytical Balance	FAT OIL AND GREASE	Master Tolu	AB204-SF/ACT / 113060109	United Analyst and Engineering Consultant Co., Ltd	2504021 BL002.25	23/04/2025	25/04/2026
2	Analytical Balance	TOTAL DISSOLVED SOLIDS	Master Tolu	XP2050001 / C215965294	Naturel Food Institute, Ministry of Industry, Thailand	250224-002-01	26/09/2025	19/10/2026
3	Analytical Balance	TOTAL SUSPENDED SOLIDS	Master Tolu	XB2050001 / C008071872	Naturel Food Institute, Ministry of Industry, Thailand	250226-001-01	20/05/2025	19/05/2026
4	DO Meter	BIOCHEMICAL OXYGEN DEMAND	YSI	5100 / 118 10183	Technology Promotion Association (Thailand-Japan)	231709	19/03/2025	19/03/2026
5	Hydro Distillation Unit	TOTAL NITROGEN	FOGS	KTY 61905293	FOGS South East Asia	12875	07/07/2024	07/07/2025
6	pH Meter	pH	YSI Environmental	pH 100A / J003335	Technology Promotion Association (Thailand-Japan)	25C1183	30/03/2025	30/03/2026

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

List Certificate of Instrument for Environmental Quality Analysis.

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
Equipment for Air Quality Analysis									
1	Ion Chromatography Cation (IC)	Chloride	Donnex	DonnexAgion / Z2030299	Archemia Lab Co.Ltd.	Qualification Report Arion (EP1908)	23 Apr 25	22 Apr 26	-
2	Ion Chromatography Anion (IC)		Donnex	DonnexAgion/PEC / Z2030001	Archemia Lab Co.Ltd.	Qualification Report Arion (EP1907)	23 Apr 25	22 Apr 26	

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

List of Instrument Certificates for Environmental Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*
1	Analytical Balance	FAT OIL AND GREASE	Master Tolu	AB204-SF/ACT / 113060109	Technology Promotion Association (Thailand-Japan)	26M0202	11 May 24	10 May 25
2	Analytical Balance	TOTAL DISSOLVED SOLIDS	Master Tolu	XP2050001 / C215965294	Naturel Food Institute, Ministry of Industry, Thailand	250224-002-01	29 Mar 25	18 Mar 26
3	Analytical Balance	TOTAL SUSPENDED SOLIDS	Master Tolu	XP2050001 / C008071872	Naturel Food Institute, Ministry of Industry, Thailand	250226-001-01	29 Mar 25	19 Mar 26
4	BOD Incubator	BIOCHEMICAL OXYGEN DEMAND	ANCO	UC-A-1201 / 1021	Technology Promotion Association (Thailand-Japan)	241W113	11 Jul 24	10 Jul 25
5	DO Meter	BIOCHEMICAL OXYGEN DEMAND	YSI	5100 / 118 01803	Technology Promotion Association (Thailand-Japan)	231709	18 Feb 25	16 Feb 26
6	Hydro Distillation Unit	TOTAL NITROGEN	FOGS	KTY 61905293	FOGS South East Asia	12875	5 Jul 24	4 Jul 25
7	pH Meter	pH	Enviroline	pH100A / J004744	Technology promotion association (Thailand-Japan)	25C1409	3 Apr 25	2 Apr 26

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



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: 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.: 24CH399
Page.: 1 of 3

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Horiba
Model : LAQUA-PH210
Serial No. : HAQA0007
ID No. : UAE.EFM.002/2569(EFM.pH.02/83)
Condition As-Received: Used Item
Received Date : 01 April 2024
Calibration Date : 02 April 2024
Reference : 2404-0037WSC-1
Submitted by : United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phraekhanong, Bangkok 10280

Ambient Temperature : $(25 \pm 2.5) ^\circ\text{C}$
Relative Humidity : $(50 \pm 15) \%$
Calibration Procedure : In-house method :
- CP-CH5 by direct measurement with DC voltage standard and direct measurement with certified reference material (CRM)
- CP-CH5 by comparison with temperature standard

Calibrated by : Warakorn Lemngsaktrakul

Approved by :

() Pornthipha Tameysakul
() Unnopphol Herachul
(✓) Sathip Meengmal

Issue Date : 06 April 2024

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม

A 0052139



Cert.No.: 24CH399
Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030048	130RC116	23E2602	27 Aug 2024
2) Ref. Standard Thermometer	4882054	110RC044	23I908	28 July 2024

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

- Technology Promotion Association (Thailand-Japan)

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

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	940102	27 Nov 2025
pH 6.866	CPA chem	940104	02 Nov 2024
pH 9.997	CPA chem	940106	02 Nov 2024

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

Calibration Results

Function : mV Measurement

Performing standard curve by Document Process Calibrator at pH (4.7)(7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement	Coverage factor
	pH	mV	mV	pH	($\pm\text{mV}$)	k
pH Meter S/N.: HAQA0007	4.00	177.48	177.5	4.01	0.058	2.00
	7.00	0.00	0.2	6.98	0.058	2.00
	7.00	0.00	0.2	6.98	0.058	2.00
	10.00	-177.48	-177.3	10.01	0.058	2.00

เอกสารไม่ควบคุม

a 1209881



Cert.No.: 24CH399
Page.: 3 of 3

Calibration Results

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4.7)(7,10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (\pm)	Coverage factor k
pH Electrode S/N.: Q92M0181	4.008	4.01	180.2	0.0079	2.00
	6.986	6.98	1.3	0.0069	2.00
	6.986	7.00	-0.9	0.0099	2.00
	9.997	10.00	-169.4	0.011	2.05

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe:

- Model : 9652-10D

- Serial No. : Q92M0181

Dimension of probe

- Length : 103 mm.

- Diameter : 16 mm.

- Immersion Depth : 90 mm.

Calibration Point ($^\circ\text{C}$)	Standard Temperature ($^\circ\text{C}$)	UUC* Reading ($^\circ\text{C}$)	Error ($^\circ\text{C}$)	Uncertainty of measurement ($\pm\text{ }^\circ\text{C}$)	Coverage factor k
25.0	25.002	25.0	-0.002	0.13	2.00
30.0	30.003	30.0	-0.003	0.13	2.00
35.0	35.003	35.0	-0.003	0.13	2.00

Remark : - UUC* = Unit Under Calibration

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

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เอกสารไม่ควบคุม

a 1209882



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 13, SUANLUANG, SUANLUANG BANGKOK 10250
TEL.0-2717-3000-29 FAX.0-2719-9484



Certificate of Calibration

Cert.No.: 24MM292
Page.: 1 of 3

Equipment : Electronic Balance
Manufacturer : Mettler Toledo
Model : AB204-S/FACT
Serial No. : 1129361010
ID No. : UAE.WA8.002/2552
Submitted by : United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phraekhanong, Bangkok 10280

Location : Balance Room (106)

Received Date : 11 May 2024

Calibration Date : 11 May 2024

Ambient Temperature : $15 ^\circ\text{C}$ to $40 ^\circ\text{C}$

Relative Humidity : 30 % to 90 %

Calibrated by : Khr Rutanaprapachai

Approved by :

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

Issue Date : 15 May 2024

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2405-0168OC-1

Cert.No.: 24MM292
Page: 2 of 3

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

Condition of this result of calibration

1. Reference standard instrument:-

Instruments	Model	Serial No.	ID No.	Test report No.	Due date
1) Standard Weight Set (E2)	15884	24053	70RC007	MM-0013-24	25 Jan 2026

- This certificate is valid only to the item calibrated on date and place of calibration.
- This result of calibration was made on requested at the point specified by customer.
- This certificate is not certified for any commercial transaction.
- 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 220 g **Resolution** 0.0001 g

Before Adjustment :

Applied Weight	Balance Reading	Correction	Measurement Uncertainty	Coverage Factor
(g)	(g)	(g)	(± mg)	(k)
100	100.0000	0.0000	0.19	2.03
200	200.0006	-0.0006	0.30	2

After Adjustment :

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

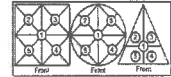
Applied Weight	Standard Deviation of Reading (g)
(g)	
100	0.00007
200	0.00005

เอกสารไม่ควบคุม



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2405-0168OC-1

Cert.No.: 24MM292
Page: 3 of 3



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	Position 2	Position 3	Position 4	Position 5	Maximum difference between off-center and central loading
(g)	(g)	(g)	(g)	(g)	(g)
-0.0004	-0.0004	-0.0003	-0.0003	-0.0004	0.0001

3. Departure from nominal value

Applied Weight	Balance Reading	Correction	Measurement Uncertainty	Coverage Factor
(g)	(g)	(g)	(± mg)	(k)
Unload	0.0000	0.0000	0.15	2.13
0.01	0.0100	0.0000	0.15	2.13
0.05	0.0500	0.0000	0.15	2.13
0.1	0.1000	0.0000	0.15	2.13
0.5	0.5000	0.0000	0.15	2.13
1	1.0000	0.0000	0.15	2.13
10	10.0000	0.0000	0.15	2.11
50	49.9999	+0.0001	0.17	2.06
100	99.9999	+0.0001	0.19	2.03
150	149.9998	+0.0002	0.29	2
200	199.9990	+0.0010	0.30	2

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

-00-

เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 2: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLIANG, SUANLIANG BANGKOK 10250
TEL.0-2717-3000-28 FAX.0-2719-9484

ISO-MRA



Certificate of Calibration

Cert. No.: 24TM1114
Page: 1 of 3

Equipment : BOD Incubator
Manufacturer : ARCO
Model : UC4-1320
Serial No. :
ID No. : UAE.WAO.018/2559
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phraekhanong,
Bangkok 10260
Location : Lab Floor 2
Received Order : 11 July 2024
Calibration Date : 11 July 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %

Calibrated by : Tawatchai Pama

Approved by :
() Ponpan Palpin
() Suwit Injal
() Kunthit Promprut

Issue Date : 14 July 2024

The Uncertainties are for a confidence probability of approximately 95%

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Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2407-0243OC-2

Cert. No.: 24TM1114
Page: 2 of 3

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

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY49023832	23LM122	TPA	26 Jul 2024

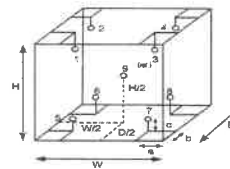
- This certificate is valid only to the item calibrated on date and place of calibration.
- This certification is traceable to the International System of Unit.

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

Result of Calibration : () Without Adjustment

Function of UUC* : Temperature Source
Fresh air setting : Not Available

Environment during calibration		
	Beginning	Finished
Temp. (°C)	26	29
REL.Humid. (%)	78	72
AC Supply (Volt)	233	234



Probe Installation Details :
a = 10 cm
b = 10 cm
c = 10 cm
Dimension of Chamber :
D = 0.82 m
W = 1.2 m
H = 1.2 m
Capacity = 0.89 m³

Position :	Ref. Std. ID No.:
1	20-16RTD-10
2	20-16RTD-02
3	20-16RTD-03
4	20-16RTD-04
5	20-16RTD-05
6	20-16RTD-06
7	20-16RTD-07
8	20-16RTD-08
9 (ref.)	22-16RTD-08

เอกสารไม่ควบคุม

Calibration Certificate

Certificate No.: 2402283-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udumuk 43, Sukhumvit Road,
Bangchack, Prakhong, Bangkok 10260

Page 1 of 4

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: XSR205DU

Serial No.: C099071872

ID No.: UAE.WAO.012/2563


Order No.: 2402283

Operation No.: 2402283-001

Date of Receipt: 2 April 2024

Date of Calibration: 2 April 2024

Calibrated by: Mr.Jerawut Prapwuttipong
Scientist

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

Date of Issue: 9 April 2024

The uncertainties are for a confidence probability of approximately 95%

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

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

8008 โทรสารศูนย์บริการ 35 หมายเลขศูนย์บริการ มาตรฐานและข้อมูลอาหาร **เอกสารไม่ควบคุม**
8008 Soi 35, Anur Admim Road, Bang Yai Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand
Tel: +66(0) 2-222 8588 Fax: +66(0) 2-222 8545

Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Resolution: 0.0001 g / 0.0001 g
Serial No.: C099071872
ID No.: UAE.WAO.012/2563
Capacity: 220 g

Page 2 of 4

Date of Calibration: 2 April 2024
Environment Condition: Ambient Temperature: 24.5 0.5 °C Relative Humidity: 47.5 2.5 %

Place of Calibration: Laboratory, UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-MA-001 In-House Method based on UKAS Lab 14 : 2019

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1mg to 200g	8505567572	TCS	M2040535	8 April 2024
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	608-H	NFI.BTH.01673	Quakey Rabben	GR24-0743	9 February 2025

3. This certificate is traceable to SI UNIT

4. This certificate is 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)
40	0.0000052
80	0.0000053
100	0.0000048
200	0.0000051

2. Off-Center Error:

A mass of 100 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)
	100.0002	100.0001	100.0002	99.9999	100.0001	100.0001	0.0002

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

8008 โทรสารศูนย์บริการ 35 หมายเลขศูนย์บริการ มาตรฐานและข้อมูลอาหาร **เอกสารไม่ควบคุม**
8008 Soi 35, Anur Admim Road, Bang Yai Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand
Tel: +66(0) 2-222 8588 Fax: +66(0) 2-222 8545

Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Resolution: 0.0001 g / 0.0001 g
Serial No.: C099071872
ID No.: UAE.WAO.012/2563
Capacity: 220 g

Page 3 of 4

Date of Calibration: 2 April 2024

Calibration Results: (Continued)

Calibration Range: 0 - 80 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 0 - 80 g; Resolution: 0.00001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (g)	Coverage Factor
Unloaded	0.000000	0.000000	0.000000	0.00000008	2.00
0.001	0.0010003	0.001001	-0.000001	0.00000091	2.00
0.005	0.0050002	0.005000	0.000000	0.00000094	2.00
0.01	0.0100003	0.010000	0.000000	0.00000091	2.00
0.05	0.0500006	0.050000	0.000000	0.00000098	2.00
0.1	0.1000011	0.100000	0.000001	0.0000011	2.00
0.5	0.5000016	0.500001	0.000000	0.0000014	2.00
1	1.0000023	1.000002	-0.000002	0.0000016	2.00
2	2.0000023	2.000002	0.000000	0.0000017	2.00
5	5.0000017	5.000002	0.000000	0.0000020	2.00
10	10.0000009	10.000000	0.000000	0.0000026	2.00
20	20.0000031	20.000002	0.000001	0.0000037	2.00
30	30.0000040	30.000003	0.000001	0.0000052	2.00
50	50.0000028	50.000004	-0.000001	0.0000069	2.00
80	80.0000069	80.000005	0.000002	0.000011	2.00

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

8008 โทรสารศูนย์บริการ 35 หมายเลขศูนย์บริการ มาตรฐานและข้อมูลอาหาร **เอกสารไม่ควบคุม**
8008 Soi 35, Anur Admim Road, Bang Yai Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand
Tel: +66(0) 2-222 8588 Fax: +66(0) 2-222 8545

Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Resolution: 0.0001 g / 0.0001 g
Serial No.: C099071872
ID No.: UAE.WAO.012/2563
Capacity: 220 g

Page 4 of 4

Date of Calibration: 2 April 2024

Calibration Results: (Continued)

Calibration Range: 81 - 200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 81 - 200 g; Resolution: 0.0001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (g)	Coverage Factor
95	95.000012	95.000000	0.000012	0.000015	2.00
100	100.000006	100.000000	0.000006	0.000015	2.00
110	110.000007	110.000001	0.000006	0.000017	2.00
120	120.000009	120.000000	0.000009	0.000018	2.00
130	130.000010	130.000000	0.000010	0.000019	2.00
140	140.000014	140.000000	0.000014	0.000020	2.00
150	150.000009	150.000001	0.000008	0.000020	2.00
160	160.000010	160.000001	0.000009	0.000022	2.00
170	170.000012	170.000001	0.000011	0.000023	2.00
180	200.000016	200.000000	0.000016	0.000028	2.00

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

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

8008 โทรสารศูนย์บริการ 35 หมายเลขศูนย์บริการ มาตรฐานและข้อมูลอาหาร **เอกสารไม่ควบคุม**
8008 Soi 35, Anur Admim Road, Bang Yai Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand
Tel: +66(0) 2-222 8588 Fax: +66(0) 2-222 8545



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



Cert.No.: 24CH399
Page.: 1 of 3

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Horiba
Model : LAQUA-PH210
Serial No. : HADA0007
ID No. : UAE.EFM.002/2568(EFM.pH.02/63)
Condition As-Received: Used item
Received Date : 01 April 2024
Calibration Date : 02 April 2024
Reference : 2404-0037WSC-1
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Sol Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260

Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In - house method :
- CP-CH5 by direct measurement with DC voltage
standard and direct measurement with
certified reference material (CRM)
- CP-CH8 by comparison with temperature standard

Calibrated by : Warakorn Lermagatrakul

Approved by :

() Pornthippa Tameyakul
() Unnopphol Harsachal
(✓) Sathip Meangmal

Issue Date : 08 April 2024

The Uncertainties are for a confidence probability of approximately 95%

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

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A 0062139



Cert.No.: 24CH399
Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030049	130RC116	23E2802	27 Aug 2024
2) Ref. Standard Thermometer	4962054	110RC044	23B05	28 July 2024

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

- Technology Promotion Association (Thailand-Japan)

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

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	940102	27 Nov 2025
pH 6.866	CPA chem	940104	02 Nov 2024
pH 9.997	CPA chem	940106	02 Nov 2024

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

Calibration Results

Function : mV Measurement

Performing standard curve by Document Process Calibrator at pH (4.7)(7.10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (± mV)	Coverage factor k
			mV	pH		
pH Meter S/N.: HADA0007	4.00	177.48	177.5	4.01	0.058	2.00
	7.00	0.00	0.2	6.98	0.058	2.00
	7.00	0.00	0.2	6.98	0.058	2.00
	10.00	-177.48	-177.3	10.01	0.058	2.00

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a 1209881



Cert.No.: 24CH399
Page.: 3 of 3

Calibration Results

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4.7)(7.10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (±)	Coverage factor k
pH Electrode S/N.: Q82M0181	4.008	4.01	180.2	0.0079	2.00
	6.986	6.98	1.3	0.0069	2.00
	6.986	7.00	-0.9	0.0069	2.00
	8.997	10.00	-189.4	0.011	2.05

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : 9662-10D

- Serial No. : Q82M0181

Dimension of probe

- Length : 103 mm.

- Diameter : 16 mm.

- Immersion Depth : 90 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor k
25.0	25.002	25.0	-0.002	0.13	2.00
30.0	30.003	30.0	-0.003	0.13	2.00
35.0	35.003	35.0	-0.003	0.13	2.00

Remark : - UUC* = Unit Under Calibration

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

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เอกสารไม่ควบคุม

a 1209882



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



Certificate of Calibration

Cert.No.: 24MM292
Page.: 1 of 3

Equipment : Electronic Balance
Manufacturer : Mettler Toledo
Model : AB204-S/FACT
Serial No. : 1129391010
ID No. : UAE.WAS.002/2552
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Sol Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260

Location : Balance Room (108)

Received order : 11 May 2024

Calibration Date : 11 May 2024

Ambient Temperature : 15 °C to 40 °C

Relative Humidity : 30 % to 90 %

Calibrated by : Khit Rutanaprapachai

Approved by : Khit Rutanaprapachai
Approved Signatory

() Ponpan Palpim
() Suwit Imjai
(✓) Khitrit Prompratt

Issue Date : 15 May 2024

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2405-0166OC-1
Procedure used :-

Cert.No.: 24MM292
Page: 2 of 3

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

Condition of this result of calibration

1. Reference standard instrument:-

Instruments Model Serial No. ID No. Test report No. Due date
1) Standard Weight Set (E2) 15884 24053 70RC007 MM-0013-24 25 Jan 2026

- This certificate is valid only to the item calibrated on date and place of calibration.
- This result of calibration was made on requested at the point specified by customer.
- This certificate is not certified for any commercial transaction.
- 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 220 g Resolution 0.0001 g

Before Adjustment :

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (± mg)	Coverage Factor (k)
100	100.0000	0.0000	0.19	2.03
200	200.0006	-0.0006	0.30	2

After Adjustment :

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

Applied Weight (g)	Standard Deviation of Reading (g)
100	0.00007
200	0.00005

เอกสารไม่ควบคุม



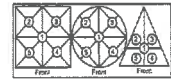
Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2405-0166OC-1

Cert.No.: 24MM292
Page: 3 of 3

Result of calibration

2. Effect of off center loading

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



Position 1 (g)	Position 2 (g)	Position 3 (g)	Position 4 (g)	Position 5 (g)	Maximum difference between off-center and central loading (g)
-0.0004	-0.0004	-0.0003	-0.0003	-0.0004	0.0001

3. Departure from nominal value

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (± mg)	Coverage Factor (k)
Unload	0.0000	0.0000	0.15	2.13
0.01	0.0100	0.0000	0.15	2.13
0.05	0.0500	0.0000	0.15	2.13
0.1	0.1000	0.0000	0.15	2.13
0.5	0.5000	0.0000	0.15	2.13
1	1.0000	0.0000	0.15	2.13
10	10.0000	0.0000	0.15	2.11
50	48.9999	+0.0001	0.17	2.06
100	99.9999	+0.0001	0.19	2.03
150	148.9998	+0.0002	0.29	2
200	199.9990	+0.0010	0.30	2

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

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เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
53/44 PAKHANAKARN ROAD 5TH FL. BANGKOK 10110, THAILAND BANGKOK 10110
TEL: 0-2111-9000-25 FAX: 0-2111-9000-26



Cert. No.: 24TM589
Page : 1 of 3

Certificate of Calibration

Equipment : Hot Air Oven
Manufacturer : Memmert
Model : UF 55
Serial No. : B212.0411
ID No. : UAE.WAO.005/2556
Submitted by : United Analyst and Engineering Consultant Co., Ltd.
3 Sol Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Lab Floor 2
Received Order : 01 April 2024
Calibration Date : 01 - 02 April 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Krisda Malee
Approved by :
() Ponpan Palpim
(✓) Suwit Imjai
() Kunthit Promprat

Issue Date : 5 April 2024

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม
A 0065065



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2404-0004OC-3
Procedure Used :-

Cert. No.: 24TM589
Page : 2 of 3

Calibration were conducted using calibration procedure CP-OT02 based on TLAAS G-20 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD) and Thermocouple Type T.

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

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

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

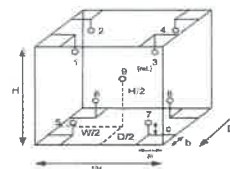
This certification is traceable to the International System of Unit.

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

Result of Calibration :- (*) Without Adjustment

Function of IUUC : Temperature Source

Fresh air setting : Close



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 = 0.75 m
Capacity = 0.30 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	27	26
REL.Humid. (%)	47	48
AC Supply (Volt)	221	220

Ref. Std. ID No.: @ Calibration Point		
Position :	(120 to 180) °C	(104) °C
1	21-18TC-01	22-18RTD-2/1
2	21-18TC-02	18RTD-2/2
3	21-18TC-03	18RTD-2/3
4	21-18TC-04	18RTD-2/4
5	21-18TC-05	18RTD-2/5
6	21-18TC-06	18RTD-2/6
7	21-18TC-07	18RTD-2/7
8	21-18TC-08	18RTD-2/8
9 (ref)	21-18TC-09	18RTD-2/9

เอกสารไม่ควบคุม
a 1209739



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2404-0004OC-3
Result of Calibration :- (°) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 24TM589
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
104.0	104.0	104.0	0.032	0.47	0.54	2
120.0	120.0	120.0	0.12	0.72	1.3	2
180.0	180.0	180.0	0.13	1.2	1.5	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	Position									
	1	2	3	4	5	6	7	8	9 (ref.)	
104.0	104.484	103.847	104.226	104.232	104.106	103.691	104.275	104.127	104.013	0.42
120.0	120.486	120.089	120.635	120.596	119.531	119.644	120.364	120.144	120.158	1.1
180.0	180.574	179.769	180.285	180.670	179.594	179.790	180.287	179.961	179.802	1.1

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 1209738



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



Certificate of Calibration

Cert. No.: 24TM1114
Page : 1 of 3

Equipment : BOD Incubator

Manufacturer : ARCO

Model : UCA-1320

Serial No. : -

ID No. : UAE.WAO.018/2559

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

Location : Lab Floor 2

Received Order : 11 July 2024

Calibration Date : 11 July 2024

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Tawatchai Pama

Approved by :

() Porpan Palpin
(✓) Suwit Imjai
() Kunchit Promprat

Approved Signatory

Issue Date : 14 July 2024

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2407-0243OC-2

Cert. No.: 24TM1114
Page : 2 of 3

Procedure Used :-

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

Condition of this result of calibration

1. Reference standard Instrument:-

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

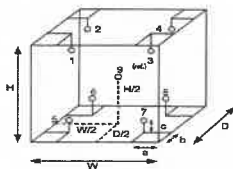
2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This certification is traceable to the International System of Unit.

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

Result of Calibration :- (°) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available



Probe Installation Details :

Dimension of Chamber :
a = 10 cm
b = 10 cm
c = 10 cm
D = 0.82 m
W = 1.2 m
H = 1.2 m
Capacity = 0.88 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	29	29
REL.Humid. (%)	78	72
AC Supply (Volt)	233	234

Position :	Ref. Std. ID No.:
1	20-18RTD-10
2	20-16RTD-02
3	20-16RTD-03
4	23-16RTD-04
5	22-16RTD-05
6	20-18RTD-06
7	20-18RTD-07
8	22-18RTD-08
9 (ref.)	22-19RTD-09

-oOo-

เอกสารไม่ควบคุม



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2407-0243OC-2
Result of Calibration :- (°) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Not Available

Cert. No.: 24TM1114
Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
20.0	20.0	19.9	0.29	0.81	1.2	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (±°C)
	Position									
	1	2	3	4	5	6	7	8	9 (ref.)	
20.0	20.361	18.640	20.312	20.079	19.908	19.872	19.955	19.818	19.758	0.48

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 %.

-oOo-

เอกสารไม่ควบคุม



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



Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C069071872
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g / 0.0001 g
ID No.: UAE.WAO.010/2563

Date of Calibration: 2 April 2024 Page 4 of 4

Calibration Results: (Continued)

Calibration Range: 81 - 200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 81 - 200 g; Resolution: 0.0001 g)

Nominal Value	Standard Value	Average Reading	Correction	Uncertainty	Coverage Factor
80	80.00010	80.0000	0.0001	0.00015	2.00
100	100.00006	100.0000	0.0001	0.00015	2.00
110	110.00007	110.0001	0.0000	0.00017	2.00
120	120.00009	120.0000	0.0001	0.00018	2.00
130	130.00010	130.0000	0.0001	0.00019	2.00
140	140.00014	140.0000	0.0001	0.00020	2.00
150	150.00009	150.0001	0.0000	0.00020	2.00
160	160.00010	160.0001	0.0000	0.00022	2.00
170	170.00012	170.0001	0.0000	0.00022	2.00
200	200.00016	200.0000	0.0002	0.00028	2.00

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

----- End -----

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



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



Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C210685394
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g / 0.0001 g
ID No.: UAE.WAO.010/2565

Date of Calibration: 2 April 2024 Page 2 of 4

Environment Condition: Ambient Temperature: 24.5 ± 0.5 °C Relative Humidity: 47.5 ± 2.5 %

Place of Calibration: Laboratory, UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-HA-001 In-House Method based on UKAS LAB 14 : 2019

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1mg to 200g	B025567572	TCS	M03040535	8 April 2024
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	608-H1	NFI.BTH.016/23	Quality Reborn	QK04-0343	9 February 2025

3. This certification is traceable to SI UNIT

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

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

Calibration Results:

1. Repeatability of Reading:

Nominal Value	Standard Deviation of Reading
40	0.000042
80	0.000052
100	0.000048
200	0.000048

2. Off-Center Error:

A mass of 100 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)
100.0000	100.0001	99.9999	99.9999	100.0000	100.0000	0.0001

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



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



Calibration Certificate

Certificate No.: 2402283-002-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 SOI UDOMSUK 41, SUKHUMVIT ROAD,
Bangchack, Praekhanong, Bangkok 10260

Page 1 of 4

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: XSR205DU

Serial No.: C210685394

ID No.: UAE.WAO.010/2565

Order No.: 2402283

Operation No.: 2402283-002

Date of Receipt: 2 April 2024

Date of Calibration: 2 April 2024

Calibrated by Mr.Jerawut Prapawattipong
Scientist

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

Date of Issue: 9 April 2024

The uncertainties are for a confidence probability of approximately 95%

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

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



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



Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C210685394
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g / 0.0001 g
ID No.: UAE.WAO.010/2565

Date of Calibration: 2 April 2024 Page 3 of 4

Calibration Results: (Continued)

Calibration Range: 0 - 80 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 0 - 80 g; Resolution: 0.00001 g)

Nominal Value	Standard Value	Average Reading	Correction	Uncertainty	Coverage Factor
Unloaded	0.000000	0.000000	0.000000	0.0000066	2.00
0.001	0.001003	0.001010	-0.000007	0.0000069	2.00
0.005	0.0050003	0.0050000	0.0000003	0.0000062	2.00
0.01	0.0100003	0.0100000	0.0000003	0.0000069	2.00
0.05	0.0500009	0.0500000	0.0000009	0.0000056	2.00
0.1	0.1000011	0.1000000	0.0000011	0.0000051	2.00
0.5	0.5000016	0.5000001	0.0000015	0.0000054	2.00
1	1.0000003	1.0000000	0.0000003	0.0000056	2.00
2	2.0000023	2.0000001	0.0000022	0.0000051	2.00
5	5.0000017	5.0000000	0.0000017	0.0000029	2.00
10	10.0000009	10.0000000	0.0000009	0.0000026	2.00
20	20.0000031	20.0000000	0.0000031	0.0000037	2.00
30	30.0000040	30.0000000	0.0000040	0.0000030	2.00
50	50.0000018	50.0000000	0.0000018	0.0000038	2.00
80	80.0000068	80.0000000	0.0000068	0.0000051	2.00

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



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



Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR204
Resolution: 0.0001 g / 0.0001 g
Serial No.: C21068594
ID No.: UAE WAO.012/2564
Capacity: 220 g

Date of Calibration: 1 April 2024 Page 4 of 4

Calibration Results: (Continued)

Calibration Range: 81 - 200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 81 - 200 g; Resolution: 0.0001 g)

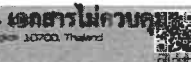
Nominal Value	Standard Value	Average Reading	Correction	Uncertainty	Coverage Factor
90	90.00010	90.0001	0.0000	0.00015	2.00
100	100.00008	100.0001	0.0000	0.00015	2.00
110	110.00007	110.0001	0.0000	0.00015	2.00
120	120.00005	120.0000	0.0001	0.00017	2.00
130	130.00010	130.0000	0.0001	0.00019	2.00
140	140.00011	140.0000	0.0001	0.00020	2.00
150	150.00009	150.0001	0.0000	0.00020	2.00
160	160.00010	160.0001	0.0000	0.00022	2.00
170	170.00012	170.0001	0.0000	0.00023	2.00
200	200.00016	200.0002	0.0000	0.00028	2.00

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

----- End -----

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

2008 ถนนสุขุมวิท 36 แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110
2008 So 36, Anuram Road, Bang 11, Klong Toey District, Bangkok 10110, Thailand
T: +66(0) 246 8888 F: +66(0) 246 8885



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
53/44 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL.0-2717-3000-29 FAX.0-2719 9484



Certificate of Calibration

Cert.No.: 24MM293
Page: 1 of 3

Equipment: Electronic Balance
Manufacturer: Mettler Toledo
Model: XSR204
Serial No.: C117635043
ID No.: UAE_WAS.012/2564
Submitted by: United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260

Location: Balance Room (10B)

Received order: 11 May 2024
Calibration Date: 11 May 2024
Ambient Temperature: 15 °C to 40 °C
Relative Humidity: 30 % to 90 %

Calibrated by: Khit Rutanasapreapachai

Approved by:

() Ponpan Palpim
() Suwit Imjai
(✓) Kunchit Promprut

Issue Date: 15 May 2024

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

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Equipment: Electronic Balance
Condition As-Received: Used Item
Reference: 2405-0168OC-2

Cert.No.: 24MM293
Page: 2 of 3

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

Condition of this result of calibration

1. Reference standard instruments:-

Instruments Model Serial No. ID No. Test report No. Due date
1) Standard Weight Set (E2) 15884 24053 70RC007 MM-0019-24 25 Jan 2026

2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This result of calibration was made on request 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 220 g Resolution 0.0001 g

Before Adjustment:

Applied Weight	Balance Reading	Correction	Measurement Uncertainty	Coverage Factor
(g)	(g)	(g)	(± mg)	(k)
100	100.0000	0.0000	0.27	2.03
200	200.0001	-0.0001	0.31	2

After Adjustment:

1. Determination of the standard deviation of weighing machine (n = 3)

Applied Weight	Standard Deviation of Reading (g)
(g)	
100	0.00007
200	0.00007



Equipment: Electronic Balance
Condition As-Received: Used Item
Reference: 2405-0168OC-2

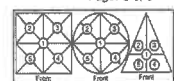
Cert.No.: 24MM293
Page: 3 of 3

Result of calibration

2. Effect of off center loading

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

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



Maximum difference between off-center and central loading (g) 0.0003

3. Departure from nominal value

Applied Weight	Balance Reading	Correction	Measurement Uncertainty	Coverage Factor
(g)	(g)	(g)	(± mg)	(k)
Unloaded	0.0000	0.0000	0.15	2.13
5	5.0000	0.0000	0.15	2.13
10	10.0000	0.0000	0.15	2.11
20	20.0000	-0.0000	0.19	2.03
50	50.0001	-0.0001	0.19	2.06
60	60.0001	-0.0001	0.19	2.04
80	80.0001	-0.0001	0.27	2
100	100.0002	-0.0002	0.27	2.03
120	120.0001	-0.0001	0.29	2
200	200.0001	-0.0001	0.31	2

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

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เอกสารไม่ควบคุม

เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-25 FAX. 0-2719-9484



Cert.No.: 24CH398
Page.: 1 of 3

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Horiba
Model : LAQUA-PH210
Serial No. : HADA0007
ID No. : UAE.FM.002/2563(EFM.pH.02/63)
Condition As-Received: Used Item
Received Date : 01 April 2024
Calibration Date : 02 April 2024
Reference : 2404-0037WSC-1
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Sol Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260

Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In-house method :
- CP-CH5 by direct measurement with DC voltage standard and direct measurement with certified reference material (CRM)
- CP-CHB by comparison with temperature standard

Calibrated by : Warakorn Lemgagtrakul

Approved by :

Approved Signatory

() Ponthippa Tameyakul
() Unnopphol Harschal
(✓) Sathip Meangmai

Issue Date : 06 April 2024

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม

A 0062139



Cert.No.: 24CH399
Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030049	130RC116	23E2802	27 Aug 2024
2) Ref. Standard Thermometer	4982054	110RC044	23B08	26 July 2024

This certification is traceable to the International System of Unit maintained through:-
- Technology Promotion Association (Thailand-Japan)

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

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	940102	27 Nov 2025
pH 6.886	CPA chem	940104	02 Nov 2024
pH 9.997	CPA chem	940106	02 Nov 2024

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

Calibration Results

Function : mV Measurement

Performing standard curve by Document Process Calibrator at pH (4,7)(7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (mV)	Coverage factor k
			mV	pH		
pH Meter S/N.: HADA0007	4.00	177.48	177.5	4.01	0.058	2.00
	7.00	0.00	0.2	6.98	0.058	2.00
	7.00	0.00	0.2	6.98	0.058	2.00
	10.00	-177.48	-177.3	10.01	0.058	2.00

เอกสารไม่ควบคุม

a 1209881



Cert.No.: 24CH399
Page.: 3 of 3

Calibration Results

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4,7)(7,10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (±)	Coverage factor k
pH Electrode S/N.: Q82M0181	4.008	4.01	180.2	0.0079	2.00
	6.886	6.98	1.3	0.0069	2.00
	6.886	7.00	-0.9	0.0069	2.00
	9.997	10.00	-189.4	0.011	2.05

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : 9652-100

- Serial No. : Q82M0181

Dimension of probe

- Length : 103 mm.

- Diameter : 16 mm.

- Immersion Depth : 80 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor k
25.0	25.002	25.0	-0.002	0.13	2.00
30.0	30.003	30.0	-0.003	0.13	2.00
35.0	35.003	35.0	-0.003	0.13	2.00

Remark : - UUC* = Unit Under Calibration

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

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เอกสารไม่ควบคุม

a 1209882



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-25 FAX. 0-2719-9484



Certificate of Calibration

Cert.No.: 24MM292
Page.: 1 of 3

Equipment : Electronic Balance
Manufacturer : Mettler Toledo
Model : AB204-SiFACT
Serial No. : 1128381010
ID No. : UAE.WAS.002/2552
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Sol Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260

Location : Balance Room (108)

Received order : 11 May 2024

Calibration Date : 11 May 2024

Ambient Temperature : 15 °C to 40 °C

Relative Humidity : 30 % to 99 %

Calibrated by : Khil Rutanaprapachai

Approved by :

Approved Signatory

() Ponpan Paipim

() Suwit Imjai

(✓) Kunchit Promprat

Issue Date : 15 May 2024

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2405-0186OC-1
Procedure used :-

Cert.No.: 24MM262
Page: 2 of 3

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

Condition of this result of calibration

1. Reference standard instruments:-

Instruments	Model	Serial No.	ID No.	Test report No.	Due date
1) Standard Weight Set (E2)	15694	24053	70R0007	MM-0013-24	25 Jan 2026

- This certificate is valid only to the item calibrated on date and place of calibration.
- This result of calibration was made on requested at the point specified by customer.
- This certificate is not certified for any commercial transaction.
- 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 220 g Resolution 0.0001 g

Before Adjustment :

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (± mg)	Coverage Factor
100	100.0000	0.0000	0.19	2.03
200	200.0006	-0.0006	0.30	2

After Adjustment :

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

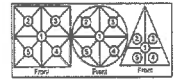
Applied Weight (g)	Standard Deviation of Reading (g)
100	0.00007
200	0.00005

เอกสารไม่ควบคุม



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2405-0186OC-1

Cert.No.: 24MM262
Page: 3 of 3



2. Effect of off center loading

A mass of 100 g was placed in 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)
-0.0004	-0.0004	-0.0003	-0.0003	-0.0004	0.0001

3. Departure from nominal value

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (± mg)	Coverage Factor
Unloaded	0.0000	0.0000	0.15	2.13
0.01	0.0100	0.0000	0.15	2.13
0.05	0.0500	0.0000	0.15	2.13
0.1	0.1000	0.0000	0.15	2.13
0.5	0.5000	0.0000	0.15	2.13
1	1.0000	0.0000	0.15	2.13
10	10.0000	0.0000	0.15	2.11
50	49.9999	+0.0001	0.17	2.06
100	99.9999	+0.0001	0.19	2.03
150	149.9998	+0.0002	0.29	2
200	199.9990	+0.0010	0.30	2

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

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เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
3144 PATTANASARAK ROAD SOI 11, PHAN LING, SAMUEUNG BANGKOK 10130
TEL: 0-2115-2800-29 FAX: 0-2709-4684



Cert. No.: 24TM589
Page : 1 of 3

Certificate of Calibration

Equipment : Hot Air Oven
Manufacturer : Memmert
Model : UF 55
Serial No. : B212.0411
ID No. : UAE.WAO.0052556
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 : 01 April 2024
Calibration Date : 01 - 02 April 2024
Ambient Temperature : (25 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Krida Malee
Approved by :
() Pongpan Palpin
(✓) Suwit Imjai
() Kunchit Promprat

Issue Date : 5 April 2024

The Uncertainties are for a confidence probability of approximately 95 %

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

เอกสารไม่ควบคุม
A 0055065



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2404-0004OC-3
Procedure Used :-

Cert. No.: 24TM589
Page : 2 of 3

Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD) and Thermocouple Type T.

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY57013711	Z3LM115	TPA	11 Jul 2024

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

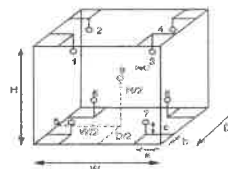
3. This certification is traceable to the International System of Unit.

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

Result of Calibration : () Without Adjustment

Function of UUC : Temperature Source

Fresh air setting : Close



Probe Installation Details :	Dimension of Chamber :
a = 5.0 cm	b = 0.50 m
b = 5.0 cm	W = 0.80 m
c = 5.0 cm	H = 0.75 m
	Capacity = 0.30 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	27	28
REL.Humid. (%)	47	48
AC Supply (Volt)	221	220

Ref. Std. ID No.: 02 Calibration Point		
Position :	(120 to 180) °C	(104) °C
1	21-18TC-01	22-18RTD-2/1
2	21-18TC-02	18RTD-2/2
3	21-18TC-03	18RTD-2/3
4	21-18TC-04	18RTD-2/4
5	21-18TC-05	18RTD-2/5
6	21-18TC-06	18RTD-2/6
7	21-18TC-07	18RTD-2/7
8	21-18TC-08	18RTD-2/8
9 (ref.)	21-18TC-09	18RTD-2/9

เอกสารไม่ควบคุม
a 1209739



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2404-0004OC-3
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 24TM589
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
104.0	104.0	104.0	0.032	0.47	0.84	2
120.0	120.0	120.0	0.12	0.72	1.3	2
180.0	180.0	180.0	0.13	1.2	1.5	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (±°C)
	Position									
	1	2	3	4	5	6	7	8	9 (ref.)	
104.0	104.484	103.847	104.226	104.232	104.106	103.691	104.275	104.127	104.013	0.42
120.0	120.486	120.089	120.635	120.596	119.531	119.644	120.364	120.144	120.158	1.1
180.0	180.574	179.769	180.285	180.670	179.594	179.790	180.287	179.961	179.802	1.1

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 1209738



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
5344 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL.0-2717-3900-28 FAX.0-2718-9484



Certificate of Calibration

Cert. No.: 24TM1114
Page : 1 of 3

Equipment : BOD Incubator

Manufacturer : ARCO

Model : UC4-1320

Serial No. : -

ID No. : UAE.WAO.018/2559

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

Location : Lab Floor 2

Received Order : 11 July 2024

Calibration Date : 11 July 2024

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Tawatchai Pama

Approved by :

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

Issue Date : 14 July 2024

The Uncertainties are for a confidence probability of approximately 95%

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เอกสารไม่ควบคุม



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2407-0243OC-2

Cert. No.: 24TM1114
Page : 2 of 3

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

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY48023932	23LM122	TPA	26 Jul 2024

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

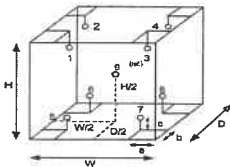
3. This certification is traceable to the International System of Unit.

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

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available



Probe Installation Details : Dimension of Chamber :
a = 10 cm D = 0.82 m
b = 10 cm W = 1.2 m
c = 10 cm H = 1.2 m
Capacity = 0.89 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	29	29
REL.Humid. (%)	78	72
AC Supply (Volt)	233	234

Position :	Ref. Std. ID No.:
1	20-18RTD-10
2	20-18RTD-02
3	20-18RTD-03
4	23-18RTD-04
5	22-18RTD-05
6	20-18RTD-06
7	20-18RTD-07
8	22-18RTD-08
9 (ref.)	22-18RTD-09

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เอกสารไม่ควบคุม



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2407-0243OC-2
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Not Available

Cert. No.: 24TM1114
Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
20.0	20.0	19.9	0.29	0.81	1.2	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (±°C)
	Position									
	1	2	3	4	5	6	7	8	9 (ref.)	
20.0	20.381	19.640	20.312	20.079	19.908	19.872	19.955	19.818	19.758	0.48

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



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



Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Resolution: 0.0001 g / 0.0001 g
Serial No.: C210685394
ID No.: UAE.WAO.010/2565
Capacity: 220 g

Date of Calibration: 2 April 2024 Page 4 of 4

Calibration Results: (Continued)

Calibration Range: 51 - 200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 81 - 200 g; Resolution: 0.0001 g)

Nominal Value	Standard Value	Average Reading	Correction	Uncertainty	Coverage Factor
90	90.00010	90.0000	0.0001	0.00013	2.00
100	100.00005	100.0000	0.0001	0.00015	2.00
110	110.00007	110.0001	0.0000	0.00017	2.00
120	120.00009	120.0000	0.0001	0.00019	2.00
130	130.00010	130.0000	0.0001	0.00019	2.00
140	140.00014	140.0000	0.0001	0.00020	2.00
150	150.00009	150.0001	0.0000	0.00020	2.00
160	160.00010	160.0001	0.0000	0.00022	2.00
170	170.00012	170.0001	0.0000	0.00023	2.00
200	200.00016	200.0000	0.0002	0.00028	2.00

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

End

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



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



Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Resolution: 0.0001 g / 0.0001 g
Serial No.: C210685394
ID No.: UAE.WAO.010/2565
Capacity: 220 g

Date of Calibration: 2 April 2024 Page 2 of 4

Environment Condition: Ambient Temperature: 24.5 ± 0.5 °C; Relative Humidity: 47.5 ± 2.5 %

Place of Calibration: Laboratory, UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-HA-001 In-House Method based on UKAS Lab 14 : 2019

2. Reference Standard:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1mg to 200g	B055567572	TCS	M23640535	8 April 2024
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	608-H1	NFI.6TH.016/23	Quality Reborn	QR24-0343	9 February 2025

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:

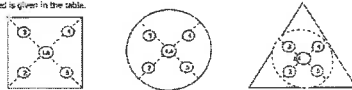
1. Repeatability of Reading:

Nominal Value	Standard Deviation of Reading
40	0.000042
90	0.000052
100	0.000048
200	0.000048

2. Off-Center Error:

A mass of 100 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)
100.0000	100.0001	99.9999	99.9999	100.0001	100.0000	0.0001

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



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



Calibration Certificate

Certificate No.: 2402283-002-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 SOI UDOMSUK 43, SUKHUMVIT ROAD, Bangkok, Prakhong, Bangkok 10260

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: XSR205DU

Serial No.: C210685394

ID No.: UAE.WAO.010/2565

Order No.: 2402283

Operation No.: 2402283-002

Date of Receipt: 2 April 2024

Date of Calibration: 2 April 2024

Calibrated by Mr.Jerawut Prapawuttipong
Scientist

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

Date of Issue: 9 April 2024

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: 20-04-65



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



Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Resolution: 0.0001 g / 0.0001 g
Serial No.: C210685394
ID No.: UAE.WAO.010/2565
Capacity: 220 g

Date of Calibration: 2 April 2024 Page 3 of 4

Calibration Results: (Continued)

Calibration Range: 0 - 80 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 0 - 80 g; Resolution: 0.0001 g)

Nominal Value	Standard Value	Average Reading	Correction	Uncertainty	Coverage Factor
Unloaded	0.00000	0.00000	0.00000	0.0000086	2.00
0.001	0.001002	0.001001	-0.000001	0.0000089	2.00
0.005	0.005003	0.005000	-0.000003	0.0000092	2.00
0.01	0.010003	0.010000	-0.000003	0.0000099	2.00
0.05	0.050005	0.050000	-0.000005	0.0000095	2.00
0.1	0.100011	0.100000	-0.000011	0.000011	2.00
0.5	0.500016	0.500001	-0.000015	0.000014	2.00
1	1.000003	1.000002	-0.000001	0.000016	2.00
2	2.000023	2.000001	-0.000022	0.000017	2.00
5	5.000017	5.000000	-0.000017	0.000026	2.00
10	10.000009	10.000000	-0.000009	0.000026	2.00
20	20.000031	20.000000	-0.000031	0.000037	2.00
30	30.000040	30.000001	-0.000039	0.000050	2.00
50	50.000028	50.000000	-0.000028	0.000068	2.00
80	80.000068	80.000002	-0.000066	0.00011	2.00

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



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



Calibration Report

Certificate No.: 2402283-002-01

Equipment:

Electric Balance

Manufacturer: METTLER TOLEDO

Model: PS205DU

Resolution: 0.0001 g / 0.001 g

Serial No.: C21685394

ID No.: UAE.WAO.0187555

Capacity: 220 g

Date of Calibration: 7 April 2024

Page 4 of 4

Calibration Results: (Continued)

Calibration Range: 81 - 200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 81 - 200 g; Resolution: 0.0001 g)

Nominal Value	Standard Value	Average Reading	Correction	Uncertainty	Coverage Factor
90	90.00010	90.0001	0.0000	0.00015	2.00
100	100.00005	100.0001	0.0000	0.00015	2.00
110	110.00007	110.0001	0.0000	0.00016	2.00
120	120.00009	120.0000	0.0001	0.00017	2.00
130	130.00010	130.0000	0.0001	0.00019	2.00
140	140.00014	140.0000	0.0001	0.00020	2.00
150	150.00009	150.0001	0.0000	0.00020	2.00
160	160.00010	160.0001	0.0000	0.00022	2.00
170	170.00012	170.0001	0.0000	0.00023	2.00
200	200.00016	200.0002	0.0000	0.00026	2.00

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

----- End -----

FCS-012 Revision: 01 Date: 29-04-65

2008 ปีงบประมาณ 35 หน่วยงานส่งเสริมและพัฒนาอุตสาหกรรม มูลนิธิส่งเสริมและพัฒนาอุตสาหกรรม
2008 ปี 35 มูลนิธิส่งเสริมและพัฒนาอุตสาหกรรม มูลนิธิส่งเสริมและพัฒนาอุตสาหกรรม มูลนิธิส่งเสริมและพัฒนาอุตสาหกรรม
Tel : +66(0) 2-262 8635 Fax : +66(0) 2-262 8345



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
5944 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL.0-2717-3900-29 FAX.0-2715-9484



Certificate of Calibration

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

Equipment : BOD Incubator

Manufacturer : ARCO

Model : UC4-1320

Serial No. :

ID No. : UAE.WAO.002/2550

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

Location : Lab Floor 2

Received Order : 11 July 2024

Calibration Date : 11 July 2024

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Tawatchai Pama

Approved by :

Approved Signatory

() Porpan Palpin

(✓) Suwit Imjai

() Kunchit Promprat

Issue Date : 14 July 2024

The Uncertainties are for a confidence probability of approximately 95 %

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

เอกสารไม่ควบคุม



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

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

Procedure Used :-

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

Condition of this result of calibration

1. Reference standard instrument:-
Instrument Serial No. Cert. No. Traceable Due Date
1) Data Acquisition MY48028932 23LM122 TPA 26 Jul 2024

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

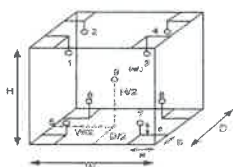
3. This certification is traceable to the International System of Unit.

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

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available



Probe Installation Details :

Dimension of Chamber :

a = 10 cm
b = 10 cm
c = 10 cm
D = 0.82 m
W = 1.2 m
H = 1.2 m
Capacity = 0.89 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	29	32
REL.Humd. (%)	78	65
AC Supply (Volt)	233	234

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



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

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

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
20.0	20.0	19.8	0.55	0.66	1.6	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
20.0	20.210	20.331	20.182	19.845	20.287	20.070	19.839	19.781	19.954	0.79

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

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

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

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

UUC* : Unit Under Calibration

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

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

-000-

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม



Certificate of Calibration

Aquion: (Anion System ID#1048)

This certificate is to verify that instrument below are calibrated

By Archemica Lab Co., Ltd.

Aquion

S/N: 220340349

For

UAE Consultant Co., Ltd.



Operator Signature: Thitipong P. Date: Apr 23-24, 2025

(Mr.Thitipong Piromkriput)

Test Engineer

เอกสารไม่ควบคุม

Qualification Report

PM_Checklist: CM_OQ and PQ
Aquion: Anion (ID#1048)

For
UAE Consultant Co., Ltd.
(1st Contract)

เอกสารไม่ควบคุม

PM

Preventive Maintenance Check List

เอกสารไม่ควบคุม



Checklist ICS Preventive Maintenance

Dionex Ion Chromatography Preventive Maintenance Report

Customer Organization	Name/Department
United Analyst and Engineering Consultant Co.,Ltd.	K.Suwanna
Engineer	Date
Mr.Thitipong Piromkriput	23-24/Apr/2025

Instrument Detail

Instrument Model	Application
Aquion (ID#1048, 1st Contract)	Anion
Instrument components	Serial Number
Aquion	220380031

Consumable Detail

Columns	Guard Columns	Suppressors	Concentrators	Etc.
AS22	AG22	ASRS300	-	-

Remark: -



Perform By Archemica

Thitipong P.
Archemica
24 Apr 2025
Date

Customer
Date

เอกสารไม่ควบคุม



General ICS Maintenance Checklist

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

เอกสารไม่ควบคุม

CM OQ

Chromeleon
Operation Qualification

เอกสารไม่ควบคุม



Chromeleon Operational Qualification

General Information

Computer Name Version Number:
Instrument Controller: DESKTOP-C4FS3L7 7.3.1 Build 6535
Client: DESKTOP-C4FS3L7 7.3.1.6535
Operator: Thitipong Piromkriput
Overall Test Result: Passed

Comparison Format:

All Parameters:	Significant Digits:	10
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Sunan Pongkarn
Reviewer's Signature / DateThitipong 24/Apr/2025
Operator's Signature / Date

เอกสารไม่ควบคุม

Chromeleon Operational Qualification, Part 1
Verification of Selected Results

Detection Algorithm: Cobra
Calibration Type: Lin, With Offset
Evaluation Type: Area
Standard Method: External
Calibration Mode: Total

Report Variable	Peak Name	Status
Offset (c0)	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Slope (c1)	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Correlation Coeff.	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Variance	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Std. Deviation	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Ret. Std. Dev.	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Variance Coeff.	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok

เอกสารไม่ควบคุม

ThermoFisher
SCIENTIFIC
Chromeleon Operational Qualification, Part 1
Verification of Selected Results

Report Variable	Peak Name	Status
Calibration Point X	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Calibration Point Y	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Amount [ng]	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Resolution (EP)	Acetanilide	ok
	Acetophenone	ok
Resolution (USP)	Acetanilide	ok
	Acetophenone	ok
Peak Asymmetry (EP/USP)	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Peak Asymmetry (AIA)	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok

เอกสารไม่ควบคุม

ThermoFisher
SCIENTIFIC
Chromeleon Operational Qualification, Part 1
Verification of Selected Results

Report Variable	Peak Name	Status
Theoretical Plates (EP)	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Theoretical Plates (USP)	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Theoretical Plates (JP)	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok

Test Result: **Passed**

เอกสารไม่ควบคุม

ThermoFisher
SCIENTIFIC
Chromeleon Operational Qualification, Part 2
Most Frequently Used Parameters: Comparison with Expected Results

Detection Algorithm: Cobra
Calibration Type: Lin, With Offset
Evaluation Type: Area
Standard Method: External
Calibration Mode: Total

Variable Category	Report Variable	Peak Name	Status
Injection	No.		ok
	Name		ok
	Type		ok
	Position		ok
	Status		ok
	Volume		ok
	Dilution Factor		ok
	Weight		ok
	IntStd		ok
	InstrumentMethod		ok
	ProcessingMethod		ok
Chromatogram	Channel		ok
	No. of Peaks		ok
	Chromatogram Start Time		ok
	Signal Min.		ok
	Signal Max.		ok
	Unit		ok
	Noise		ok
Peak Results	No.	Acetanilide	ok
	No.	Acetophenone	ok
	No.	Propiophenone	ok
	Peak Name	Acetanilide	ok
	Peak Name	Acetophenone	ok
	Peak Name	Propiophenone	ok
	Ret.Time	Acetanilide	ok
	Ret.Time	Acetophenone	ok
	Ret.Time	Propiophenone	ok
	Ret.Time	Propiophenone	ok

เอกสารไม่ควบคุม

ThermoFisher
SCIENTIFIC
Chromeleon Operational Qualification, Part 2
Most Frequently Used Parameters: Comparison with Expected Results

Variable Category	Report Variable	Peak Name	Status
Peak Results	Abs.Ret.Dev.	Acetanilide	ok
	Ret.Dev.(abs)	Acetophenone	ok
	Ret.Dev.(abs)	Propiophenone	ok
	Rel.Ret.Dev.	Acetanilide	ok
	Ret.Dev.(rel)	Acetophenone	ok
	Ret.Dev.(rel)	Propiophenone	ok
	Area	Acetanilide	ok
	Area	Acetophenone	ok
	Area	Propiophenone	ok
	Rel.Area	Acetanilide	ok
	Rel.Area (Total)	Acetophenone	ok
	Rel.Area (Total)	Propiophenone	ok
	Height	Acetanilide	ok
	Height	Acetophenone	ok
	Height	Propiophenone	ok
	Rel.Height (Total)	Acetanilide	ok
	Rel.Height (Total)	Acetophenone	ok
	Rel.Height (Total)	Propiophenone	ok
	Amount	Acetanilide	ok
	Amount	Acetophenone	ok
	Amount	Propiophenone	ok
	Concentration	Acetanilide	ok
	Concentration	Acetophenone	ok
	Concentration	Propiophenone	ok
	Rel.Amount	Acetanilide	ok
	Rel.Amount	Acetophenone	ok
	Rel.Amount	Propiophenone	ok
	Peak Width (0%)	Acetanilide	ok
	Peak Width (0%)	Acetophenone	ok
	Peak Width (0%)	Propiophenone	ok
	Peak Width (5%)	Acetanilide	ok
	Peak Width (5%)	Acetophenone	ok
	Peak Width (5%)	Propiophenone	ok
	Peak Width (10%)	Acetanilide	ok
	Peak Width (10%)	Acetophenone	ok
	Peak Width (10%)	Propiophenone	ok

เอกสารไม่ควบคุม



Chromleon Operational Qualification, Part 2
Most Frequently Used Parameters: Comparison with Expected Results

Variable Category	Report Variable	Peak Name	Status
Peak Results	Peak Width (50%)	Acetanilide	ok
	Peak Width (50%)	Acetophenone	ok
	Peak Width (50%)	Propiophenone	ok
	Left Width (0%)	Acetanilide	ok
	Left Width (0%)	Acetophenone	ok
	Left Width (0%)	Propiophenone	ok
	Right Width (0%)	Acetanilide	ok
	Right Width (0%)	Acetophenone	ok
	Right Width (0%)	Propiophenone	ok
	Peak Start	Acetanilide	ok
	Peak Start	Acetophenone	ok
	Peak Start	Propiophenone	ok
	Peak Stop	Acetanilide	ok
	Peak Stop	Acetophenone	ok
	Peak Stop	Propiophenone	ok
	Peak Start Value	Acetanilide	ok
	Peak Start Value	Acetophenone	ok
	Peak Start Value	Propiophenone	ok
	Peak Stop Value	Acetanilide	ok
	Peak Stop Value	Acetophenone	ok
	Peak Stop Value	Propiophenone	ok
	BL-Value Peak Start	Acetanilide	ok
	BL-Value Peak Start	Acetophenone	ok
	BL-Value Peak Start	Propiophenone	ok
	BL-Value Peak Stop	Acetanilide	ok
	BL-Value Peak Stop	Acetophenone	ok
	BL-Value Peak Stop	Propiophenone	ok
	Type	Acetanilide	ok
	Type	Acetophenone	ok
	Type	Propiophenone	ok
	Resolution (EP)	Acetanilide	ok
	Resolution (EP)	Acetophenone	ok
	Resolution (USP)	Acetanilide	ok
	Resolution (USP)	Acetophenone	ok
	Asymmetry (EP)	Acetanilide	ok
	Asymmetry (EP)	Acetophenone	ok
	Asymmetry (EP)	Propiophenone	ok

เอกสารไม่ควบคุม



Chromleon Operational Qualification, Part 2
Most Frequently Used Parameters: Comparison with Expected Results

Variable Category	Report Variable	Peak Name	Status
Peak Results	Asymmetry(AIA)	Acetanilide	ok
	Asymmetry(AIA)	Acetophenone	ok
	Asymmetry(AIA)	Propiophenone	ok
	Theor. Plates(EP)	Acetanilide	ok
	Theor. Plates(EP)	Acetophenone	ok
	Theor. Plates(EP)	Propiophenone	ok
	Theor. Plates(USP)	Acetanilide	ok
	Theor. Plates(USP)	Acetophenone	ok
	Theor. Plates(USP)	Propiophenone	ok
	Theor. Plates (JP)	Acetanilide	ok
	Theor. Plates (JP)	Acetophenone	ok
	Theor. Plates (JP)	Propiophenone	ok
Peak Calibration	Cal.Mode	Acetanilide	ok
	Cal.Mode	Acetophenone	ok
	Cal.Mode	Propiophenone	ok
	Cal.Type	Acetanilide	ok
	Cal.Type	Acetophenone	ok
	Cal.Type	Propiophenone	ok
	Weights	Acetanilide	ok
	Weights	Acetophenone	ok
	Weights	Propiophenone	ok
	Calibr. Coefficient C0	Acetanilide	ok
	Calibr. Coefficient C0	Acetophenone	ok
	Calibr. Coefficient C0	Propiophenone	ok
	Calibr. Coefficient C1	Acetanilide	ok
	Calibr. Coefficient C1	Acetophenone	ok
	Calibr. Coefficient C1	Propiophenone	ok

เอกสารไม่ควบคุม



Chromleon Operational Qualification, Part 2
Most Frequently Used Parameters: Comparison with Expected Results

Variable Category	Report Variable	Peak Name	Status
Peak Calibration	No. of Points	Propiophenone	ok
	No. of Points(disabled)	Acetanilide	ok
	No. of Points(disabled)	Acetophenone	ok
	No. of Points(disabled)	Propiophenone	ok
	Variance	Acetanilide	ok
	Variance	Acetophenone	ok
	Variance	Propiophenone	ok
	Var.Coeff	Acetanilide	ok
	Var.Coeff	Acetophenone	ok
	Var.Coeff	Propiophenone	ok
	Std.Dev.	Acetanilide	ok
	Std.Dev.	Acetophenone	ok
	Std.Dev.	Propiophenone	ok
	Rel.Std.Dev.	Acetanilide	ok
	Rel.Std.Dev.	Acetophenone	ok
	Rel.Std.Dev.	Propiophenone	ok
	Corr.Coeff.	Acetanilide	ok
	Corr.Coeff.	Acetophenone	ok
	Corr.Coeff.	Propiophenone	ok
	R-Square	Acetanilide	ok
	R-Square	Acetophenone	ok
	R-Square	Propiophenone	ok
	Adj. R-Square	Acetanilide	ok
	Adj. R-Square	Acetophenone	ok
	Adj. R-Square	Propiophenone	ok
	X	Acetanilide	ok
	X	Acetophenone	ok
	X	Propiophenone	ok
	Y	Acetanilide	ok
	Y	Acetophenone	ok
	Y	Propiophenone	ok
	W	Acetanilide	ok
	W	Acetophenone	ok
	W	Propiophenone	ok
	F(X)	Acetanilide	ok
	F(X)	Acetophenone	ok
	F(X)	Propiophenone	ok

เอกสารไม่ควบคุม



Chromleon Operational Qualification, Part 2
Most Frequently Used Parameters: Comparison with Expected Results

Variable Category	Report Variable	Peak Name	Status
Peak Calibration	Residual for Cal.Point X	Acetanilide	ok
	Residual for Cal.Point X	Acetophenone	ok
	Residual for Cal.Point X	Propiophenone	ok
	Calibration Point Status	Acetanilide	ok
	Calibration Point Status	Acetophenone	ok
	Calibration Point Status	Propiophenone	ok
	Amount	Acetanilide	ok
	Amount	Acetophenone	ok
Component	Amount	Propiophenone	ok
	Cal.Type	Acetanilide	ok
	Peak Type	Acetanilide	ok
	Left Limit	Acetophenone	ok
	Right Limit	Acetanilide	ok
	Group	Acetanilide	ok
	Factor	Acetophenone	ok
	Amount	Acetanilide	ok
	Conc.Unit	Acetophenone	ok

เอกสารไม่ควบคุม



Chromleon Operational Qualification, Part 2
Most Frequently Used Parameters: Comparison with Expected Results

Variable Category	Report Variable	Peak Name	Status
Peak Purity	PPI	Acetanilide	ok
	PPI	Acetophenone	ok
	PPI	Propiophenone	ok
	RSD PPI	Acetanilide	ok
	RSD PPI	Acetophenone	ok
	RSD PPI	Propiophenone	ok
	Match	Acetanilide	ok
	Match	Acetophenone	ok
	Match	Propiophenone	ok
	RSD Match	Acetanilide	ok
	RSD Match	Acetophenone	ok
	RSD Match	Propiophenone	ok
	Rel.Max at	Acetanilide	ok
	Rel.Max at	Acetophenone	ok
	Rel.Max at	Propiophenone	ok

Test Result: Passed

เอกสารไม่ควบคุม



Chromleon Operational Qualification, Part 3
System Suitability Test: Comparison with Expected Results

Variable Category	Report Variable	Status
System Suitability	Number	ok
	Name	ok
	Inj.Condition	ok
	Eval. Formula	ok
	Operator	ok
	Statistics	ok
	Rounding	ok
	MinimumNumberOfInjections	ok
	MaximumNumberOfInjections	ok
	Channel	ok
	Peak	ok
	Ref. Value Formula 1	ok
	Ref. Value Formula 2	ok
	N.A.	ok
System Suitability	Inj. Eval. Result	ok
	Eval. Result	ok
	Peak Result	ok
	Injection Condition Result	ok
	Ref. Value 1	ok
	Ref. Value 2	ok
	Result	ok
	Message	ok
	Average	ok
	Count	ok
	Maximum	ok
	Minimum	ok
	Range	ok
	Rel. Range	ok
	Rel. Std. Dev.	ok
	Std. Dev.	ok
	Sum	ok

Test Result: Passed

เอกสารไม่ควบคุม

PQ

Performance Qualification

IC PUMP FLOW RATE ACCURACY



IC Pump Flow Rate

Set Point (mL)	Reading (mL/min)	Deviation (%)	OQ Limit (%)	Result
0.5	0.4972	0.560	± 2.0	PASS
1.0	0.9960	0.40	± 2.0	PASS

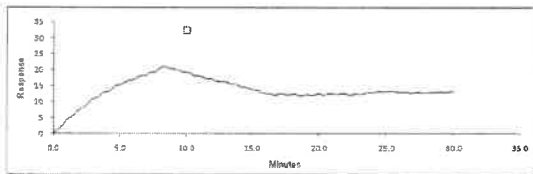


Field Service Representative Signature:	Customer Signature:
Date: 19 Apr 2025	Date: 19 Apr 2025

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม

NOISE AND DRIFT (CD)

ThermoFisher
SCIENTIFIC

Information

System Name	AquionR/FIC
Detector SN	220360059
Data Path	chrom:\desktop-c4f3d7\ChromelonLocal\Archemica\Service Contract\2025\1st Con 23-Apr-2025\Aquion #231048\IC_OG.qm\B26 ump\ECD_1\channel\ECD_1.chm

Noise and Drift

Test	Measured (nS)	OQ Limit (nS)	Result	Conversion Factor
Noise	0.7 nS	≤ 2.0 nS	PASS	1000
Drift	12.7 nS/hr	≤ 20.0 nS/hr	PASS	1000

OVERALL TEST RESULT: PASS

Field Service Representative Signature:	Customer Signature:
Date: 24 Apr 2025	Date: 24 Apr 2025

เอกสารไม่ควบคุม

TEST EQUIPMENT AND STANDARDS

ThermoFisher
SCIENTIFIC

Test Equipment

Equipment	Manufacturer	Model	Serial Number	Cal/Ver Date	Good Until
Multimeter	Fluke	289	69270015	N/A	N/A
Thermocouple	Fluke	K-Type	69270015	N/A	N/A
Balance	Mettler Toledo	AB204-S	1129361010	N/A	N/A
IC Qualification	Thermo Scientific	Test Box	24159332	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A

Standards/Chemicals

Description	Manufacturer	Concentration	Part Number	Lot Number	Expiration Date
Nitrate	Thermo Scientific	5 ppm	060254	241021	Oct-2025
Nitrate	Thermo Scientific	10 ppm	060254	241021	Oct-2025
Nitrate	Thermo Scientific	25 ppm	060254	241021	Oct-2025
Nitrate	Thermo Scientific	50 ppm	060254	241021	Oct-2025
Nitrate	Thermo Scientific	100 ppm	060254	241021	Oct-2025
Nitrate	Thermo Scientific	1000 ppm	060254	241021	Oct-2025
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A

Field Service Representative Signature:

Thirapong P.

Date: 24 Apr 2025

Customer Signature:

Date: 24 Apr 2025

เอกสารไม่ควบคุม

REPEATABILITY (CD)

ThermoFisher
SCIENTIFIC

Information

System Name	AquionR/FIC
Detector SN	220360059
Data Path	ChromelonLocal\Archemica\Service Contract\2025\1st Con 23-Apr-2025\Aquion #1048\IC_OG

Peak Results

Sample Name	Injection Volume (µL)	Retention Time (min)	Area
Repeatability 01	25	0.4793	3.742
Repeatability 02	25	0.4793	3.749
Repeatability 03	25	0.4797	3.715
Repeatability 04	25	0.4797	3.756
Repeatability 05	25	0.4793	3.747
Repeatability 06	25	0.4793	3.688

Repeatability

Test	Measured (% RSD)	OQ Limit (% RSD)	Result
Retention Time	0.2	≤ 5.0	PASS
Area	0.7	≤ 1.0	PASS

OVERALL TEST RESULT: PASS

Field Service Representative Signature:	Customer Signature:
Date: 24 Apr 2025	Date: 24 Apr 2025

เอกสารไม่ควบคุม

CARRYOVER (CD)

ThermoFisher
SCIENTIFIC

Information

System Name	Aquion
Detector SN	220360059
Data Path	ChromelonLocal\Archemica\Service Contract\2025\1st Con 23-Apr-2025\Aquion #1048\IC_OG

Peak Results

Sample Name	Injection Volume (µL)	Retention Time (min)	Area
Reference Blank	25	0.4793	0.035
High Standard	25	0.4797	488.726
Carryover	25	0.4733	0.042

Results

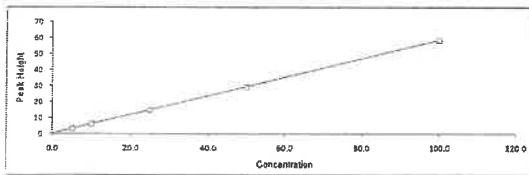
Test	Observed (%)	OQ Limit (%)	Result
AREA	0.01	≤ 0.10	PASS

OVERALL TEST RESULT: PASS

Field Service Representative Signature:	Customer Signature:
Date: 24 Apr 2025	Date: 24 Apr 2025

เอกสารไม่ควบคุม

DETECTOR LINEARITY (CD)

ThermoFisher
SCIENTIFIC

Information

System Name	Ajalon
Detector SN	220360059
Date Path	ChromleonLocal//Archemia/Service Contract/2025/1st Con 23-Apr-2025/Ajalon #1048/C OQ

Peak Results

Sample Name	Concentration	Peak Height	Calculated
Detector Linearity 01	5	3.247	5.03
Detector Linearity 02	10	6.197	10.06
Detector Linearity 03	25	14.967	25.12
Detector Linearity 04	50	29.261	49.62
Detector Linearity 05	100	58.743	100.15

Linearity

Test	Observed	OQ Limit	Result
r ²	1.000	≥ 0.999	PASS

OVERALL TEST RESULT: PASS

Field Service Representative Signature:	Customer Signature:
<i>[Signature]</i>	<i>[Signature]</i>
Date: 24/Apr/2025	Date: 24/Apr/2025

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Detector Linearity (CD) Report Page 1 of 1

เอกสารไม่ควบคุม

TEMPERATURE ACCURACY

ThermoFisher
SCIENTIFIC

Column Compartment

Set Point (°C)	Reading (°C)	Deviation (°C)	OQ Limit (°C)	Result
30.0	30.5	0.5	± 2.0	PASS

OVERALL TEST RESULT: PASS

Field Service Representative Signature:	Customer Signature:
<i>[Signature]</i>	<i>[Signature]</i>
Date: 24/Apr/2025	Date: 24/Apr/2025

RPG Reports v2.070
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Temperature Accuracy Report Page 1 of 1

เอกสารไม่ควบคุม

Certificate

Certificate of Standards and
Instruments for Qualification

SYSTRONICS INSLAB COMPANY LIMITED 18/11-12, Sutthumvit Rd., Nongpho, Mueang Rong, Phrayang 21150, Thailand Tel: +6628 084 146-5, Email: calibration@systronics.co.th													
CERTIFICATE OF CALIBRATION													
Customer Name: Archemia Lab Co., Ltd.		Certificate No: EL241787											
Customer Address: 39 Soi Sukhumvit 63 (Bangkok), Sukhumvit Rd. North Klongton, Wattana, Bangkok 10110		Job No: 24110052											
Instrument Description: TRUE RMS MULTIMETER		Page: 1 of 5											
Manufacturer: FLUKE		Received Date: 14 Nov 2024											
Model No: 289		Calibrated Date: 18 Nov 2024											
Serial Number: 59270015		Issued Date: 18 Nov 2024											
Calibration Procedure: Calibration were conducted using in-house calibration procedure according to direct measurement with reference standard.		Tag No: [Blank]											
Procedure No: CP-EL-01, 02, 03, 04, 05, 06, 07, 10.		Service: [Blank]											
Comment: [Blank]		Condition As Received: Used											
Reference Standards Instrument <table border="1"> <thead> <tr> <th>Instrument Name</th> <th>Model</th> <th>Serial No.</th> <th>Cert. No.</th> <th>Due Date</th> </tr> </thead> <tbody> <tr> <td>Mult-Function Calibrator</td> <td>Fluke 5522A</td> <td>2177901</td> <td>EP-0033-23</td> <td>03 Apr 2025</td> </tr> </tbody> </table>				Instrument Name	Model	Serial No.	Cert. No.	Due Date	Mult-Function Calibrator	Fluke 5522A	2177901	EP-0033-23	03 Apr 2025
Instrument Name	Model	Serial No.	Cert. No.	Due Date									
Mult-Function Calibrator	Fluke 5522A	2177901	EP-0033-23	03 Apr 2025									
Traceability Information: - Traceable to the International System of Units (SI) through the National Institute of Metrology (Thailand), NIMT.													
Environmental Conditions: Temperature: (23 ± 3) °C Relative Humidity: (50 ± 15) %													
Calibration Information: - The result of calibration was found accurate as show on date and place of calibration only. - The reported uncertainty of measurement is based on standard uncertainty multiplied by a coverage factor k = 2, providing confidence level of approximately 95%.													
Calibrated by: Mr. Supthana Prajapal		Approved Signatory: [Signature]											
This certificate may not be reproduced, except in full unless permission for the publication of abstract is obtained in writing from the calibration organization issuing this report.													

เอกสารไม่ควบคุม

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18/11-12, Sukhumvit Rd., Nongtho, Muang Rayong, Rayong 21160, Thailand
Tel: +66(38) 894 145-8, Email: calibration@systronics.co.th

CERTIFICATE OF CALIBRATION

Certificate No. EL241787
Page 2 of 5

Range	Standard Value	UUC*Reading	Error	(±) Uncertainty
Function : DC Voltage Measurement (Without Adjustment)				
50 mV	0.0000 mV	0.000 mV	0.000 mV	0.0016 mV
50 mV	5.0000 mV	4.995 mV	-0.005 mV	0.0016 mV
50 mV	45.0000 mV	44.993 mV	-0.007 mV	0.0022 mV
50 mV	450.0000 mV	449.992 mV	-0.008 mV	0.0022 mV
500 mV	50.0000 mV	50.000 mV	0.000 mV	0.0061 mV
500 mV	450.0000 mV	449.98 mV	-0.02 mV	0.0080 mV
500 mV	450.0000 mV	449.99 mV	-0.01 mV	0.0080 mV
5 V	0.500000 V	0.5000 V	0.0000 V	0.00009 V
5 V	4.50000 V	4.4997 V	-0.0003 V	0.00002 V
5 V	4.50000 V	4.4997 V	-0.0003 V	0.00002 V
50 V	5.00000 V	5.000 V	0.000 V	0.00009 V
50 V	45.0000 V	44.997 V	-0.003 V	0.00095 V
50 V	45.0000 V	44.997 V	-0.003 V	0.00095 V
500 V	50.0000 V	50.00 V	0.00 V	0.0009 V
500 V	450.000 V	449.97 V	-0.03 V	0.0095 V
500 V	450.000 V	449.97 V	-0.03 V	0.0095 V
1000 V	100.0000 V	100.0 V	0.0 V	0.058 V
1000 V	900.000 V	900.0 V	0.0 V	0.060 V
1000 V	900.000 V	900.0 V	0.0 V	0.060 V
Function : DC Voltage Measurement LoZ (Without Adjustment)				
1000 V	0.000000 V	0.0 V	0.0 V	0.058 V
1000 V	100.0000 V	100.1 V	0.1 V	0.058 V
1000 V	900.000 V	900.8 V	0.8 V	0.060 V
1000 V	900.000 V	900.8 V	0.8 V	0.060 V
Function : AC Voltage Measurement (Without Adjustment)				
50 mV	5.000 mV	4.995 mV	-0.005 mV	0.0053 mV
50 mV	45.000 mV	45.003 mV	0.003 mV	0.013 mV
500 mV	50.000 mV	49.94 mV	-0.06 mV	0.014 mV
500 mV	450.00 mV	450.13 mV	0.13 mV	0.11 mV
5 V	0.50000 V	0.4986 V	-0.0014 V	0.00012 V
5 V	4.5000 V	4.5012 V	0.0012 V	0.0011 V
50 V	5.0000 V	4.998 V	-0.002 V	0.0012 V
50 V	45.000 V	45.012 V	0.012 V	0.0085 V
500 V	50.000 V	49.98 V	-0.02 V	0.011 V
500 V	450.0 V	450.16 V	0.16 V	0.12 V
1000 V	100.000 V	100.0 V	0.0 V	0.060 V
1000 V	900.00 V	900.4 V	0.4 V	0.23 V

Remarks: (*) UUC: Unit Under Calibration

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SYSTRONICS INSLAB COMPANY LIMITED
18/11-12, Sukhumvit Rd., Nongtho, Muang Rayong, Rayong 21160, Thailand
Tel: +66(38) 894 145-8, Email: calibration@systronics.co.th

CERTIFICATE OF CALIBRATION

Certificate No. EL241787
Page 3 of 5

Range	Standard Value	UUC*Reading	Error	(±) Uncertainty
Function : AC Voltage Measurement LoZ (Without Adjustment)				
1000 V	100.000 V	100.4 V	0.4 V	0.060 V
1000 V	900.00 V	905.7 V	5.7 V	0.23 V
Function : DC Current Measurement (Without Adjustment)				
500 uA	0.000 uA	0.00 uA	0.00 uA	0.017 uA
500 uA	50.000 uA	49.99 uA	-0.01 uA	0.023 uA
500 uA	450.00 uA	449.95 uA	-0.05 uA	0.078 uA
5000 uA	500.00 uA	500.0 uA	0.0 uA	0.097 uA
5000 uA	4500.0 uA	4499.4 uA	-0.6 uA	0.57 uA
50 mA	5.0000 mA	5.001 mA	0.001 mA	0.00062 mA
50 mA	45.0000 mA	44.995 mA	-0.005 mA	0.0056 mA
400 mA	40.000 mA	39.99 mA	-0.01 mA	0.0077 mA
400 mA	360.00 mA	359.53 mA	-0.07 mA	0.096 mA
5 A	0.50000 A	0.50001 A	0.00001 A	0.00013 A
5 A	4.5000 A	4.4991 A	-0.0009 A	0.00022 A
10 A	1.00000 A	1.000 A	0.000 A	0.00061 A
10 A	9.0000 A	8.999 A	-0.002 A	0.0040 A
Function : AC Current Measurement (Without Adjustment)				
500 uA	50.00 uA	49.82 uA	-0.18 uA	0.13 uA
500 uA	450.00 uA	449.85 uA	-0.15 uA	0.48 uA
5000 uA	500.00 uA	499.8 uA	-0.2 uA	0.51 uA
5000 uA	4500.0 uA	4501.0 uA	1.0 uA	3.1 uA
50 mA	5.0000 mA	4.988 mA	-0.012 mA	0.0032 mA
50 mA	45.000 mA	44.981 mA	-0.019 mA	0.021 mA
400 mA	40.000 mA	39.96 mA	-0.04 mA	0.029 mA
400 mA	360.00 mA	359.13 mA	-0.87 mA	0.22 mA
5 A	0.50000 A	0.4990 A	-0.0010 A	0.00028 A
5 A	4.5000 A	4.4972 A	-0.0028 A	0.00038 A
10 A	1.00000 A	1.000 A	0.000 A	0.0005 A
10 A	9.0000 A	8.999 A	-0.001 A	0.0005 A

Remarks: (*) UUC: Unit Under Calibration

Thi Hong P.
24/4/2015

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SYSTRONICS INSLAB COMPANY LIMITED
18/11-12, Sukhumvit Rd., Nongtho, Muang Rayong, Rayong 21160, Thailand
Tel: +66(38) 894 145-8, Email: calibration@systronics.co.th

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Certificate No. EL241787
Page 4 of 5

Range	Standard Value	UUC*Reading	Error	(±) Uncertainty
Function : Resistance Measurement (Without Adjustment)				
500 Ω	0.000 Ω	0.00 Ω	0.00 Ω	0.0075 Ω
500 Ω	50.000 Ω	49.99 Ω	-0.01 Ω	0.0084 Ω
500 Ω	450.000 Ω	449.93 Ω	-0.07 Ω	0.017 Ω
5 kΩ	0.500000 kΩ	0.4999 kΩ	-0.0001 kΩ	0.000060 kΩ
5 kΩ	4.50000 kΩ	4.4986 kΩ	-0.0014 kΩ	0.00017 kΩ
50 kΩ	5.00000 kΩ	5.000 kΩ	0.000 kΩ	0.00060 kΩ
50 kΩ	45.0000 kΩ	45.001 kΩ	0.001 kΩ	0.0017 kΩ
500 kΩ	50.0000 kΩ	49.99 kΩ	-0.01 kΩ	0.0060 kΩ
500 kΩ	450.000 kΩ	449.97 kΩ	-0.03 kΩ	0.018 kΩ
5 MΩ	0.500000 MΩ	0.4998 MΩ	-0.0002 MΩ	0.000061 MΩ
5 MΩ	4.50000 MΩ	4.4981 MΩ	-0.0019 MΩ	0.00056 MΩ
30 MΩ	3.00000 MΩ	3.000 MΩ	0.000 MΩ	0.00061 MΩ
30 MΩ	27.0000 MΩ	26.987 MΩ	-0.013 MΩ	0.0075 MΩ
50 MΩ	5.00000 MΩ	5.00 MΩ	0.00 MΩ	0.0059 MΩ
50 MΩ	45.0000 MΩ	44.97 MΩ	-0.03 MΩ	0.021 MΩ
100 MΩ	10.0000 MΩ	10.0 MΩ	0.0 MΩ	0.056 MΩ
100 MΩ	90.0000 MΩ	89.9 MΩ	-0.1 MΩ	0.069 MΩ
500 MΩ	250.000 MΩ	249.4 MΩ	-0.6 MΩ	0.68 MΩ
500 MΩ	450.00 MΩ	448.0 MΩ	-2.0 MΩ	5.9 MΩ
Function : Resistance Measurement LoZ (Without Adjustment)				
50 Ω	0.0000 Ω	0.000 Ω	0.000 Ω	0.0047 Ω
50 Ω	5.0000 Ω	5.004 Ω	0.004 Ω	0.0049 Ω
50 Ω	25.0000 Ω	24.995 Ω	-0.005 Ω	0.0057 Ω
50 Ω	45.0000 Ω	44.993 Ω	-0.007 Ω	0.0060 Ω
Function : Capacitance Measurement (Without Adjustment)				
1 nF	0.0000 nF	0.000 nF	0.000 nF	0.0078 nF
1 nF	0.5000 nF	0.499 nF	-0.001 nF	0.0098 nF
1 nF	0.9000 nF	0.898 nF	-0.002 nF	0.012 nF
10 nF	1.0000 nF	1.00 nF	0.00 nF	0.013 nF
10 nF	9.0000 nF	9.00 nF	0.00 nF	0.029 nF
100 nF	10.0000 nF	10.0 nF	0.0 nF	0.064 nF
100 nF	90.000 nF	90.0 nF	0.0 nF	0.29 nF
1 μF	0.100000 μF	0.100 μF	0.000 μF	0.00064 μF
1 μF	0.90000 μF	0.900 μF	0.000 μF	0.0029 μF
10 μF	1.00000 μF	1.00 μF	0.00 μF	0.0064 μF
10 μF	9.0000 μF	9.00 μF	0.00 μF	0.028 μF
100 μF	10.0000 μF	10.0 μF	0.0 μF	0.064 μF
100 μF	90.000 μF	90.0 μF	0.0 μF	0.42 μF
1000 μF	100.000 μF	100 μF	0 μF	0.72 μF
1000 μF	900.00 μF	899 μF	-1 μF	4.2 μF
10 mF	1.00000 mF	1.00 mF	0.00 mF	0.0072 mF
10 mF	9.0000 mF	9.00 mF	0.00 mF	0.043 mF
100 mF	10.0000 mF	10.0 mF	0.0 mF	0.072 mF
100 mF	90.000 mF	89.8 mF	-0.2 mF	0.89 mF

Remarks: (*) UUC: Unit Under Calibration

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SYSTRONICS INSLAB COMPANY LIMITED
18/11-12, Sukhumvit Rd., Nongtho, Muang Rayong, Rayong 21160, Thailand
Tel: +66(38) 894 145-8, Email: calibration@systronics.co.th

CERTIFICATE OF CALIBRATION

Certificate No. EL241787
Page 5 of 5

Range	Standard Value	UUC*Reading	Error	(±) Uncertainty
Function : Frequency Measurement (Without Adjustment)				
100 Hz	10.00 Hz	10.000 Hz	0.000 Hz	0.00059 Hz
100 Hz	90.00 Hz	90.000 Hz	0.000 Hz	0.00066 Hz
1000 Hz	100.00 Hz	100.00 Hz	0.00 Hz	0.0058 Hz
1000 Hz	900.0 Hz	900.0 Hz	0.00 Hz	0.0061 Hz
10 kHz	1.0000 kHz	1.0000 kHz	0.0000 kHz	0.000058 kHz
10 kHz	9.0000 kHz	9.0000 kHz	0.0000 kHz	0.00007 kHz
100 kHz	10.000 kHz	10.000 kHz	0.0000 kHz	0.00058 kHz
100 kHz	90.00 kHz	90.000 kHz	0.0000 kHz	0.00061 kHz
1000 kHz	100.00 kHz	100.00 kHz	0.00 kHz	0.0058 kHz
1000 kHz	900.0 kHz	900.0 kHz	0.00 kHz	0.0059 kHz
Function : Thermocouple Measurement K Type (Without Adjustment)				
-200 to 1350 °C	-5.553 mV	-189.0 °C	-178.6 °C	1.4 °C
-200 to 1350 °C	0.000 mV	0.0 °C	0.6 °C	0.24 °C
-200 to 1350 °C	4.996 mV	100.0 °C	100.5 °C	0.6 °C
-200 to 1350 °C	24.905 mV	600.0 °C	600.6 °C	0.6 °C
-200 to 1350 °C	37.325 mV	900.0 °C	900.6 °C	0.6 °C
-200 to 1350 °C	48.838 mV	1200.0 °C	1200.7 °C	0.7 °C

Remarks: (*) UUC: Unit Under Calibration

END OF CALIBRATION

Thi Hong P.
24/4/2015

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Certificate of Completion

This certifies that

Thitipong Piromkripuk

Has successfully completed

eLearn: RPG IC-Specific Qualification Service Training

Issued electronically and
approved by:
Thermo Fisher University LMS
Certification Management and
Compliance Group
lms.training@thermofisher.com

Thitipong P.
24 Apr 2024

Valid for 3 years from:
Aug 11/2024

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Certificate of Analysis

Better Separations Through
Better Chemistry

Dionex Nitrate OQ/PQ IC Standards Kit (Set of 6)

Product Number 060254
Certificate of Analysis

Lot Number 241021

Expiration of Certification
October 2025

The Dionex Nitrate Standard was developed to aid the analysis of anions by Ion Chromatography (IC). The single-ion standard was prepared by the dissolution of high-purity salt in ≥ 18.2 megohm deionized water, which was tested by IC for ionic contaminants. The bottle label states the nominal concentration value of the ionic component for informational purposes only. The actual ion concentration value was determined by Ion Chromatography. The IC system was standardized using the National Institute of Standards & Technology (NIST), Standard Reference Material, SRM 3185 (Nitrate Standard Solution). Actual concentration values determined for the single-ion is listed below.

Dionex Nitrate Standard

Vial #	Concentration (mg/L)
1	4.95 \pm 0.09
2	9.97 \pm 0.02
3	25.33 \pm 0.12
4	50.46 \pm 0.28
5	101.4 \pm 1
6	1004 \pm 4

Thitipong P.
24 Apr 2024

The concentration value is based a proven reliable method of analysis. The estimated uncertainties are two standard deviations of the concentration value. The concentration value is warranted to be stable for one year from the date of manufacture.

The preparation and analyses of the Dionex Nitrate Standard was performed with extreme care by Thermo Scientific Corporation Consumables Manufacturing Department in Sunnyvale California.

Document No. 078890-01 20-Dec-2011

thermoscientific.com/dionex
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Thermo Fisher Scientific
1220 Twin Way
P.O. Box 2022
Beverly, CA 94920-2022
(505) 730-0700

thermo
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Certificate of Calibration

Aquion: (Anion System ID#1047)

This certificate is to verify that instrument below are calibrated

By Archemica Lab Co., Ltd.

Aquion S/N: 220380031
AS-DV S/N: 2203880133

For
UAE Consultant Co., Ltd.

Operator Signature: Saharat Popayom Date: Apr 23-24, 2025

(Mr. Saharat Popayom)

Test Engineer

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Qualification Report

PM_Checklist: CM_OQ and PQ
Aquion: Anion (ID#1047)

For
UAE Consultant Co., Ltd.
(1st Contract)

เอกสารไม่ควบคุม

PM

Preventive Maintenance Check List

เอกสารไม่ควบคุม



Checklist ICS Preventive Maintenance

Dionex Ion Chromatography Preventive Maintenance Report

Customer Organization	Name/ Department
United Analyst and Engineering Consultant Co., Ltd.	K.Suwanna
Engineer	Date
Mr. Saharat Popayom	23-24/Apr/2025

Instrument Detail

Instrument Model	Application
Aquion (ID#1047, 1st Contract)	Anion
Instrument components	Serial Number
Aquion	220380031
AS-DV Autosampler	2203880133

Consumable Detail

Columns	Guard Columns	Suppressors	Concentrators	Etc.
AS18	AG18	ADRS600	-	EGC III KOH
				CR-ATC

Remark: -



Perform By Archemica

Signature
Archemica
24/4/2025
Date

Signature
Customer
24/4/2025
Date

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Checklist ICS Preventive Maintenance

General ICS Maintenance Checklist

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

เอกสารไม่ควบคุม



AS-DV Autosampler Preventive Maintenance Checklist

<input checked="" type="checkbox"/> AS-DV	2203680133	-
---	------------	---

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

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เอกสารไม่ควบคุม

CM OQ

Chromeleon
Operation Qualification

เอกสารไม่ควบคุม

ThermoFisher
SCIENTIFIC

Chromeleon Operational Qualification

General Information

Computer Name: DESKTOP-C4FS3L7
Version Number: 7.3.1 Build 6535
Client: DESKTOP-C4FS3L7
Operator: Saharat Popayom
Overall Test Result: Passed

Comparison Format:

All Parameters:	Significant Digits:	10
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Reviewer's Signature // Date

Operator's Signature // Date

เอกสารไม่ควบคุม

ThermoFisher
SCIENTIFICChromeleon Operational Qualification, Part 1
Verification of Selected Results

Detection Algorithm: CoRe
Calibration Type: Lin, With Offset
Evaluation Type: Area
Standard Method: External
Calibration Mode: Total

Report Variable	Peak Name	Status
Offset (c0)	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Slope (c1)	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Correlation Coeff.	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Variance	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Std. Deviation	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Rel. Std. Dev.	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Variance Coeff.	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok

เอกสารไม่ควบคุม

ThermoFisher
SCIENTIFIC
Chromleon Operational Qualification, Part 1
Verification of Selected Results

Report Variable	Peak Name	Status
Calibration Point X	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Calibration Point Y	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Amount [ng]	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Resolution (EP)	Acetanilide	ok
	Acetophenone	ok
Resolution (USP)	Acetanilide	ok
	Acetophenone	ok
Peak Asymmetry (EP/USP)	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Peak Asymmetry (AIA)	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok

เอกสารไม่ควบคุม

ThermoFisher
SCIENTIFIC
Chromleon Operational Qualification, Part 1
Verification of Selected Results

Report Variable	Peak Name	Status
Theoretical Plates (EP)	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Theoretical Plates (USP)	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok
Theoretical Plates (JP)	Acetanilide	ok
	Acetophenone	ok
	Propiophenone	ok

Test Result: **Passed**

เอกสารไม่ควบคุม

ThermoFisher
SCIENTIFIC
Chromleon Operational Qualification, Part 2
Most Frequently Used Parameters: Comparison with Expected Results

Detection Algorithm: Cobra
Calibration Type: Lin, With Offset
Evaluation Type: Area
Standard Method: External
Calibration Mode: Total

Variable Category	Report Variable	Peak Name	Status
Injection	No.		ok
	Name		ok
	Type		ok
	Position		ok
	Status		ok
	Volume		ok
	Dilution Factor		ok
	Weight		ok
	IntStd		ok
	InstrumentMethod		ok
	ProcessingMethod		ok
Chromatogram	Channel		ok
	No. of Peaks		ok
	Chromatogram Start Time		ok
	Signal Min.		ok
	Signal Max.		ok
	Unit		ok
	Noise		ok
Peak Results	No.	Acetanilide	ok
	No.	Acetophenone	ok
	No.	Propiophenone	ok
	Peak Name	Acetanilide	ok
	Peak Name	Acetophenone	ok
	Peak Name	Propiophenone	ok
	Ret.Time	Acetanilide	ok
	Ret.Time	Acetophenone	ok
	Ret.Time	Propiophenone	ok
	Ret.Time	Propiophenone	ok

เอกสารไม่ควบคุม

ThermoFisher
SCIENTIFIC
Chromleon Operational Qualification, Part 2
Most Frequently Used Parameters: Comparison with Expected Results

Variable Category	Report Variable	Peak Name	Status
Peak Results	Abs.Ret.Dev.	Acetanilide	ok
	Ret.Dev.(abs)	Acetophenone	ok
	Ret.Dev.(abs)	Propiophenone	ok
	Rel.Ret.Dev.	Acetanilide	ok
	Ret.Dev.(rel)	Acetophenone	ok
	Ret.Dev.(rel)	Propiophenone	ok
	Area	Acetanilide	ok
	Area	Acetophenone	ok
	Area	Propiophenone	ok
	Rel.Area	Acetanilide	ok
	Rel.Area (Total)	Acetophenone	ok
	Rel.Area (Total)	Propiophenone	ok
	Height	Acetanilide	ok
	Height	Acetophenone	ok
	Height	Propiophenone	ok
	Rel.Height (Total)	Acetanilide	ok
	Rel.Height (Total)	Acetophenone	ok
	Rel.Height (Total)	Propiophenone	ok
	Amount	Acetanilide	ok
	Amount	Acetophenone	ok
	Amount	Propiophenone	ok
	Concentration	Acetanilide	ok
	Concentration	Acetophenone	ok
	Concentration	Propiophenone	ok
	Rel.Amount	Acetanilide	ok
	Rel.Amount	Acetophenone	ok
	Rel.Amount	Propiophenone	ok
	Peak Width (0%)	Acetanilide	ok
	Peak Width (0%)	Acetophenone	ok
	Peak Width (0%)	Propiophenone	ok
	Peak Width (5%)	Acetanilide	ok
	Peak Width (5%)	Acetophenone	ok
	Peak Width (5%)	Propiophenone	ok
	Peak Width (10%)	Acetanilide	ok
	Peak Width (10%)	Acetophenone	ok
	Peak Width (10%)	Propiophenone	ok

เอกสารไม่ควบคุม



Chromleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

Variable Category	Report Variable	Peak Name	Status
Peak Results	Peak Width (50%)	Acetanilide	ok
	Peak Width (50%)	Acetophenone	ok
	Peak Width (50%)	Propiophenone	ok
	Left Width (0%)	Acetanilide	ok
	Left Width (0%)	Acetophenone	ok
	Left Width (0%)	Propiophenone	ok
	Right Width (0%)	Acetanilide	ok
	Right Width (0%)	Acetophenone	ok
	Right Width (0%)	Propiophenone	ok
	Peak Start	Acetanilide	ok
	Peak Start	Acetophenone	ok
	Peak Start	Propiophenone	ok
	Peak Stop	Acetanilide	ok
	Peak Stop	Acetophenone	ok
	Peak Stop	Propiophenone	ok
	Peak Start Value	Acetanilide	ok
	Peak Start Value	Acetophenone	ok
	Peak Start Value	Propiophenone	ok
	Peak Stop Value	Acetanilide	ok
	Peak Stop Value	Acetophenone	ok
	Peak Stop Value	Propiophenone	ok
	BL-Value Peak Start	Acetanilide	ok
	BL-Value Peak Start	Acetophenone	ok
	BL-Value Peak Start	Propiophenone	ok
	BL-Value Peak Stop	Acetanilide	ok
	BL-Value Peak Stop	Acetophenone	ok
	BL-Value Peak Stop	Propiophenone	ok
	Type	Acetanilide	ok
	Type	Acetophenone	ok
	Type	Propiophenone	ok
	Resolution (EP)	Acetanilide	ok
	Resolution (EP)	Acetophenone	ok
	Resolution (USP)	Acetanilide	ok
	Resolution (USP)	Acetophenone	ok
	Asymmetry (EP)	Acetanilide	ok
	Asymmetry (EP)	Acetophenone	ok
	Asymmetry (EP)	Propiophenone	ok

เอกสารไม่ควบคุม



Chromleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

Variable Category	Report Variable	Peak Name	Status
Peak Results	Asymmetry(AIA)	Acetanilide	ok
	Asymmetry(AIA)	Acetophenone	ok
	Asymmetry(AIA)	Propiophenone	ok
	Theor. Plates(EP)	Acetanilide	ok
	Theor. Plates(EP)	Acetophenone	ok
	Theor. Plates(EP)	Propiophenone	ok
	Theor. Plates(USP)	Acetanilide	ok
	Theor. Plates(USP)	Acetophenone	ok
	Theor. Plates(USP)	Propiophenone	ok
	Theor. Plates(JP)	Acetanilide	ok
	Theor. Plates(JP)	Acetophenone	ok
	Theor. Plates(JP)	Propiophenone	ok
Peak Calibration	Cal.Mode	Acetanilide	ok
	Cal.Mode	Acetophenone	ok
	Cal.Mode	Propiophenone	ok
	Cal.Type	Acetanilide	ok
	Cal.Type	Acetophenone	ok
	Cal.Type	Propiophenone	ok
	Weights	Acetanilide	ok
	Weights	Acetophenone	ok
	Weights	Propiophenone	ok
	Calibr. Coefficient C0	Acetanilide	ok
	Calibr. Coefficient C0	Acetophenone	ok
	Calibr. Coefficient C0	Propiophenone	ok
	Calibr. Coefficient C1	Acetanilide	ok
	Calibr. Coefficient C1	Acetophenone	ok
	Calibr. Coefficient C1	Propiophenone	ok
Component	RF-Value	Acetanilide	ok
	RF-Value	Acetophenone	ok
	RF-Value	Propiophenone	ok
	No. of Points	Acetanilide	ok
	No. of Points	Acetophenone	ok

เอกสารไม่ควบคุม



Chromleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

Variable Category	Report Variable	Peak Name	Status
Peak Calibration	No. of Points	Propiophenone	ok
	No. of Points(disabled)	Acetanilide	ok
	No. of Points(disabled)	Acetophenone	ok
	No. of Points(disabled)	Propiophenone	ok
	Variance	Acetanilide	ok
	Variance	Acetophenone	ok
	Variance	Propiophenone	ok
	Var.Coeff	Acetanilide	ok
	Var.Coeff	Acetophenone	ok
	Var.Coeff	Propiophenone	ok
	Std.Dev.	Acetanilide	ok
	Std.Dev.	Acetophenone	ok
	Std.Dev.	Propiophenone	ok
	Rel.Std.Dev.	Acetanilide	ok
	Rel.Std.Dev.	Acetophenone	ok
	Rel.Std.Dev.	Propiophenone	ok
	Corr.Coeff.	Acetanilide	ok
	Corr.Coeff.	Acetophenone	ok
	Corr.Coeff.	Propiophenone	ok
	R-Square	Acetanilide	ok
	R-Square	Acetophenone	ok
	R-Square	Propiophenone	ok
	Adj. R-Square	Acetanilide	ok
	Adj. R-Square	Acetophenone	ok
	Adj. R-Square	Propiophenone	ok
	X	Acetanilide	ok
	X	Acetophenone	ok
	X	Propiophenone	ok
	Y	Acetanilide	ok
	Y	Acetophenone	ok
	Y	Propiophenone	ok
	W	Acetanilide	ok
	W	Acetophenone	ok
	W	Propiophenone	ok
	F(X)	Acetanilide	ok
	F(X)	Acetophenone	ok
	F(X)	Propiophenone	ok

เอกสารไม่ควบคุม



Chromleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

Variable Category	Report Variable	Peak Name	Status
Peak Calibration	Residual for Cal.Point X	Acetanilide	ok
	Residual for Cal.Point X	Acetophenone	ok
	Residual for Cal.Point X	Propiophenone	ok
	Calibration Point Status	Acetanilide	ok
	Calibration Point Status	Propiophenone	ok
	Amount	Acetanilide	ok
	Amount	Acetophenone	ok
Component	Amount	Propiophenone	ok
	Cal.Type	Acetanilide	ok
	Peak Type	Acetanilide	ok
	Left Limit	Acetophenone	ok
	Right Limit	Acetanilide	ok
	Group	Acetanilide	ok
	Factor	Acetophenone	ok
Component	Amount	Acetanilide	ok
	Conc.Unit	Acetophenone	ok

เอกสารไม่ควบคุม



Chromleon Operational Qualification, Part 2

Most Frequently Used Parameters: Comparison with Expected Results

Variable Category	Report Variable	Peak Name	Status
Peak Purity	PPI	Acetanilide	ok
	PPI	Acetophenone	ok
	PPI	Propiophenone	ok
	RSD PPI	Acetanilide	ok
	RSD PPI	Acetophenone	ok
	RSD PPI	Propiophenone	ok
	Match	Acetanilide	ok
	Match	Acetophenone	ok
	Match	Propiophenone	ok
	RSD Match	Acetanilide	ok
	RSD Match	Acetophenone	ok
	RSD Match	Propiophenone	ok
	Rel.Max st	Acetanilide	ok
	Rel.Max st	Acetophenone	ok
	Rel.Max st	Propiophenone	ok

Test Result: Passed

เอกสารไม่ควบคุม



Chromleon Operational Qualification, Part 3

System Suitability Test: Comparison with Expected Results

Variable Category	Report Variable	Status
System Suitability	Number	ok
	Name	ok
	Inj.Condition	ok
	Eval. Formula	ok
	Operator	ok
	Statistics	ok
	Rounding	ok
	MinimumNumberOfInjections	ok
	MaximumNumberOfInjections	ok
	Channel	ok
	Peak	ok
	Ref. Value Formula 1	ok
	Ref. Value Formula 2	ok
	N.A.	ok
	Inj. Eval. Result	ok
Test Case Result	Eval. Result	ok
	Peak Result	ok
	Injection Condition Result	ok
	Ref. Value 1	ok
	Ref. Value 2	ok
	Result	ok
	Message	ok
	Average	ok
	Count	ok
	Maximum	ok
	Minimum	ok
	Range	ok
	Rel. Range	ok
	Rel. Std. Dev.	ok
	Std. Dev.	ok
	Sum	ok

Test Result: Passed

เอกสารไม่ควบคุม

PQ

Performance Qualification

IC PUMP FLOW RATE ACCURACY



IC Pump Flow Rate

Set Point (mL) (mL/min)	Reading (mL/min)	Deviation (%)	OQ Limit (%)	Result
0.5	0.4964	0.720	± 2.0	PASS
1.0	0.9958	0.42	± 2.0	PASS

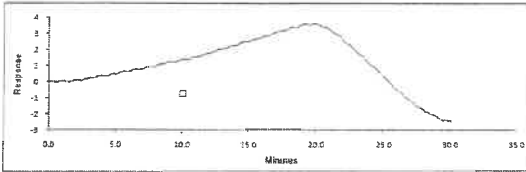
OVERALL TEST RESULT: PASS
DATE: 23-Apr-2025

Field Service Representative Signature	Customer Signature
Date: 23-Apr-2025	Date: 23-Apr-2025

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม

NOISE AND DRIFT (CD)

ThermoFisher
SCIENTIFIC

Information

System Name	AquonRFIC
Detector SN	220360045
Data Path	chrom:\desktop-c4f317\ChromleonLocal\Archemia\Service Contract\2025\1st Con 23-Apr-2025\AquonRFIC %231047\IC_OQ.smp\84.smp\ECU_1.channel\ECU_1.dhm

Noise and Drift

Test	Measured (nS)	OQ Limit (nS)	Result	Conversion Factor
Noise	0.2 nS	≤ 2.0 nS	PASS	1000
Drift	12.9 nS/hr	≤ 20.0 nS/hr	PASS	1000

OVERALL TEST RESULT: PASS

Field Service Representative Signature:	Customer Signature:
Date: 24 Apr 2025	Date:

เอกสารไม่ควบคุม

TEST EQUIPMENT AND STANDARDS

ThermoFisher
SCIENTIFIC

Test Equipment

Equipment	Manufacturer	Model	Serial Number	Cal/Ver Date	Good Until
Multimeter	Fluke	289	59270015	N/A	N/A
Thermocouple	Fluke	K-Type	59270015	N/A	N/A
Balance	Mettler-Toledo	AB204-S	1129361010	N/A	N/A
IC Qualification	Thermo Scientific	Test Box	24190332	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A

Standards/Chemicals

Description	Manufacturer	Concentration	Part Number	Lot Number	Expiration Date
Nitrate	Thermo Scientific	5 ppm	060254	241021	Oct-2025
Nitrate	Thermo Scientific	10 ppm	060254	241021	Oct-2025
Nitrate	Thermo Scientific	25 ppm	060254	241021	Oct-2025
Nitrate	Thermo Scientific	50 ppm	060254	241021	Oct-2025
Nitrate	Thermo Scientific	100 ppm	060254	241021	Oct-2025
Nitrate	Thermo Scientific	1000 ppm	060254	241021	Oct-2025
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A

Field Service Representative Signature:

Customer Signature:

Date: 24 Apr 2025	Date: 24 Apr 2025
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เอกสารไม่ควบคุม

REPEATABILITY (CD)

ThermoFisher
SCIENTIFIC

Information

System Name	AquonRFIC
Detector SN	220360045
Data Path	ChromleonLocal\Archemia\Service Contract\2025\1st Con 23-Apr-2025\AquonRFIC #1047\IC_OQ

Peak Results

Sample Name	Injection Volume (µL)	Retention Time (min)	Area
Repeatability 01	25	0.4467	3.611
Repeatability 02	25	0.4467	3.616
Repeatability 03	25	0.4467	3.607
Repeatability 04	25	0.4467	3.627
Repeatability 05	25	0.4467	3.616
Repeatability 06	25	0.4467	3.571

Repeatability

Test	Measured (% RSD)	OQ Limit (% RSD)	Result
Retention Time	0.0	≤ 5.0	PASS
Area	0.5	≤ 1.0	PASS

OVERALL TEST RESULT: PASS

Field Service Representative Signature:	Customer Signature:
Date: 24 Apr 2025	Date: 24 Apr 2025

เอกสารไม่ควบคุม

CARRYOVER (CD)

ThermoFisher
SCIENTIFIC

Information

System Name	Aquon
Detector SN	220360045
Data Path	ChromleonLocal\Archemia\Service Contract\2025\1st Con 23-Apr-2025\AquonRFIC #1047\IC_OQ

Peak Results

Sample Name	Injection Volume (µL)	Retention Time (min)	Area
Reference Blank	25	0.4467	0.056
High Standard	25	0.4463	47.903
Carryover	25	0.4467	0.06

Results

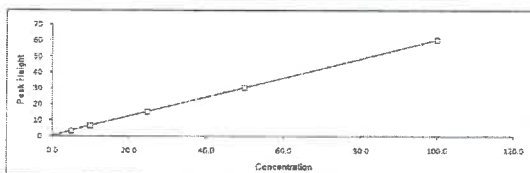
Test	Observed (%)	OQ Limit (%)	Result
AREA	0.01	≤ 0.10	PASS

OVERALL TEST RESULT: PASS

Field Service Representative Signature:	Customer Signature:
Date: 24 Apr 2025	Date: 24 Apr 2025

เอกสารไม่ควบคุม

DETECTOR LINEARITY (CD)

ThermoFisher
SCIENTIFIC

Information

System Name	Aquilon
Detector SN	220380045
Data Path	Chromleon1.local\Archemia\Service Contract\2025\1st Con 23-Apr-2025\AquilonRFIC #1047AC

Peak Results

Sample Name	Concentration	Peak Height	Calculated
Detector Linearity D1	5	3.478	5.01
Detector Linearity D2	10	6.952	10.06
Detector Linearity D3	25	15.516	25.06
Detector Linearity D4	50	30.296	49.71
Detector Linearity D5	100	60.532	100.11

Linearity

Test	Observed	OQ Limit	Result
r ²	1.000	≥ 0.999	PASS

OVERALL TEST RESULT: PASS

Field Service Representative Signature:	Customer Signature:
Date: 18 Apr 2025	Date: 18 Apr 2025

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Detector Linearity (CD) Report Page 1 of 1

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TEMPERATURE ACCURACY

ThermoFisher
SCIENTIFIC

Column Compartment

Set Point (°C)	Reading (°C)	Deviation (°C)	OQ Limit (°C)	Result
30.0	30.7	0.7	± 2.0	PASS

OVERALL TEST RESULT: PASS

Field Service Representative Signature:	Customer Signature:
Date: 18 Apr 2025	Date: 18 Apr 2025

RPG Reports v2.070
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Temperature Accuracy Report Page 1 of 1

เอกสารไม่ควบคุม

Certificate

Certificate of Standards and
Instruments for Qualification

SYSTRONICS INSLAB COMPANY LIMITED			
15/11-15, Sukhumvit Rd., Nongpho, Nongpho, Bangkok 10110, Thailand Tel: +66 (0) 261 145-4, Email: info@systronics.com			
CERTIFICATE OF CALIBRATION			
Customer Name: Archemia Lab. Co., Ltd.		Certificate No.: EL241787	
Customer Address: 39 Soi Sukhumvit 63 (Ekkamai), Sukhumvit Rd., North Klongton, Watana, Bangkok 10110		Job No.: 24110052 Page: 1 of 5	
Instrument Description: TRUE RMS MULTIMETER		Received Date: 14 Nov 2024	
Manufacturer: FLUKE		Calibrated Date: 18 Nov 2024	
Model No.: 289		Issued Date: 18 Nov 2024	
Serial Number: 59270015		Tag No.: Service: Condition As Received: Used	
Calibration Procedure: Calibration was conducted using in-house calibration procedure according to direct measurement with reference standard.			
Procedure No.: CP-EL-01, 02, 03, 04, 05, 06, 07, 10.			
Comment: 24 Apr 2025			
Reference Standards Instrument:			
Instrument Name	Model	Serial No.	Cert. No.
Multi-Function Calibrator	Fluke 5522A	2177901	EE-0033-23
			Due Date: 03 Apr 2025
Traceability Information: - Traceable to the International System of Units (SI) through the National Institute of Metrology (Thailand), NIMT.			
Environmental Conditions: Temperature: (23 ± 3) °C Relative Humidity: (50 ± 15) %			
Calibration Information: - The result of calibration was found accurate as shown on date and place of calibration only. - The reported uncertainty of measurement is based on standard uncertainty multiplied by a coverage factor k = 2, providing confidence level of approximately 95%.			
Calibrated by: Mr. Supathana Prasanna		Approved by: Mr. Tanawat Sripakdee	
This certificate may not be reproduced, except in full, without permission for the publication of an abstract is obtained in writing from the calibration organization issuing this report.			

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เอกสารไม่ควบคุม

SYSTRONICS INSLAB COMPANY LIMITED
19/11-12, Sukhumvit Rd., Nongprue, Bang Phay, Rayong 21160, Thailand
Tel: 06338 884 145-6, Email: calibration@systronics.co.th

CERTIFICATE OF CALIBRATION

Certificate No. **EL241787**
Page **2 of 5**

Range	Standard Value	UUC*Reading	Error	(±) Uncertainty
Function : DC Voltage Measurement (Without Adjustment)				
50 mV	0.0000 mV	0.000 mV	0.000 mV	0.0016 mV
50 mV	3.0000 mV	4.995 mV	-0.005 mV	0.0016 mV
50 mV	45.0000 mV	44.995 mV	-0.005 mV	0.0022 mV
50 mV	450.0000 mV	449.995 mV	-0.005 mV	0.0022 mV
500 mV	50.0000 mV	50.000 mV	0.000 mV	0.0061 mV
500 mV	450.0000 mV	449.98 mV	-0.02 mV	0.0080 mV
500 mV	450.0000 mV	449.99 mV	0.01 mV	0.0080 mV
5 V	0.50000 V	0.5000 V	0.0000 V	0.000099 V
5 V	4.50000 V	4.4997 V	-0.0003 V	0.000082 V
5 V	4.50000 V	4.4997 V	-0.0003 V	0.000082 V
50 V	5.00000 V	5.000 V	0.000 V	0.00009 V
50 V	45.0000 V	44.997 V	-0.003 V	0.00095 V
50 V	45.0000 V	44.997 V	0.003 V	0.00095 V
500 V	50.0000 V	50.00 V	0.00 V	0.0009 V
500 V	450.0000 V	449.97 V	-0.03 V	0.0009 V
500 V	450.0000 V	449.97 V	0.03 V	0.0009 V
1000 V	100.0000 V	100.0 V	0.0 V	0.008 V
1000 V	900.000 V	900.0 V	0.0 V	0.060 V
1000 V	900.000 V	900.0 V	0.0 V	0.060 V
Function : DC Voltage Measurement LoZ (Without Adjustment)				
1000 V	0.0000000 V	0.0 V	0.0 V	0.058 V
1000 V	100.0000 V	100.1 V	0.1 V	0.058 V
1000 V	900.000 V	900.8 V	0.8 V	0.060 V
1000 V	900.000 V	900.8 V	-0.8 V	0.060 V
Function : AC Voltage Measurement (Without Adjustment)				
50 mV	5.0000 mV	4.988 mV	-0.012 mV	0.0053 mV
50 mV	45.0000 mV	45.003 mV	0.003 mV	0.013 mV
500 mV	50.0000 mV	49.94 mV	-0.06 mV	0.014 mV
500 mV	450.0000 mV	450.13 mV	0.13 mV	0.11 mV
5 V	0.50000 V	0.4986 V	-0.0014 V	0.00012 V
5 V	4.50000 V	4.5012 V	0.0012 V	0.0011 V
50 V	5.00000 V	4.988 V	-0.012 V	0.0012 V
50 V	45.0000 V	45.012 V	0.012 V	0.0085 V
500 V	50.0000 V	49.88 V	-0.12 V	0.011 V
500 V	450.000 V	450.16 V	0.16 V	0.12 V
1000 V	100.000 V	100.0 V	0.0 V	0.060 V
1000 V	900.000 V	900.4 V	0.4 V	0.23 V

Remarks : (*) UUC : Unit Under Calibration

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SYSTRONICS INSLAB COMPANY LIMITED
19/11-12, Sukhumvit Rd., Nongprue, Bang Phay, Rayong 21160, Thailand
Tel: 06338 884 145-6, Email: calibration@systronics.co.th

CERTIFICATE OF CALIBRATION

Certificate No. **EL241787**
Page **3 of 5**

Range	Standard Value	UUC*Reading	Error	(±) Uncertainty
Function : AC Voltage Measurement LoZ (Without Adjustment)				
1000 V	100.000 V	100.4 V	0.4 V	0.060 V
1000 V	900.00 V	905.7 V	5.7 V	0.23 V
Function : DC Current Measurement (Without Adjustment)				
500 uA	0.000 uA	0.00 uA	0.00 uA	0.017 uA
500 uA	50.000 uA	49.99 uA	-0.01 uA	0.023 uA
500 uA	450.00 uA	449.95 uA	-0.05 uA	0.078 uA
5000 uA	500.00 uA	500.0 uA	0.0 uA	0.097 uA
5000 uA	4500.0 uA	4499.4 uA	-0.6 uA	0.57 uA
50 mA	5.0000 mA	5.001 mA	0.001 mA	0.00082 mA
50 mA	45.0000 mA	44.996 mA	-0.004 mA	0.0058 mA
400 mA	40.0000 mA	39.99 mA	-0.01 mA	0.0077 mA
400 mA	350.000 mA	359.99 mA	9.99 mA	0.290 mA
5 A	0.50000 A	0.5001 A	0.0001 A	0.00013 A
5 A	4.5000 A	4.4991 A	-0.0009 A	0.00022 A
10 A	1.00000 A	1.000 A	0.000 A	0.00061 A
10 A	9.0000 A	8.999 A	-0.002 A	0.0040 A
Function : AC Current Measurement (Without Adjustment)				
500 uA	50.00 uA	49.82 uA	-0.18 uA	0.13 uA
500 uA	450.00 uA	449.85 uA	-0.15 uA	0.48 uA
5000 uA	500.00 uA	499.8 uA	-0.2 uA	0.51 uA
5000 uA	4500.0 uA	4501.0 uA	1.0 uA	3.1 uA
50 mA	5.0000 mA	4.988 mA	-0.012 mA	0.0032 mA
50 mA	45.0000 mA	44.981 mA	-0.019 mA	0.031 mA
400 mA	40.0000 mA	39.96 mA	-0.04 mA	0.028 mA
400 mA	350.000 mA	360.13 mA	10.13 mA	0.22 mA
5 A	0.50000 A	0.4990 A	-0.0010 A	0.00028 A
5 A	4.5000 A	4.4972 A	-0.0028 A	0.00058 A
10 A	1.00000 A	1.000 A	0.000 A	0.00075 A
10 A	9.0000 A	8.999 A	-0.001 A	0.0038 A

Remarks : (*) UUC : Unit Under Calibration

S. Inthasri
24 Apr 2015

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SYSTRONICS INSLAB COMPANY LIMITED
19/11-12, Sukhumvit Rd., Nongprue, Bang Phay, Rayong 21160, Thailand
Tel: 06338 884 145-6, Email: calibration@systronics.co.th

CERTIFICATE OF CALIBRATION

Certificate No. **EL241787**
Page **4 of 5**

Range	Standard Value	UUC*Reading	Error	(±) Uncertainty
Function : Resistance Measurement (Without Adjustment)				
500 Ω	0.0000 Ω	0.00 Ω	0.00 Ω	0.0075 Ω
500 Ω	50.0000 Ω	49.99 Ω	-0.01 Ω	0.0084 Ω
500 Ω	450.000 Ω	449.93 Ω	-0.07 Ω	0.017 Ω
5 kΩ	0.500000 kΩ	0.4999 kΩ	-0.0001 kΩ	0.000060 kΩ
5 kΩ	4.50000 kΩ	4.4986 kΩ	-0.0014 kΩ	0.00017 kΩ
50 kΩ	5.00000 kΩ	5.000 kΩ	0.000 kΩ	0.00060 kΩ
50 kΩ	45.0000 kΩ	45.001 kΩ	0.001 kΩ	0.0017 kΩ
500 kΩ	50.0000 kΩ	49.99 kΩ	-0.01 kΩ	0.0060 kΩ
500 kΩ	450.000 kΩ	449.87 kΩ	-0.13 kΩ	0.018 kΩ
5 MΩ	0.500000 MΩ	0.4998 MΩ	-0.0002 MΩ	0.000061 MΩ
5 MΩ	4.50000 MΩ	4.4981 MΩ	-0.0019 MΩ	0.000056 MΩ
30 MΩ	3.000000 MΩ	3.000 MΩ	0.000 MΩ	0.000061 MΩ
30 MΩ	27.00000 MΩ	26.987 MΩ	-0.013 MΩ	0.0075 MΩ
50 MΩ	5.00000 MΩ	5.00 MΩ	0.00 MΩ	0.00099 MΩ
50 MΩ	45.0000 MΩ	44.97 MΩ	-0.03 MΩ	0.021 MΩ
100 MΩ	10.00000 MΩ	10.0 MΩ	0.0 MΩ	0.0058 MΩ
100 MΩ	90.00000 MΩ	89.9 MΩ	-0.1 MΩ	0.099 MΩ
500 MΩ	250.0000 MΩ	249.4 MΩ	-0.6 MΩ	0.68 MΩ
500 MΩ	450.0000 MΩ	448.0 MΩ	-2.0 MΩ	5.9 MΩ
Function : Resistance Measurement LoZ (Without Adjustment)				
50 Ω	0.0000 Ω	0.000 Ω	0.000 Ω	0.0047 Ω
50 Ω	5.0000 Ω	5.004 Ω	0.004 Ω	0.0049 Ω
50 Ω	25.0000 Ω	24.995 Ω	-0.005 Ω	0.0057 Ω
50 Ω	45.0000 Ω	44.993 Ω	-0.007 Ω	0.0060 Ω
Function : Capacitance Measurement (Without Adjustment)				
1 nF	0.0000 nF	0.000 nF	0.000 nF	0.0078 nF
1 nF	0.5000 nF	0.499 nF	-0.001 nF	0.0098 nF
1 nF	0.5000 nF	0.898 nF	0.398 nF	0.012 nF
10 nF	1.0000 nF	1.00 nF	0.00 nF	0.013 nF
10 nF	9.0000 nF	9.00 nF	0.00 nF	0.029 nF
100 nF	10.0000 nF	10.0 nF	0.0 nF	0.064 nF
100 nF	90.0000 nF	90.0 nF	0.0 nF	0.29 nF
1 uF	0.100000 uF	0.100 uF	0.000 uF	0.00064 uF
1 uF	0.900000 uF	0.900 uF	0.000 uF	0.0029 uF
10 uF	1.00000 uF	1.00 uF	0.00 uF	0.0064 uF
10 uF	9.0000 uF	9.00 uF	0.00 uF	0.028 uF
100 uF	10.0000 uF	10.0 uF	0.0 uF	0.064 uF
100 uF	90.000 uF	90.0 uF	0.0 uF	0.42 uF
1000 uF	100.000 uF	100 uF	0 uF	0.72 uF
1000 uF	900.00 uF	899 uF	-1 uF	4.2 uF
10 mF	1.00000 mF	1.00 mF	0.00 mF	0.0072 mF
10 mF	9.0000 mF	9.00 mF	0.00 mF	0.043 mF
100 mF	10.0000 mF	10.0 mF	0.0 mF	0.072 mF
100 mF	90.000 mF	89.8 mF	-0.2 mF	0.89 mF

Remarks : (*) UUC : Unit Under Calibration

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SYSTRONICS INSLAB COMPANY LIMITED
19/11-12, Sukhumvit Rd., Nongprue, Bang Phay, Rayong 21160, Thailand
Tel: 06338 884 145-6, Email: calibration@systronics.co.th

CERTIFICATE OF CALIBRATION

Certificate No. **EL241787**
Page **5 of 5**

Range	Standard Value	Required UUC*Reading	UUC*Reading	Error	(±) Uncertainty
Function : Frequency Measurement (Without Adjustment)					
100 Hz	10.00 Hz	1 V	10.000 Hz	0.000 Hz	0.00059 Hz
100 Hz	90.00 Hz	1 V	90.000 Hz	0.000 Hz	0.00066 Hz
1000 Hz	100.00 Hz	1 V	100.00 Hz	0.00 Hz	0.0008 Hz
1000 Hz	900.0 Hz	1 V	900.00 Hz	0.00 Hz	0.0061 Hz
10 kHz	1.0000 kHz	1 V	1.0000 kHz	0.0000 kHz	0.000058 kHz
10 kHz	9.0000 kHz	1 V	9.0000 kHz	0.0000 kHz	0.000077 kHz
100 kHz	10.000 kHz	1 V	10.000 kHz	0.000 kHz	0.000058 kHz
100 kHz	90.000 kHz	1 V	90.000 kHz	0.000 kHz	0.000058 kHz
1000 kHz	100.00 kHz	1 V	100.00 kHz	0.00 kHz	0.00058 kHz
1000 kHz	900.0 kHz	1 V	900.0 kHz	0.00 kHz	0.0009 kHz
Function : Thermocouple Measurement K Type (Without Adjustment)					
-200 to 1350 °C	-5.550 mV	-180.0 °C	-178.6 °C	1.4 °C	0.37 °C
-200 to 1350 °C	0.000 mV	0.0 °C	0.6 °C	0.6 °C	0.24 °C
-200 to 1350 °C	4.095 mV	100.0 °C	100.6 °C	0.6 °C	0.22 °C
-200 to 1350 °C	24.905 mV	600.0 °C	600.6 °C	0.6 °C	0.22 °C
-200 to 1350 °C	37.325 mV	900.0 °C	900.6 °C	0.6 °C	0.22 °C
-200 to 1350 °C	48.338 mV	1200.0 °C	1200.7 °C	0.7 °C	0.23 °C

Remarks : (*) UUC : Unit Under Calibration

END OF CALIBRATION

S. Inthasri
24 Apr 2015

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Certificate of Completion

This certifies that

Saharat Popayom

Has successfully completed

OJT RPG Mentoring: Ion Chromatography System
Qualification/Service Training

ออกใบรับรอง
สำเร็จ
24 Apr 2024

Valid for 3 years from:
Aug 28/2024

Issued electronically and
approved by:
Thermo Fisher University LMS
Certification Management and
Compliance Group
lms.training@thermofisher.com

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Certificate of Analysis

Better Separations Through
Better Chemistry

Dionex Nitrate OQ/PQ IC Standards Kit (Set of 6)

Product Number: 060254
Certificate of Analysis

Lot Number: 241021

Expiration of Certification
October 2025

The Dionex Nitrate Standard was developed to aid the analysis of anions by Ion Chromatography (IC). The single-ion standard was prepared by the dissolution of high-purity salt in 218.2 megohm deionized water, which was tested by IC for ionic contaminants. The bottle label states the nominal concentration value of the ionic component for informational purposes only. The actual ion concentration value was determined by Ion Chromatography. The IC system was standardized using the National Institute of Standards & Technology (NIST), Standard Reference Material, SRM 3185 (Nitrate Standard Solution). Actual concentration values determined for the single-ion is listed below.

Dionex Nitrate Standard

Vial #	Concentration (mg/L)
1	4.95 ± 0.09
2	9.97 ± 0.02
3	25.33 ± 0.12
4	50.46 ± 0.28
5	101.4 ± 1
6	1004 ± 4

Signature
24 Apr 2024

The concentration value is based on a proven reliable method of analysis. The estimated uncertainties are two standard deviations of the concentration value. The concentration value is warranted to be stable for one year from the date of manufacture.

The preparation and analyses of the Dionex Nitrate Standard was performed with extreme care by Thermo Scientific Corporation Consumables Manufacturing Department in Sunnyvale California.

Document T-1, 075090-01

20-Dec-2011

thermoscientific.com/dionex
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JUG21549-BH 02/15 02/15/11

Thermo Fisher Scientific
12201 Timberly
P.O. Box 1000
San Jose, CA 95126-1000
408.737.0700

thermo
scientific

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Certificate of Calibration

Aquion: (Anion System ID#1047)

This certificate is to verify that instrument below are calibrated

By Archemica Lab Co., Ltd.

Aquion S/N: 220380031
AS-DV S/N: 2203880133

For
UAE Consultant Co., Ltd.

Operator Signature: Saharat Popayom Date: Apr 23-24, 2025

(Mr. Saharat Popayom)

Test Engineer

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Certificate of Calibration

Cert.No.: 25CH408
Page.: 1 of 3

Equipment : pH Meter
Manufacturer : EcoSense
Model : pH100A
Serial No. : JC04744
ID No. : UAE.EFM.058/2566 (EFM.pH.01/66)
Condition As-Received: Used Item
Received Date : 01 April 2025
Calibration Date : 03 April 2025
Reference : 2504-0031WSC-1
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangchak,
Phraekhanong, Bangkok 10260
Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In - house method :
- CP-CH5 by direct measurement with DC voltage
standard and direct measurement with
certified reference material (CRM)
- CP-CH8 by comparison with temperature standard

Calibrated by : Walelek Sirithean

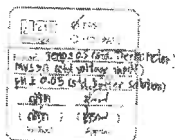
Approved by : _____
Approved Signatory

() Chakrit Weewwanjua
() Ponpan Palpim
(✓) Seithip Meangmai

Issue Date : 4 April 2025

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

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



Cert.No.: 25CH408
Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030049	130RC116	24E2759	25 Aug 2025
2) Ref. Standard Thermometer	4982054	110RC044	24I757	14 July 2025

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

2. Certified Reference Materials

:The measurement results are traceable to SI through Hach Lange GmbH Ltd.,
Deutsche Akkreditierungsstelle, Accredited No.D-RM-15184-01-03
:The measurement results are traceable to SI through CPA chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.007	CPA chem	1068665	18 Jan 2027
pH 6.999	Hach Lange GmbH	C03220	29 Oct 2026
pH 10.010	CPA chem	1068669	18 Jan 2026

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

Calibration Results

Function : mV Measurement

Performing standard curve by Document Process Calibrator at pH (4,7)(7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement { ±mV }	Coverage factor k
	pH	mV	mV	pH		
pH Meter S/N.: JC04744	4.00	177.48	177	4.01	0.58	2.00
	7.00	0.00	0	7.00	0.58	2.00
	7.00	0.00	0	7.00	0.58	2.00
	10.00	-177.48	-177	10.01	0.58	2.00



Cert.No.: 25CH408
Page.: 3 of 3

Calibration Results

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4,7)(7,10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (±)	Coverage factor k
pH Electrode S/N.: 240710SIA805377	4.007	4.01	173	0.0085	2.05
	6.999	7.00	-2	0.0095	2.00
	6.999	7.00	-2	0.0085	2.00
	10.010	10.00	-176	0.0095	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : _____
- Serial No. : 240710SIA805377
- Dimension of probe
- Length : 110 mm.
- Diameter : 12 mm.
- Immersion Depth : 100 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor k
15.0	15.000	14.9	-0.100	0.13	2.00
30.0	30.001	29.9	-0.101	0.13	2.00
45.0	45.002	45.0	-0.002	0.13	2.00

Remark : - UUC* = Unit Under Calibration

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



Cert.No.: 25TW29
 Page.: 1 of 2

Equipment : DO Meter

Manufacturer : YSI

Model : 5100

Serial No. : 11B 101863

ID No. : UAE.WAO.004/2554

Received Date : 14 February 2025


Test Date : 17 February 2025

Reference : 2502-0473DSC-1

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

Laboratory Condition : Temperature { 25 ± 5 } °C
Humidity { 50 ± 20 } %
in - house method : CP-CH8
by Comparison Technique with Azide Modification Method

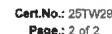
Tested by : Weisak Sirthean

Approved by : 
Approved Signatory

{ } Chakrit Waeewwanjua
{ } Nonpan Palpin
(✓) Sathip Meangmai

Issue Date : 18 February 2025

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Condition of this result of calibration

- | | | | | |
|---|---------------------|----------------|------------------------|-----------------|
| <p>1. Reference Standard Instruments :</p> <p>This certification is traceable to the International System of Unit through the reference standards laboratory of Industrial Calibration Center, Technology Promotion Association (Thailand-Japan).</p> | | | | |
| <u>Instruments</u> | <u>Serial No.</u> | <u>ID No.</u> | <u>Certificate No.</u> | <u>Due Date</u> |
| 1. Burette | - | 130BU10 | 23CS1172 | 22 Mar 2026 |
| 2. Balance | 14233821 | 110RC001 | 24MM131 | 04 July 2025 |
| <p>2. Standard Material :-</p> | | | | |
| <u>Material</u> | <u>Manufacturer</u> | <u>Lot.No.</u> | <u>Assay</u> | |
| Sodium Trisulfate 5-Hydrate AR | KEMAU | 2203152447 | 99.6% | |

Result : Dissolved Oxygen Meter Adjustment With Air 100 %
Dissolved Oxygen Probe No.: 24F100202

Titration Method (Azide Modification Method) (mg/L)	DQ Meter Reading (mg/L)	Standard Deviation (mg/L)
8.22	8.22	0.0055

This report was certified only for the instrument we tested. It is allowable to use for study intend to use for advertising and referral purpose is prohibited. This report may not be reproduced other in full, without written approval of the laboratory

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Validation of Pyranolysin Assay (Verification of Certificate)						
Certificate No.: 251W29		Equipment: Do Meter				
Brand : YSI		Model: 5110				
Serial No.: 118 101863		ID No.: UAE-WMO-004/2554				
Calibration results						
Titration Method	Standard Deviation (mg/L)	DO meter Reading (mg/L)	Error %	Corrected DO (mg/L)	Total Error (mg/L)	judgment (Total Error < Acceptance) (mg/L)
R.21	0.0055	8.22	0.0003	0.0003	0.0	0.02
Operator : Sanyuqi, sanyuqi		Date : 2024.03.14		Signature : Sanyuqi		
Infl. : 2024/2/28		Infl. : 2024.03.14		Infl. : 2024.03.14		

เอกสารไม่ควบคุม

Use Form 4 (050)-10/2004-04-2073

Customer Service Report

Date:	July 5, 2024	Customer:	VAE																			
Job No.:	8315	Address:	Bangkok																			
Instrument:	836 Distributor	Serial:	9405393																			
<table border="1"> <tr> <th colspan="2">Travel To Customer (Hrs)</th> </tr> <tr> <td>08.30</td><td>1</td> </tr> <tr> <td>09.30</td><td></td> </tr> </table>		Travel To Customer (Hrs)		08.30	1	09.30		<table border="1"> <tr> <th colspan="2">Labour (Hrs)</th> </tr> <tr> <td>09.30</td><td>5</td> </tr> <tr> <td>14.30</td><td></td> </tr> </table>		Labour (Hrs)		09.30	5	14.30		<table border="1"> <tr> <th colspan="2">Travel From Customer (Hrs)</th> </tr> <tr> <td>14.30</td><td>1.5</td> </tr> <tr> <td>15.00</td><td></td> </tr> </table>	Travel From Customer (Hrs)		14.30	1.5	15.00	
Travel To Customer (Hrs)																						
08.30	1																					
09.30																						
Labour (Hrs)																						
09.30	5																					
14.30																						
Travel From Customer (Hrs)																						
14.30	1.5																					
15.00																						
Start																						
Finish																						
Job Type																						
Application	Special	Standard																				
Distributor	Courtesy Visit	Installation	Training																			
Digital Service	PMA Onboarding	Quote	In House																			
Internal	Warranty	Repair	PM																			
Investigate	Sales Support	Remote	Health Check Visit																			
PMA Type																						
	Smartcare	Smartcare Pro	Postcare																			
	Smartcare Advance	Foscare Pro	N/A																			
Details of Work / Test																						
<p>- PMA</p> <p>- Visual Check</p> <p>+ No leak</p> <p>+ No damage</p> <p>- Change PM Kit</p> <p>- Function Check</p> <p>+ Rotation</p> <p>+ Manual</p> <p>+ Specifier</p> <p>+ PMA / Valve</p> <p>Follow up</p>																						
Instrument Ready for Use																						
OK																						
Not OK*																						
Part No:	Batch	Description	Qty																			
03.01.2024	03.01.2024	PM kit 836	1																			

I confirm this report is accurate and complete			
Signed FOSS		Signed Customer	
Name	Donal S. Smith	Name	
Email:		Customer Contact:	
*Remarks:		เอกสารแนบ	

เอกสารไม่ควบคุม

Certificate of Calibration

Certificate No.: 250422-1-BL002-25
Code No.: BL002-25

Page: 1 of 3

Customer Name: United Analyst and Engineering Consultant Co., Ltd.
Address: 3 Soi Udom suk 41, Sukhumvit Rd., Bang Chak, Phra Khanong, Bangkok 10260

Equipment: Electronic Balance
Manufacturer: Mettler Toledo
Model: AB204-S/FACT
Serial No.: 1129361010
Asset No.: UAE.WAS.002/2552

Building: N/A Floor: 1 Room: 107

Received Date: April 22, 2025

Date of Calibration: April 23, 2025

Calibration Conditions: Temperature 22.8 °C to 23.4 °C
Humidity 54.8 % to 68.9 %
Pressure 756.6 mmHg to 758.2 mmHg

Calibrated by: Sakkarin Srirahang

Approved by: Suwit Chotnok

Signature:

Issued Date: April 25, 2025

- Note : 1) The Uncertainties are for a confidence probability of approximately 95%
2) This Certificate is valid only to the item calibrated on date and place of calibration.
3) 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 United Analyst and Engineering Consultant Co., Ltd. (UAE)

เอกสารไม่ควบคุม

Certificate No.: 250422-1-BL002-25

Code No.: BL002-25

Page: 2 of 3

Equipment: Electronic Balance
Manufacturer: Mettler Toledo
Model: AB204-S/FACT
Serial No.: 1129361010
Max. Capacity: 220 g
Calibration Date: April 23, 2025
Condition As-Received: In Condition

Condition of Equipment:

Condition of This Result of Calibration:

1. Calibration Method: This instrument was calibrated by method UAE.CT.CAL.066 In-House Method based on UKAS Lab 14 : 2022

2. Reference Standards:

Reference Standards	Model	Serial No.	Calibrated By	Certificate No.	Traceability	Due Date
Standard Weight Class E2 (200g)	1 mg to 1 kg	8789109172	AMARC	25-009559	Mettler Toledo	21-Jan-27
Standard Weight Class F1 (200g)	1 mg to 200 g	11119512	AMARC	24-013680	Mettler Toledo	04-Feb-25
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Traceability	Due Date
Thermo-Hygro-Baro Meter	MHB382SD	AK46457	SUCCESS	2644-00997/67	Success Gateway	21-Nov-25
Thermo-Hygro-Baro Meter	MHB382SD	AK46457	TPA	25FT95	TPA	25-Feb-26

3. This certification is traceable to SI Unit

4. This certification 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. Through the reference standard laboratory of AMARC 25-009559 Calibration 0152

Calibration Result:

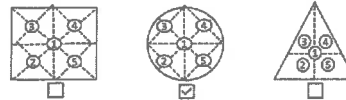
1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
200g	0.000045

2. Eccentric or off-center loading

A mass of 100 g was placed and moved to various position on pan

The Balance reading obtained is given in the table.



1 (g)	2 (g)	3 (g)	4 (g)	5 (g)	Maximum Difference (g)
100.0000	99.9996	99.9997	100.0003	100.0005	0.0005

เอกสารไม่ควบคุม

Certificate No.: 250422-1-BL002-25

Code No.: BL002-25

Page: 3 of 3

Equipment: Electronic Balance
Manufacturer: Mettler Toledo
Model: AB204-S/FACT
Serial No.: 1129361010
Max. Capacity: 220 g
Calibration Date: April 23, 2025

Calibration Result: (Continued)

Calibration Range: 0 - 200 g

Calibration Adjustment: Internal Calibration

3. Error of indication from nominal or conventional mass value:

Nominal Value (g)	Reference Value (g)	Indication (g)	Correction (g)	Uncertainty (± mg)	Coverage Factor k
Unloaded	0.0000000	0.0000	0.0000	0.10	2.05
0.01	0.0100025	0.0099	0.0001	0.10	2.05
0.05	0.0500056	0.0500	0.0000	0.10	2.05
0.1	0.1000012	0.0999	0.0001	0.10	2.05
0.5	0.5000133	0.5000	0.0000	0.10	2.05
1	1.0000105	1.0000	0.0000	0.10	2.05
10	10.000010	10.0000	0.0000	0.11	2.04
40	40.000076	40.0000	0.0000	0.14	2.00
50	50.000056	50.0000	0.0001	0.15	2.00
80	80.000107	80.0000	0.0001	0.18	2.00
100	100.000109	99.9999	0.0002	0.17	2.00
120	120.00015	119.9999	0.0003	0.21	2.00
150	150.000165	149.9998	0.0003	0.24	2.00
160	160.000175	159.9997	0.0003	0.26	2.00
200	200.000129	199.9998	0.0004	0.50	2.00

4. Effect of Tare test:

Tare Load (g)	Test Load (g)	Indication (g)	Correction (g)
100	20.000041	19.9999	0.0001
	40.000076	39.9998	0.0002
	60.000056	59.9997	0.0003
	80.000107	79.9999	0.0002
	100.000168	100.0004	-0.0003

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

เอกสารไม่ควบคุม

o-o-End-o-o

Calibration Certificate

Certificate No.: 2502226-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road, Bangchack, Phra Khanong, Bangkok 10260

Page 1 of 4

Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR20SDU
Serial No.: C009071872
ID No.: UAE.WAO.012/2563

Order No.: 2502226
Operation No.: 2502226-001
Date of Receipt: 19 March 2025
Date of Calibration: 20 March 2025

Calibrated by Mr.Yothin Charoensuk Scientist
Approved by (Mr. Pharesphet Tuanjit)
Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team
Date of Issue: 25 March 2025

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.

EC-009 Revision 01 Date: 20-04-05

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2502226-001-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Resolution: 0.0001 g / 0.0001 g
Serial No.: C09071872
ID No.: UAE.WAO.012/2503
Capacity: 82 g / 220 g

Date of Calibration: 20 March 2025
Environment Condition: Ambient Temperature: 21.2 ± 0.6 °C Relative Humidity: 48 ± 3.5 %
Place of Calibration: XSR 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 W-01-001 In-house Method based on ISO 17025 Lab 14 : 2019

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1mg to 200g	B59557572	TCS	M24041005	19 April 2025
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermohygro Meter	606-H1	NFI 6TH 017/23	Quality Person	QK25-0542	10 February 2025

3. This certification is traceable to SI UNIT

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

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

Calibration Results:

1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
40	0.000052
80	0.000042
100	0.000026
200	0.000000

2. Off-Center Error:

A mass of 100 g was placed and moved to various position on pan.

The balance reading obtained is given in the table.

						(Maximum Difference)
1	2	3	4	5	6	(g)
100.0001	100.0001	100.0001	100.0001	100.0001	100.0002	0.0001

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

2008 มหานครพัฒนา จำกัด 36 หมู่ 8 ตำบลบางพลีใหญ่ อำเภอบางพลี จังหวัดสมุทรปราการ 10710
2008 So. 36, Anur Anant Road, Bang M. Khan Subdistrict, Bang Phra District, Bangkok 10710, Thailand
โทร: +662 020 8558 โทร: +662 020 8555



Calibration Report

Certificate No.: 2502226-001-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Resolution: 0.0001 g / 0.0001 g
Serial No.: C09071872
ID No.: UAE.WAO.012/2503
Capacity: 82 g / 220 g

Date of Calibration: 20 March 2025
Calibration Results: (Continued)
Calibration Range: 0-80 g
Calibration Adjustment: Internal Calibration
3. Departure from Nominal Value: (Range: 0 - 82 g ; Resolution: 0.0001 g)

Nominal Value	Standard Value	Average Reading	Correction	Uncertainty	Coverage Factor
0	0.000000	0.00000	0.00000	0.0000004	2.00
0.001	0.001003	0.00100	0.00000	0.0000002	2.00
0.002	0.002002	0.00200	0.00000	0.0000002	2.00
0.01	0.010002	0.01000	0.00000	0.0000001	2.00
0.05	0.049995	0.05000	0.00000	0.0000001	2.00
0.1	0.100011	0.10000	0.00001	0.0000011	2.00
0.5	0.500016	0.50000	0.00002	0.0000014	2.00
1	1.000002	1.00001	-0.00001	0.0000016	2.00
2	2.000023	2.00005	-0.00003	0.0000017	2.00
5	5.000015	5.00005	-0.00004	0.0000021	2.00
10	10.000049	10.00005	-0.00004	0.0000026	2.00
20	20.000030	20.00012	-0.00009	0.0000037	2.00
30	30.000019	30.00012	-0.00009	0.0000050	2.00
50	50.000024	50.00014	-0.00011	0.0000066	2.00
80	80.000067	80.00020	-0.00013	0.000011	2.00

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

2008 มหานครพัฒนา จำกัด 36 หมู่ 8 ตำบลบางพลีใหญ่ อำเภอบางพลี จังหวัดสมุทรปราการ 10710
2008 So. 36, Anur Anant Road, Bang M. Khan Subdistrict, Bang Phra District, Bangkok 10710, Thailand
โทร: +662 020 8558 โทร: +662 020 8555



Calibration Report

Certificate No.: 2502226-001-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Resolution: 0.0001 g / 0.0001 g
Serial No.: C09071872
ID No.: UAE.WAO.012/2503
Capacity: 82 g / 220 g

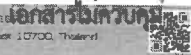
Date of Calibration: 20 March 2025
Calibration Results: (Continued)
Calibration Range: > 80-200 g
Calibration Adjustment: Internal Calibration
3. Departure from Nominal Value: (Range: > 80 - 200 g ; Resolution: 0.0001 g)

Nominal Value	Standard Value	Average Reading	Correction	Uncertainty	Coverage Factor
90	90.00010	90.0002	-0.0001	0.000013	2.00
100	100.00006	100.0001	0.00004	0.000016	2.00
110	110.00007	110.0001	0.00003	0.000017	2.00
120	120.00009	120.0002	-0.0001	0.000018	2.00
130	130.00010	130.0002	-0.0001	0.000019	2.00
140	140.00013	140.0002	-0.0001	0.000019	2.00
150	150.00009	150.0002	-0.0001	0.000021	2.00
160	160.00010	160.0002	-0.0001	0.000022	2.00
170	170.00012	170.0002	-0.0001	0.000023	2.00
200	200.00013	200.0002	-0.0001	0.000026	2.00

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

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

2008 มหานครพัฒนา จำกัด 36 หมู่ 8 ตำบลบางพลีใหญ่ อำเภอบางพลี จังหวัดสมุทรปราการ 10710
2008 So. 36, Anur Anant Road, Bang M. Khan Subdistrict, Bang Phra District, Bangkok 10710, Thailand
โทร: +662 020 8558 โทร: +662 020 8555



Calibration Certificate

Certificate No.: 2502226-002-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomsak 41, Sukhumvit Road, Bangchack, Prakhonong, Bangkok 10260

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: XSR205DU

Serial No.: C210685394

ID No.: UAE.WAO.010/2505

Order No.: 2502226

Operation No.: 2502226-002

Date of Receipt: 19 March 2025

Date of Calibration: 20 March 2025

Calibrated by Mr.Yothin Charoensuk
Scientist

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

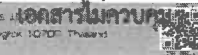
Date of Issue: 25 March 2025

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

2008 มหานครพัฒนา จำกัด 36 หมู่ 8 ตำบลบางพลีใหญ่ อำเภอบางพลี จังหวัดสมุทรปราการ 10710
2008 So. 36, Anur Anant Road, Bang M. Khan Subdistrict, Bang Phra District, Bangkok 10710, Thailand
โทร: +662 020 8558 โทร: +662 020 8555





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



Calibration Report

Certificate No.: 2502226-002-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Resolution: 0.0001 g / 0.0001 g
Serial No.: C210685394
ID No.: UAE.WAO.0102565
Capacity: 82 g / 220 g

Date of Calibration: 20 March 2025 Page 2 of 4

Environment Condition: Ambient Temperature: 21.2 ± 0.6 °C Relative Humidity: 49 ± 3.5 %

Place of Calibration: 209 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 W-MA-001 In-House Method based on UKAS Lab 14 : 2015

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1mg to 200g	8505567072	TCS	M24041005	19 April 2025
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	608-H1	NFLBTH 017723	Quality Room	QR23-0542	10 February 2026

3. This certification is traceable to SI UNIT

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

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

Calibration Results:

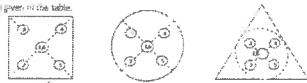
1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
40	0.000002
80	0.000002
100	0.000009
200	0.000009

2. Off-Center Error:

A mass of 100 g was placed and moved to various position on pan

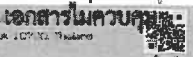
The balance reading obtained is given in the table.



1	2	3	4	5	6	(Maximum Difference)
(g)	(g)	(g)	(g)	(g)	(g)	(g)
100.0001	100.0001	100.0001	100.0001	100.0001	100.0001	0.0000

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

20009 Pattanakarn Road, Bang Khen Subdistrict, Bang Phli District, Bangkok 10710, Thailand
Tel: +662-012-86608 Fax: +662-012-86605



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



Calibration Report

Certificate No.: 2502226-002-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Resolution: 0.0001 g / 0.0001 g
Serial No.: C210685394
ID No.: UAE.WAO.0102565
Capacity: 82 g / 220 g

Date of Calibration: 20 March 2025 Page 3 of 4

Calibration Results: (Continued)

Calibration Range: 0-80 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 0 - 82 g; Resolution: 0.00001 g)

Nominal Value	Standard Value	Average Reading	Correction	Uncertainty	Coverage Factor
(g)	(g)	(g)	(g)	(g)	(g)
Unloaded	0.000000	0.000000	0.000000	0.00000087	2.00
0.001	0.001003	0.001000	-0.000003	0.00000099	2.00
0.005	0.005000	0.005000	-0.000000	0.00000092	2.00
0.01	0.010003	0.010002	-0.000002	0.00000089	2.00
0.05	0.049995	0.050001	-0.000001	0.00000095	2.00
0.1	0.100011	0.100002	-0.000001	0.0000011	2.00
0.5	0.500016	0.500004	-0.000002	0.0000014	2.00
1	1.000003	1.000005	-0.000002	0.0000016	2.00
2	2.000003	2.000006	-0.000001	0.0000017	2.00
5	5.000015	5.000006	-0.000001	0.0000020	2.00
10	10.000009	10.000005	-0.000004	0.0000026	2.00
20	20.000006	20.000007	-0.000001	0.0000037	2.00
30	30.000004	30.000004	-0.000001	0.0000050	2.00
50	50.000003	50.000008	-0.000005	0.0000068	2.00
80	80.000001	80.000013	-0.000006	0.000011	2.00

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

20009 Pattanakarn Road, Bang Khen Subdistrict, Bang Phli District, Bangkok 10710, Thailand
Tel: +662-012-86608 Fax: +662-012-86605



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



Calibration Report

Certificate No.: 2502226-002-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Resolution: 0.0001 g / 0.0001 g
Serial No.: C210685394
ID No.: UAE.WAO.0102565
Capacity: 82 g / 220 g

Date of Calibration: 20 March 2025 Page 4 of 4

Calibration Results: (Continued)

Calibration Range: >80-200 g

Calibration Adjustment: Internal Calibration

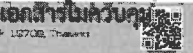
3. Departure from Nominal Value: (Range: >80 - 200 g; Resolution: 0.0001 g)

Nominal Value	Standard Value	Average Reading	Correction	Uncertainty	Coverage Factor
(g)	(g)	(g)	(g)	(g)	(g)
90	90.000010	90.000002	-0.000008	0.000015	2.00
100	100.000006	100.000001	-0.000005	0.000016	2.00
110	110.000007	110.000002	-0.000005	0.000017	2.00
120	120.000009	120.000003	-0.000006	0.000018	2.00
130	130.000010	130.000002	-0.000008	0.000019	2.00
140	140.000013	140.000002	-0.000011	0.000019	2.00
150	150.000009	150.000003	-0.000006	0.000021	2.00
160	160.000010	160.000002	-0.000008	0.000022	2.00
170	170.000012	170.000002	-0.000010	0.000023	2.00
200	200.000013	200.000002	-0.000011	0.000028	2.00

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

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

20009 Pattanakarn Road, Bang Khen Subdistrict, Bang Phli District, Bangkok 10710, Thailand
Tel: +662-012-86608 Fax: +662-012-86605



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



Certificate of Calibration

Cert. No.: 24TM1114
Page : 1 of 3

Equipment: BOD Incubator

Manufacturer: ARCO

Model: UC4-1320

Serial No.: -

ID No.: UAE.WAO.0182559

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

Location: Lab Floor 2

Received Order: 11 July 2024

Calibration Date: 11 July 2024

Ambient Temperature: (26 ± 10) °C

Relative Humidity: (50 ± 30) %

Calibrated by: Tawatchai Pansa

Approved by:
Approved Signatory

() Ponpan Palpin
() Suwit Injai
() Kunchit Promprat

Issue Date: 14 July 2024

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

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

เอกสารไม่ควบคุม



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2407-0243QC-2
Procedure Used :-

Cert. No.: 24TM1114
Page : 2 of 3

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

Condition of this result of calibration

1. Reference standard instrument:-

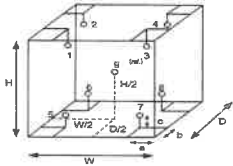
Instrument Serial No. Cert. No. Traceable Due Date
1) Data Acquisition MY49023832 23LM122 TPA 26 Jul 2024
2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This certification is traceable to the International System of Unit.

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

Result of Calibration :- (") Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available



Probe Installation Details :

Dimension of Chamber :
a = 10 cm
b = 19 cm
c = 10 cm
D = 0.82 m
W = 1.2 m
H = 1.2 m
Capacity = 0.89 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	29	29
REL.Humid. (%)	78	72
AC Supply (Volt)	233	234

Position :	Ref. Std. ID No.:
1	20-18RTD-10
2	20-18RTD-02
3	20-18RTD-03
4	23-18RTD-04
5	22-18RTD-05
6	20-18RTD-06
7	20-18RTD-07
8	22-18RTD-08
9 (ref.)	22-18RTD-09

เอกสารไม่ควบคุม



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2407-0243QC-2
Result of Calibration :- (") Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Not Available

Cert. No.: 24TM1114
Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
20.0	20.0	19.9	0.29	0.81	1.2	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
20.0	20.361	19.640	20.312	20.079	19.908	19.872	19.955	19.918	19.758	0.48

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



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
53/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL.0-2717-3000-29 FAX.0-2719-9484



Certificate of Calibration

Cert.No.: 25CH353
Page: 1 of 3

Equipment : pH Meter
Manufacturer : Horiba
Model : LAQUA-PH210
Serial No. : HA0A0007
ID No. : UAE.EFM.002/2563(EFM.pH.02/63)
Condition As-Received: Used Item
Received Date : 18 March 2025
Calibration Date : 20 March 2025
Reference : 2503-0612WSC-1
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomeuk 41, Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10260

Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In - house method :
- CP-CH5 by direct measurement with DC voltage standard and direct measurement with certified reference material (CRM)
- CP-CH8 by comparison with temperature standard

Calibrated by : Uthen Kankaw

Approved by : _____
Approved Signatory

() Chakrit Wewwanjua
() Porpan Paipin
(✓) Saithip Meangmai

Issue Date : 20 March 2025

The Uncertainties are for a confidence probability of approximately 95%

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



Cert.No.: 25CH353
Page: 2 of 2

Condition of this calibration result

1. Reference Standard Instrument

Instrument Serial No. ID No. Cert. No. Due Date
1) Document Process Calibrator 4316C066 130RC092 24E1320 22 Apr 2025
2) Ref. Standard Thermometer 4982054 110RC044 241757 14 July 2025

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

2. Certified Reference Materials : The measurement results are traceable to SI through Hach Lange GmbH Ltd., Deutsche Akkreditierungsgesellschaft, Accredited No.D-RM-15184-01-00
: The measurement results are traceable to SI through CPA chem Ltd., ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

Buffer Solution Manufacturer Lot No. Exp. date
pH 4.007 CPA chem 1080895 18 Jan 2027
pH 6.999 Hach Lange GmbH C03220 29 Oct 2026
pH 10.010 CPA chem 1080899 18 Jan 2026

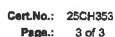
3. This certificate is valid only to the item calibrated on date and place of calibration.

Calibration Results

Function : mV Measurement

Performing standard curve by Document Process Calibrator at pH (4,7)(7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (± mV)	Coverage factor k
			mV	pH		
pH Meter S/N: HA0A0007	4.00	177.48	177.5	4.01	0.058	2.00
	7.00	0.00	0.3	6.98	0.058	2.00
	7.00	0.00	0.3	6.98	0.058	2.00
	10.00	-177.48	-177.1	10.01	0.058	2.00



Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4,7)(7,10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (±)	Coverage factor k
pH Electrode S/N.: 992H0385	4.007	4.00	150.1	0.0085	2.05
	6.999	7.00	-26.1	0.0095	2.00
	6.999	7.00	-28.7	0.011	2.05
	10.010	10.01	-202.4	0.010	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : 9652

- Serial No. : 992H0385

Dimension of probe

- Length : 103 mm.

- Diameter : 16 mm.

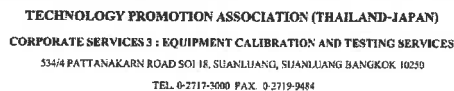
- Immersion Depth : 90 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor <i>k</i>
15.0	15.006	15.0	-0.006	0.13	2.00
30.0	28.888	30.0	0.002	0.13	2.00
45.0	44.993	45.0	0.007	0.13	2.00

Remark - UUC* = Unit Under Calibration

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

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Certificate of Testing

Cert.No.: 25TW29
Page: 1 of 2

Equipment : DO Meter

Manufacturer : YSI

Model : 5100

Serial No. : 11B 101863

ID No. : UAE.WAO.004/2554

Received Date : 14 February 2025


Test Date : 17 February 2025

Reference : 2502-0473DSC-1

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

Laboratory Condition : Temperature (25 ± 5) °C
Humidity (50 ± 20) %
In - house method : CP-CHS
by Comparison Technique with Azide Modification Method

Tested by : Walalak Sirithien

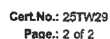
Approved by : 
Approved Signatory

() Chakrit Waewwanjua
() Nonpan Palpin
(√) Sathip Meangmai

Issue Date : 18 February 2025

18 February 2025

เอกสารไม่ควบคุม



Condition of this result of calibration

1. Reference Standard instruments :
This certification is traceable to the International System of Unit through the reference standards laboratory of Industrial Calibration Center, Technology Promotion Association (Thailand-Japan).

<u>Instruments</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
1. Burette	-	130BU10	23CG1172	22 Mar 2025
2. Balance	14233821	110RC001	24MM131	04 July 2025

2. Standard Material :-

<u>Material</u>	<u>Manufacturer</u>	<u>Lot.No.</u>	<u>Assay</u>
Sodium Thiosulfate 5-Hydrate AR	KEMAUS	2203162447	99.6%

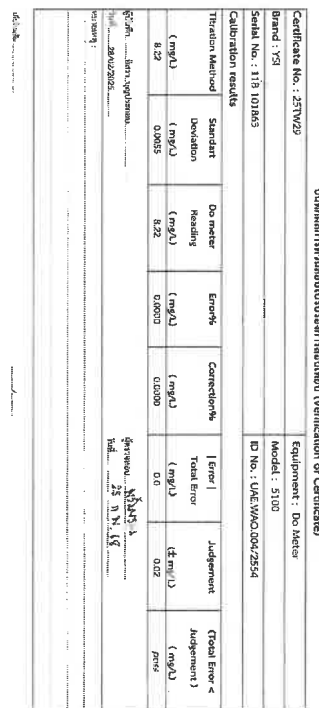
Result : Dissolved Oxygen Meter Adjustment With Air 100 %
Dissolved Oxygen Probe No.: 24F100202

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.22	8.22	0.0055

This report was certified only for the instrument we tested. It is allowable to use for study intend to use for advertising and referral purpose is prohibited. This report may not be reproduced other in full, without written approval of the laboratory

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เอกสารไม่ควบคุม



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เอกสารไม่ควบคุม

Calibration Certificate

Certificate No.: 2502226-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address: 3 Soi Udumuk 41, Sukhumvit Road,
Bangchack, Prakhnong, Bangkok 10260

Page 1 of 4

Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Serial No.: C09071872
ID No.: UAE.WAO.012/2563
Order No.: 2502226
Operation No.: 2502226-001
Date of Receipt: 19 March 2025
Date of Calibration: 20 March 2025

Calibrated by Mr.Yethin Charoensuk
Scientist
Approved by N. Nijphatt
(Mr.Pheraphat Tunsit)
Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team
Date of Issue: 25 March 2025

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: 20-04-55

ห้องปฏิบัติการมาตรฐาน 35 : การสอบเทียบเครื่องมือการวัด (ห้องปฏิบัติการมาตรฐาน)
2009 ถนน 36 อำเภอเมือง จังหวัด กรุงเทพมหานคร 10260 ประเทศไทย
โทร : 02-012-2563 แฟกซ์ : 02-012-2563

Calibration Report

Certificate No.: 2502226-001-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C09071872
Capacity: 82 g / 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.012/2563

Page 2 of 4

Date of Calibration: 20 March 2025
Environment Condition: Ambient Temperature: 21.2 °C Relative Humidity: 48 ± 3.5 %

Place of Calibration: 208 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 W-HA-001 In-House Method based on UKAS Lab 14: 2019

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1mg to 200g	8505567572	TCS	M24041025	19 April 2025
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	608-41	NFI.BTH.017/23	Quality Reborn	QR25-0542	10 February 2026

3. The certification is traceable to SI UNIT

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.

Calibration Results:

1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
40	0.0000052
80	0.0000042
160	0.0000000
200	0.0000060

2. Off-Center Error:

A mass of 100 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)
100.0001	100.0001	100.0001	100.0001	100.0001	100.0002	0.0001

FCS-012 Revision: 01 Date: 20-04-55

ห้องปฏิบัติการมาตรฐาน 35 : การสอบเทียบเครื่องมือการวัด (ห้องปฏิบัติการมาตรฐาน)
2009 ถนน 36 อำเภอเมือง จังหวัด กรุงเทพมหานคร 10260 ประเทศไทย
โทร : 02-012-2563 แฟกซ์ : 02-012-2563

Calibration Report

Certificate No.: 2502226-001-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C09071872
Capacity: 82 g / 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.012/2563

Page 3 of 4

Date of Calibration: 20 March 2025

Calibration Results: (Continued)

Calibration Range: 0-80 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Values (Range: 0 - 82 g ; Resolution: 0.00001 g)

Nominal Value	Standard Value	Average Reading	Correction	Uncertainty	Coverage Factor
Unloaded	0.000000	0.00000	0.00000	0.0000089	2.00
0.001	0.001803	0.00180	0.00000	0.0000092	2.00
0.005	0.005802	0.00580	0.00000	0.0000091	2.00
0.01	0.010803	0.01080	0.00000	0.0000091	2.00
0.05	0.049995	0.05000	0.00000	0.0000098	2.00
0.1	0.100011	0.10000	0.00001	0.000011	2.00
0.5	0.500016	0.50000	0.00002	0.000014	2.00
1	1.000013	1.00001	-0.00001	0.000016	2.00
2	2.000023	2.00005	-0.00003	0.000017	2.00
5	5.000015	5.00005	-0.00004	0.000021	2.00
10	10.000005	10.00005	-0.00004	0.000026	2.00
20	20.000020	20.00012	-0.00009	0.000037	2.00
30	30.000038	30.00012	-0.00008	0.000050	2.00
50	50.000028	50.00014	-0.00011	0.000068	2.00
80	80.000067	80.00020	-0.00013	0.00011	2.00

FCS-012 Revision: 01 Date: 20-04-55

ห้องปฏิบัติการมาตรฐาน 35 : การสอบเทียบเครื่องมือการวัด (ห้องปฏิบัติการมาตรฐาน)
2009 ถนน 36 อำเภอเมือง จังหวัด กรุงเทพมหานคร 10260 ประเทศไทย
โทร : 02-012-2563 แฟกซ์ : 02-012-2563

Calibration Report

Certificate No.: 2502226-001-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C09071872
Capacity: 82 g / 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.012/2563

Page 4 of 4

Date of Calibration: 20 March 2025

Calibration Results: (Continued)

Calibration Range: >80-200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value (Range: >80 - 200 g ; Resolution: 0.00001 g)

Nominal Value	Standard Value	Average Reading	Correction	Uncertainty	Coverage Factor
90	90.000010	90.00002	-0.00001	0.000015	2.00
100	100.000005	100.00001	0.00000	0.000016	2.00
110	110.000007	110.00001	0.00000	0.000017	2.00
120	120.000009	120.00002	-0.00001	0.000018	2.00
130	130.000010	130.00002	-0.00001	0.000019	2.00
140	140.000012	140.00002	-0.00001	0.000019	2.00
150	150.000009	150.00002	-0.00001	0.000021	2.00
160	160.000010	160.00002	-0.00001	0.000022	2.00
170	170.000012	170.00002	-0.00001	0.000023	2.00
200	200.000012	200.00002	-0.00001	0.000028	2.00

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

FCS-012 Revision: 01 Date: 20-04-55

ห้องปฏิบัติการมาตรฐาน 35 : การสอบเทียบเครื่องมือการวัด (ห้องปฏิบัติการมาตรฐาน)
2009 ถนน 36 อำเภอเมือง จังหวัด กรุงเทพมหานคร 10260 ประเทศไทย
โทร : 02-012-2563 แฟกซ์ : 02-012-2563



Certificate of Calibration

Cert.No.: 25CH163
Page.: 1 of 3

Equipment : pH Meter
Manufacturer : EcoSense
Model : pH100A
Serial No. : JC03335
ID No. : UAE.EFM.062/2562(ENV.pH.02/82)
Condition As-Received: Used Item
Received Date : 04 February 2025
Calibration Date : 05 February 2025
Reference : 2502-0105WSC-1
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260

Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In - house method :
- CP-CH5 by direct measurement with DC voltage
standard and direct measurement with
certified reference material (CRM)
- CP-CH8 by comparison with temperature standard

Calibrated by : Warakorn Lemgegrakul

Approved by :

Approved Signatory

() Chakrit Weewwanjua
() Ponpan Palpim
(✓) Sathip Meangmai

Issue Date : 06 February 2025

The Uncertainties are for a confidence probability of approximately 95%

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



Cert.No.: 25CH163
Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030048	130RC116	24E2769	25 Aug 2025
2) Ref. Standard Thermometer	4982054	110RC044	24I757	14 July 2025

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

2. Certified Reference Materials

: The measurement results are traceable to SI through Hach Lenge GmbH Ltd.
Deutsche Akkreditierungsstelle, Accredited No. D-RM-15/94-01-00
: The measurement results are traceable to SI through CPA chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.007	CPA chem	1066665	18 Jan 2027
pH 6.999	Hach Lenge GmbH	C03220	29 Oct 2026
pH 10.010	CPA chem	1066669	18 Jan 2026

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

Calibration Results

Function : mV Measurement

Performing standard curve by Document Process Calibrator at pH (4,7)(7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (mV)	Coverage factor k
	pH	mV	mV	pH		
pH Meter S/N.: JC03335	4.00	177.48	177	4.01	0.58	2.00
	7.00	0.00	0	7.00	0.58	2.00
	7.00	0.00	0	7.00	0.58	2.00
	10.00	-177.48	-177	10.01	0.58	2.00



Cert.No.: 25CH163
Page.: 3 of 3

Calibration Results

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4,7)(7,10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (±)	Coverage factor k
pH Electrode S/N.: 231018SIA605377	4.007	4.01	173	0.0079	2.00
	6.999	7.00	-2	0.0092	2.00
	6.999	7.00	-2	0.0085	2.00
	10.010	10.01	-177	0.0092	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model :

- Serial No. : 231018SIA605377

Dimension of probe

- Length : 110 mm

- Diameter : 12 mm

- Immersion Depth : 100 mm

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor k
15.0	15.003	15.1	0.097	0.13	2.00
30.0	30.002	30.1	0.098	0.13	2.00
45.0	45.002	45.1	0.098	0.13	2.00

Remark : - UUC* = Unit Under Calibration

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

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Certificate of Testing

Cert.No.: 25TW23
Page.: 1 of 2

Equipment : DO Meter
Manufacturer : YSI
Model : 5100
Serial No. : 11B 101863
ID No. : UAE.WAO.004/2554
Received Date : 14 February 2025
Test Date : 17 February 2025
Reference : 2502-0473DSC-1
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangchak,
Phrakhanong, Bangkok 10260

Laboratory Condition : Temperature (25 ± 5) °C
Humidity (50 ± 20) %
Test Procedure : In - house method : CP-CH9
by Comparison Technique with Azide Modification Method

Tested by : Walalak Sinthean

Approved by :
Approved Signatory

() Chakrit Weewwanjua
() Ponpan Palpim
(✓) Sathip Meangmai

Issue Date : 18 February 2025



Cert.No.: 25TW28
Page.: 2 of 2

Condition of this result of calibration

1. Reference Standard Instruments :
This certification is traceable to the International System of Unit through the reference standards
Laboratory of Industrial Calibration Center, Technology Promotion Association (Thailand-Japan)

Instruments	Serial No.	ID No.	Certificate No.	Due Date
1. Burette	-	130BU10	23CG1172	22 Mar 2025
2. Balance	14233821	110RC001	24MM131	04 July 2025

2. Standard Material :-

Material	Manufacturer	Lot.No.	Assay
Sodium Thiosulfate 5-Hydrate AR	KEMALUS	2203162447	99.6%

Result : Dissolved Oxygen Meter Adjustment With Air 100 %
Dissolved Oxygen Probe No.: 24F100202

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.22	8.22	0.0055


This report was certified only for the instrument we tested. It is allowable to use for study
Intend to use for advertising and referral purpose is prohibited. This report may not be reproduced
other in full, without written approval of the laboratory

-00-

เอกสารไม่ควบคุม

ใบรับรองการสอบเทียบปริมาณทางเคมี (Verification of Certificate)										
Certificate No. : 25TW28		Brand : VFA		Equipment : Do Meter		Model : 5100				
Serial No. : 118 101063		ID No. : UAE-WAO-004/2551								
Calibration results										
Titration Method	Standard Deviation (mg/L)	Do meter Reading (mg/L)	Error% (mg/L)	Correctivity% (mg/L)	Total Error (mg/L)	Judgment (mg/L)	Total Error < Judgment (mg/L)			
	8.22	0.0055	0.22	0.0093	0.0003	0.0	0.02	pass		

Operator : Nur Nophasan :
Ref. : 2504/2565

Signature :  :
Tel. : 25 3 74 15

เอกสารไม่ควบคุม

FOSS

Customer Service Report

Date: 2 July 2024
Job No.: 8214
Instrument: 254 Digital

FOSS South East Asia
3388 Sirinrat Building, 25th - 26th Floor, Unit No. 3388/90,
Rama IV Road, Klongtoey, Klongtoey, Bangkok, Thailand 10110

Report No.: 12875
Customer: UAE
Address: Bangkok
Serial: 9414

Start	Travel To Customer (Hrs)	Labour (Hrs)	Travel From Customer (Hrs)
Finish	09:30 09:30	09:30 10:30	14:30 16:00

Job Type			
Application	Special	Standard	
Distributor	Courtesy Visit	Installation	Training
Digital Service	PMA Onboarding	Quote	In House
Internal	Warranty	Repair	PM
Investigate	Sales Support	Remote	Health Check Visit

PMA Type	Smartcare	Smartcare Pro	/	Foscare	
	Smartcare Advance	Foscare Pro	<	N/A	

Details of Work / Test	
- Visual Check -	OK
- No. 100	OK
- Change No. 100	OK
- Electronic Check -	OK
- Dilution 100ml	OK
- Alkali 100ml	OK
- Receiver N/A	OK
- 100ml / 100ml	OK
- 100ml / 100ml	OK
Instrument Ready for Use	OK

Part No.	Batch	Description	Qty
6050144	02.01.2024	PM kit 100ml	1

I confirm this report is accurate and complete	
Signed FOSS	Signed Customer
Name	Name

Email: Customer Contact: เอกสารไม่ควบคุม

United Analyst and Engineering Consultant Co., Ltd.



Certificate of Calibration

Certificate No.: 250422-1-BL002-25
Code No.: BL002-25
Page: 1 of 3

Customer Name: United Analyst and Engineering Consultant Co., Ltd.
Address: 3 Soi Udom suk #1, Sukhumvit Rd., Bang Chak, Phra Khanong, Bangkok 10260

Equipment: Electronic Balance
Manufacturer: Mettler Toledo
Model: AB204-S/FACT
Serial No.: 1129361010
Asset No.: UAE.WAS.002/2552
Building: N/A Floor: 1 Room: 107

Received Date: April 22, 2025
Date of Calibration: April 23, 2025
Calibration Conditions: Temperature 22.8 °C to 23.4 °C
Humidity 54.8 % to 68.9 %
Pressure 756.6 mmHg to 758.2 mmHg

Calibrated by: Sakkarin Srirahang

Approved by: Suwit Chotnok

Signature: Suwit Chotnok

Issued Date: April 25, 2025

- Note : 1) The Uncertainties are for a confidence probability of approximately 95%
2) This Certificate is valid only to the item calibrated on date and place of calibration.
3) 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 United Analyst and Engineering Consultant Co., Ltd. (UAE)

เอกสารไม่ควบคุม



Certificate No.: 250422-1-BL002-25
 Code No.: BL002-25
 Page: 2 of 3

Equipment: Electronic Balance Manufacturer: Mettler Toledo
 Model: AB204-S/FACT Readability: 0.0001 g
 Serial No.: 1129361010 ID No.: UAE.WAS.002/2552
 Max. Capacity: 220 g
 Calibration Date: April 23, 2025
 Condition As-Received: In Condition

Condition of Equipment:

Condition of This Result of Calibration:

1. Calibration Method: This instrument was calibrated by method UAE/CP/CAL/006 In-House Method based on UKAS Lab 14 : 2022

2. Reference Standards:

Reference Standard:	Model	Serial No.	Calibrated By	Certificate No.	Traceability	Due Date
Standard Weight Class E2 (0.01g)	1 mg to 1 kg	8749109122	AMARC	25-009359	Mettler Toledo	21-Jan-27
Standard Weight Class F1 (0.001g)	1 mg to 200 g	11119512	AMARC	24-013840	Mettler Toledo	04-Feb-26
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Traceability	Due Date
Thermohygro-Meter	MH8-38250	AK46457	SUCCESS	SG-H-00997/67	Success Gateway	21-Nov-25
Thermohygro-Meter	MH8-38250	AK46457	TFA	25P795	TFA	25-Feb-26

3. This certification is traceable to SI Unit

4. This certification 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. Through the reference standard laboratory of AMARC 25-009359 Calibration 0152

Calibration Result:

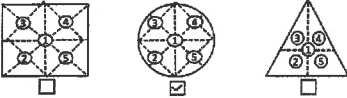
1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
200*	0.000045

2. Eccentric or off-center loading

A mass of 100 g was placed and moved to various position on pan

The balance reading obtained is given in the table.



1 (g)	2 (g)	3 (g)	4 (g)	5 (g)	Maximum Difference (g)
100.0000	99.9996	99.9997	100.0003	100.0005	0.0005

เอกสารไม่ครบถ้วน



Certificate No.: 250422-1-BL002-25
 Code No.: BL002-25
 Page: 3 of 3

Equipment: Electronic Balance Manufacturer: Mettler Toledo
 Model: AB204-S/FACT Readability: 0.0001 g
 Serial No.: 1129361010 ID No.: UAE.WAS.002/2552
 Max. Capacity: 220 g
 Calibration Date: April 23, 2025

Calibration Result: (Continued)

Calibration Range: 0 - 200 g

Calibration Adjustment: Internal Calibration

3. Error of Indication from nominal or conventional mass value:

Nominal Value (g)	Reference Value (g)	Indication (g)	Correction (g)	Uncertainty (± mg)	Coverage Factor k
Unloaded	0.0000000	0.0000	0.0000	0.10	2.05
0.01	0.0100025	0.0099	0.0001	0.10	2.05
0.05	0.0500056	0.0500	0.0000	0.10	2.05
0.1	0.1000012	0.0999	0.0001	0.10	2.05
0.5	0.5000133	0.5000	0.0000	0.10	2.05
1	1.0000105	1.0000	0.0000	0.10	2.05
10	10.000010	10.0000	0.0000	0.11	2.04
40	40.000076	40.0000	0.0000	0.14	2.00
50	50.000056	50.0000	0.0001	0.13	2.00
80	80.000107	80.0000	0.0001	0.18	2.00
100	100.000109	99.9999	0.0002	0.17	2.00
120	120.00015	119.9999	0.0003	0.21	2.00
150	150.000165	149.9998	0.0003	0.24	2.00
160	160.000175	159.9997	0.0005	0.26	2.00
200	200.000129	199.9998	0.0004	0.30	2.00

4. Effect of Tare test:

Tare Load (g)	Test Load (g)	Indication (g)	Correction (g)
100	20.000041	19.9999	0.0001
	40.000076	39.9998	0.0002
	60.000065	59.9997	0.0003
	80.000107	79.9995	0.0002
	100.000168	99.9998	-0.0003

Remark:

The report uncertainty of measurement was based on standard uncertainty multiplied by coverage factor k, providing

เอกสารไม่ครบถ้วน

o—o-End-o—o



Calibration Certificate

Certificate No.: 2502226-001-01
 Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
 Address: 3 Soi Udomsuk 41, Sukhumvit Road,
 Bangchack, Prakanong, Bangkok 10260

Page 1 of 4

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: XSR205DU

Serial No.: C009071672

ID No.: UAE.WAO.012/2563

Order No.: 2502226

Operation No.: 2502226-001

Date of Receipt: 19 March 2025

Date of Calibration: 20 March 2025

Calibrated by Mr.Yothin Charoensuk
 Scientist

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

Date of Issue: 25 March 2025

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-CE-013 Revision: 01 Date: 20-04-65

เอกสารไม่ครบถ้วน



Calibration Report

Certificate No.: 2502226-001-01
 Equipment: Electronic Balance Manufacturer: METTLER TOLEDO
 Model: XSR205DU Readability: 0.00001 g / 0.0001 g
 Serial No.: C009071672 ID No.: UAE.WAO.012/2563
 Capacity: 82 g / 720 g

Date of Calibration: 20 March 2025

Page 2 of 4

Environment Condition: Ambient Temperature: 21.2 ± 0.6 °C Relative Humidity: 48 ± 3.5 %

Place of Calibration: 209 Balance Room, UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.

Condition of Equipment: Good Condition

Condition of This Result of Calibration:

1. Calibration Method: NFI Method W-M4-001 In-House Method based on UKAS Lab 14 : 2019

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1mg to 200g	850557972	TCS	N24041005	19 April 2025
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermohygro-Meter	608-41	NFLRTH 012/23	Quality Return	QR25-0542	10 February 2026

3. This certification is traceable to SI UNIT

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

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

Calibration Results:

1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
40	0.000052
80	0.000092
100	0.000000
200	0.000000

2. Off-Center Error:

A mass of 100 g was placed and moved to various position on pan.

The balance reading obtained is given in the table.



1 (g)	2 (g)	3 (g)	4 (g)	5 (g)	6 (g)	Maximum Difference (g)
100.0001	100.0001	100.0001	100.0001	100.0002	100.0002	0.0001

F-CE-013 Revision: 01 Date: 20-04-65

เอกสารไม่ครบถ้วน

Calibration Report

Certificate No.: 2502226-001-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C09971872
Capacity: 82 g / 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g / 0.0001 g
ID No.: UAE.WAO.012/2563

Date of Calibration: 20 March 2025 Page 3 of 4

Calibration Results: (Continued)

Calibration Range: 0-80 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 0 - 82 g; Resolution: 0.00001 g)

Nominal Value	Standard Value	Average Reading	Correction	Uncertainty	Coverage Factor
Unloaded	0.00000	0.00000	0.00000	0.0000009	2.00
0.001	0.001003	0.00100	0.00000	0.0000032	2.00
0.005	0.005002	0.00500	0.00000	0.0000009	2.00
0.01	0.010003	0.01000	0.00000	0.0000011	2.00
0.05	0.049995	0.05000	0.00000	0.0000009	2.00
0.1	0.100011	0.10000	0.00001	0.0000011	2.00
0.5	0.500016	0.50000	0.00002	0.0000014	2.00
1	1.000071	1.00001	-0.00006	0.0000016	2.00
2	2.00023	2.00005	-0.00018	0.0000017	2.00
5	5.00015	5.00005	-0.00010	0.0000021	2.00
10	10.00009	10.00005	-0.00004	0.0000026	2.00
20	20.00030	20.00012	-0.00018	0.0000037	2.00
30	30.00039	30.00012	-0.00027	0.0000050	2.00
50	50.00027	50.00014	-0.00013	0.0000068	2.00
80	80.00067	80.00029	-0.00038	0.000011	2.00

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

2008 So. 36, Anuram Road, Bang Yai Khan Subdistrict, Bang Yai District, Bangkok 10700 Thailand
Tel: +662 844 8545 Fax: +662 844 8545



Calibration Report

Certificate No.: 2502226-001-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C09971872
Capacity: 82 g / 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g / 0.0001 g
ID No.: UAE.WAO.012/2563

Date of Calibration: 20 March 2025 Page 4 of 4

Calibration Results: (Continued)

Calibration Range: >80-200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: >80 - 200 g; Resolution: 0.0001 g)

Nominal Value	Standard Value	Average Reading	Correction	Uncertainty	Coverage Factor
90	90.00010	90.0002	-0.0001	0.000015	2.00
100	100.00056	100.0001	0.00046	0.000016	2.00
110	110.00007	110.0001	0.00003	0.000017	2.00
120	120.00009	120.0002	-0.0001	0.000018	2.00
130	130.00010	130.0002	-0.0001	0.000019	2.00
140	140.00012	140.0002	-0.0001	0.000019	2.00
150	150.00009	150.0002	-0.0001	0.000021	2.00
160	160.00010	160.0002	-0.0001	0.000022	2.00
170	170.00012	170.0002	-0.0001	0.000023	2.00
200	200.00012	200.0002	-0.0001	0.000026	2.00

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

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

2008 So. 36, Anuram Road, Bang Yai Khan Subdistrict, Bang Yai District, Bangkok 10700 Thailand
Tel: +662 844 8545 Fax: +662 844 8545



Calibration Certificate

Certificate No.: 2502226-002-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address: 3 Sol Udomsuk 41, Sukhumvit Road, Bangkok, Prakhonong, Bangkok 10260

Page 1 of 4

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: XSR205DU

Serial No.: C210685394

ID No.: UAE.WAO.010/2565

Order No.: 2502226

Operation No.: 2502226-002

Date of Receipt: 19 March 2025

Date of Calibration: 20 March 2025

Calibrated by Mr.Yothin Charoensuk

Scientist

Approved by N. Niphet

(Mr.Pheraphat Tuanjit)

Manager, Division of Calibration Laboratory

Date of Issue: 25 March 2025

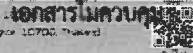
Responsible for the Technical Management Team

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

2008 So. 36, Anuram Road, Bang Yai Khan Subdistrict, Bang Yai District, Bangkok 10700 Thailand
Tel: +662 844 8545 Fax: +662 844 8545



Calibration Report

Certificate No.: 2502226-002-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C210685394
Capacity: 82 g / 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.010/2565

Date of Calibration: 20 March 2025 Page 2 of 4

Environment Condition: Ambient Temperature: 21.2 °C Relative Humidity: 48 ± 3.5 %

Place of Calibration: 208 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 W-MA-001 In-House Method based on UKAS Lab 14 : 2019

2. Reference Standards:

Reference Standards	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1mg to 200g	8505567572	TCS	M24041005	19 Apr 2025
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	608-411	NFI.BTH 012/23	Quality Return	QR25-0542	10 February 2025

3. This certification is traceable to SI UNIT

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

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

Calibration Results:

5. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
40	0.000042
80	0.000052
100	0.000060
200	0.000060

2. Off-Center Error:

A mass of 100 g was placed and moved to various position on pan.

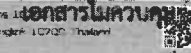
The balance reading obtained is given in the table



1	2	3	4	5	6	(Maximum Difference)
100.0001	100.0001	100.0001	100.0001	100.0001	100.0001	0.0000

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

2008 So. 36, Anuram Road, Bang Yai Khan Subdistrict, Bang Yai District, Bangkok 10700 Thailand
Tel: +662 844 8545 Fax: +662 844 8545



Calibration Report

Certificate No.: 2502226-002-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C210685394
Capacity: 82 g / 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.010/2565

Date of Calibration: 20 March 2025

Page 3 of 4

Calibration Results: (Continued)

Calibration Range: 0-80 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 0 - 82 g ; Resolution: 0.00001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (g)	Coverage Factor k
Unloaded	0.000000	0.000000	0.000000	0.0000007	2.00
0.001	0.001003	0.001000	0.000000	0.0000006	2.00
0.004	0.005002	0.005001	-0.000001	0.0000002	2.00
0.01	0.010003	0.010002	-0.000002	0.0000008	2.00
0.05	0.049995	0.050001	-0.000001	0.0000006	2.00
0.1	0.100011	0.100002	-0.000009	0.0000011	2.00
0.2	0.200015	0.200004	-0.000012	0.0000014	2.00
1	1.000003	1.000005	-0.000005	0.0000016	2.00
2	2.000023	2.000005	-0.000021	0.0000017	2.00
5	5.000015	5.000005	-0.000005	0.0000020	2.00
10	10.000009	10.000005	-0.000004	0.0000026	2.00
20	20.000030	20.000017	-0.000014	0.0000031	2.00
30	30.000039	30.000009	-0.000030	0.0000050	2.00
50	50.000020	50.000008	-0.000012	0.0000068	2.00
80	80.000067	80.000011	-0.000056	0.0000111	2.00

F CS 012 Revision: 01 Date: 20-04-55

20000 Soi Jit Anur Amorn Road Bang Yai 11210 Thailand, Bangkok 10700 Thailand
Tel: +662 2522 6000 Fax: +662 2522 6005

Calibration Report

Certificate No.: 2502226-002-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C210685394
Capacity: 82 g / 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.010/2565

Date of Calibration: 20 March 2025

Page 4 of 4

Calibration Results: (Continued)

Calibration Range: >80-200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: >80 - 200 g ; Resolution: 0.0001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (g)	Coverage Factor k
90	90.00010	90.00002	-0.00008	0.000015	2.00
100	100.00005	100.00001	-0.00004	0.000016	2.00
110	110.00007	110.00002	-0.00005	0.000017	2.00
120	120.00009	120.00007	-0.00002	0.000018	2.00
130	130.00010	130.00002	-0.00008	0.000019	2.00
140	140.00013	140.00002	-0.00011	0.000019	2.00
150	150.00009	150.00002	-0.00007	0.000021	2.00
160	160.00010	160.00007	-0.00003	0.000022	2.00
170	170.00012	170.00002	-0.00010	0.000023	2.00
200	200.00013	200.00002	-0.00011	0.000026	2.00

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

----- End -----

F CS 012 Revision: 01 Date: 20-04-55

20000 Soi Jit Anur Amorn Road Bang Yai 11210 Thailand, Bangkok 10700 Thailand
Tel: +662 2522 6000 Fax: +662 2522 6005

List of Instruments Certification for Water Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
1	pH Meter	pH	Hanna	LACUA-PH210 H41100026	Technology Promotion Association (Thailand-Japan)	2502226	20 Feb 25	19 Feb 25	

List of Instruments Certification for Water Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
1	pH Meter	pH	Hanna	LACUA-PH210 H41100026	Technology Promotion Association (Thailand-Japan)	2502226	9 Jan 25	8 Jan 25	

List of Instruments Certification for Water Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Water									
1	pH Meter	pH	Hanna	LAQUA-PH210 HMC2060	Technology Promotion Association (Thailand-Japan)	26CH128H/1	15 Oct 24	14 Oct 25	-

List of Instruments Certification for Water Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Water									
1	pH Meter	pH	Ecodense	ph100DA J481025157-6N	Technology Promotion Association (Thailand-Japan)	26CH14819	18 Nov 24	13 Nov 25	-

List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Workplace									
1	Primary Flow Calibrator	Calibrate personal pump	TSI Inc	61746 47146231752L	Innovative Instrument Co., Ltd.	24-APN-092	15 May 24	14 May 25	-
2	Air Sampling Pump	Chlorine Acetone	Senidyne	GAWS 5 20170202013	Innovative Instrument Co., Ltd.	24-ASP-181	23 Sep 24	22 Sep 25	-
3	Air Sampling Pump	Chlorine Acetone	Senidyne	GAWS 5 J9T170101037	Innovative Instrument Co., Ltd.	24-ASP-221	5 Nov 24	5 Nov 25	-
4	Air Sampling Pump	Chlorine Acetone	Senidyne	GAWS 5 20160610041	Innovative Instrument Co., Ltd.	24-ASP-182	24 Sep 24	23 Sep 25	-
5	Alveolar Surrometer	Chlorine Acetone	Baifjo, Germany	-	Technology Promotion Association (Thailand-Japan)	24P11516	4 Jun 24	3 Jun 25	-
6	Signal Thermo - Hygrometer	Chlorine Acetone	Digicon	7M-02 439281148	Technology Promotion Association (Thailand-Japan)	24H1487	15 Jun 24	14 Jun 25	-
7	Thermal Environment Monitor	Heat Meter	Quest Technosystems, Inc	QualTemp 36 16X130000	Innovative Instrument Co., Ltd	24-TPM-371	15 Aug 24	14 Aug 25	-
8	Thermal Environment Monitor	Heat Meter	3M	QualTemp 32 TP5030005	Innovative Instrument Co., Ltd	25-TPM-053	18 Jun 25	27 Jun 26	-

List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Ambient									
1	Police Traffic Standard Calibrator	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Andersen Instruments, Inc	Q25A 1901	Planetree Associated Co., Ltd	CO-033-46	14 Jul 23	13 Jul 25	-
2	Police Monorecette	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Dwyer	1221-36-WMA -	Technology Promotion Association (Thailand-Japan)	24P1250	10 Apr 24	9 Apr 25	-
3	Personal Airrometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Baifjo, Germany	-	Technology Promotion Association (Thailand-Japan)	24P1327	27 Apr 24	21 Apr 25	-
4	Real Thermo-hygrometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Baifjo, Germany	-	Technology Promotion Association (Thailand-Japan)	24H1752	10 Apr 24	9 Apr 25	-
5	Nitrogen Sulfate Analyzer	Nitrogen Dioxide	Thermo Electron	48C 45C-006011016	UAE Consultant Co., Ltd	04100204	4 Oct 24	3 Oct 25	-
6	Standard Gas (Nitrate)	Nitrogen Dioxide	Aligas	EB0162111 2016P95	Aligas an Air Liquide company	E09H97E15A0014	6 Jun 23	5 Jun 25	-
7	Sulphur Dioxide Analyzer	Sulphur Dioxide	Thermo Scientific	475 C12333067	UAE Consultant Co., Ltd	15020201	03 May 24	18 May 25	-
8	Standard Gas (Nitrate)	Sulphur Dioxide	Aligas	EB0162111 2016P95	Aligas an Air Liquide company	E09H97E15A0014	6 Jun 23	5 Jun 25	-
9	Carbon Monoxide analyzer	Carbon Monoxide	Thermo	488 1209354907	UAE Consultant Co., Ltd	08002024	9 Sep 24	8 Sep 25	-
10	Standard Gas (Nitrate)	Carbon Monoxide	Aligas	EB0162111 2016P95	Aligas an Air Liquide company	E09H97E15A0014	6 Jun 23	5 Jun 25	-

List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Workplace									
1	Primary Flow Calibrator	Calibrate personal pump	TSAPC	4146 41461122003	Innovative Instrument Co., Ltd.	25-APM013	15 Jan 25	14 Jan 26	-
2	Air Sampling Pump	Chlorine	Sensidyne	20180102011	Innovative Instrument Co., Ltd.	25-ASP-034	15 Mar 25	14 Mar 26	-
3	Reinold Barometer	Chlorine	Bergo, Germany		Technology Promotion Association (Thailand-Japan)	25P1376	17 Apr 25	16 Apr 26	-
4	Dat. Thermo-hygrometer	Chlorine	Bergo, Germany		Technology Promotion Association (Thailand-Japan)	24H1884	17 Jul 24	16 Jul 25	-
5	Sound Level Calibrator (Acoustic Calibration)	Calibrate Sound Level Meter	Sennheiser	5035	Innovative Instrument Co., Ltd.	25-ACI-088	25 Jan 24	24 Jan 25	-
6	Noise Dosimeter	Noise Dosimeter	Sennheiser	SV 104 143229	Innovative Instrument Co., Ltd.	24-NDM6170	15 Jul 24	14 Jul 25	-
7	Noise Dosimeter	Noise Dosimeter	Sennheiser	SV 104 143230	Innovative Instrument Co., Ltd.	24-NDM6172	15 Jul 24	14 Jul 25	-
8	Noise Dosimeter	Noise Dosimeter	Sennheiser	SV 104 A102267	Innovative Instrument Co., Ltd.	24-NDM6175	16 Jul 24	15 Jul 25	-
9	Digital Lux Meter	Lux	Eitech Instrument, Taiwan	407026	Innovative Instrument Co., Ltd.	24-LUX-200	1 Aug 24	31 Jul 25	-
10	Light Meter	Lux	Eitech Instrument, Taiwan	407026 A105624	Innovative Instrument Co., Ltd.	24-LUX4075	11 Mar 25	10 Mar 26	-

List of Instruments Certification for Water Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Water									
1	pH Meter	pH	Hanna	LAQUA-PH210 HA10030	Technology Promotion Association (Thailand-Japan)	25CH28V1	15 Oct 24	14 Oct 25	-

List of Instruments Certification for Water Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Water									
1	pH Meter	pH	Hanna	LAQUA PH210 HA10030	Technology Promotion Association (Thailand-Japan)	25CH282	28 Feb 25	27 Feb 26	-



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Cert.No.: 24CH240
Page.: 1 of 3

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Hanna
Model : LAQUA-PH210
Serial No. : HA1M0038
ID No. : UAE.EFM.012/2585(EFM.pH.02/85)
Condition As-Received: Used Item
Received Date : 18 February 2024
Calibration Date : 20 February 2024
Reference : 2402-0594WBC-4
Submitted by : United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260
Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In-house method :
- CP-CH5 by direct measurement with DC Voltage Standard and direct measurement with certified reference material (CRM)
- CP-CH8 by comparison with temperature standard
Calibrated by : Weleak Sirithean
Approved by :
() Pornthippa Tameyakul
() Unnopphol Harasathai
(x) Sathip Meangmai
Issue Date : 22 February 2024

The Uncertainties are for a confidence probability of approximately 95%

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A 0063842



Cert.No.: 24CH240
Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030048	130RC116	23E2802	27 Aug 2024
2) Ref. Standard Thermometer	4982054	110RC044	23I908	26 July 2024

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

- Technology Promotion Association (Thailand-Japan)

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

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	940102	27 Nov 2025
pH 6.866	CPA chem	940104	02 Nov 2024
pH 9.997	CPA chem	940106	02 Nov 2024

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

Calibration Results

Function : mV Measurement

Performing standard curve by Document Process Calibrator at pH (4,7)(7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input		Actual Reading		Uncertainty of Measurement (\pm mV)	Coverage factor k
	pH	mV	mV	mV	pH		
pH Meter S/N: HA1M0036	4.00	177.48	177.5	4.01	4.01	0.058	2.00
	7.00	0.00	0.0	7.00	7.00	0.058	2.00
	7.00	0.00	0.0	7.00	7.00	0.058	2.00
	10.00	-177.48	-177.4	10.01	10.01	0.058	2.00

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a 1203290



Cert.No.: 24CH240
Page.: 3 of 3

Calibration Results

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4,7)(7,10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (\pm)	Coverage factor k
pH Electrode S/N: Q62M0181	4.008	4.01	177.8	0.0071	2.00
	6.866	6.89	2.5	0.0089	2.00
	6.866	6.89	1.8	0.0099	2.00
	9.997	10.00	-169.3	0.0085	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : 9825-100

- Serial No. : Q62M0181

Dimension of probe

- Length : 107 mm.

- Diameter : 16 mm.

- Immersion Depth : 100 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (\pm °C)	Coverage factor k
25.0	25.000	25.0	0.000	0.13	2.00
30.0	30.000	30.0	0.000	0.13	2.00
35.0	34.999	35.0	0.001	0.13	2.00

Remark : UUC* = Unit Under Calibrator

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

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a 1203289



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ILAC-MRA



Certificate of Calibration

Cert.No.: 25CH22
Page.: 1 of 3

Equipment : pH Meter
Manufacturer : HANNA
Model : LAQUA-PH210
Serial No. : HA0F0026
ID No. : UAS-EFM.068/2564(EFM.pH.01/64)
Condition As-Received : Used Item
Received Date : 08 January 2025
Calibration Date : 09 January 2025
Reference : 2501-0223WSC-1
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Sol Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260

Ambient Temperature : (25 \pm 2.5) °C
Relative Humidity : (50 \pm 15) %
Calibration Procedure : In - house method :
- CP-CH5 by direct measurement with DC voltage standard and direct measurement with certified reference material (CRM)
- CP-CH8 by comparison with temperature standard

Calibrated by : Warakorn Lemgertkul

Approved by :

Saithip

Approved Signatory

() Pomthippa Tamayakul
() Ponpan Palpin
(✓) Saithip Meangmai

Issue Date : 10 January 2025

The Uncertainties are for a confidence probability of approximately 95%

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Cert.No.: 25CH22
Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030049	130RC116	24E2759	25 Aug 2025
2) Ref. Standard Thermometer	4982054	110RC044	24I757	14 July 2025

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

2. Certified Reference Materials

- The measurement results are traceable to SI through Hach Lange GmbH Ltd.,
Deutsche Akkreditierungsgesellschaft, Accredited No. D-RM-15184-01-00
- The measurement results are traceable to SI through CPA chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	1034203	27 Sep 2026
pH 7.000	Hach Lange GmbH	C03185	08 July 2026
pH 10.010	CPA chem	1034205	27 Sep 2025

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

Calibration Results

Function : mV Measurement

Performing standard curve by Document Process Calibrator at pH (4,7)(7,10)

Unit Under Calibration	Nominal Value		Standard Voltage Input		Actual Reading		Uncertainty of Measurement (mV)	Coverage factor k
	pH	mV	mV	pH	mV	pH		
pH Meter S/N.: HA0F0026	4.00	177.48	177.5	4.01	0.058	2.00	0.058	2.00
	7.00	0.00	0.1	7.00	0.058	2.00	0.058	2.00
	7.00	0.00	0.1	7.00	0.058	2.00	0.058	2.00
	10.00	-177.48	-177.3	10.01	0.058	2.00	0.058	2.00

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Cert.No.: 25CH22
Page.: 3 of 3

Calibration Results

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4,7)(7,10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (±)	Coverage factor k
pH Electrode S/N.: -	4.008	4.01	186.1	0.0071	2.00
	7.000	7.00	10.2	0.0095	2.00
	7.000	7.00	10.0	0.0095	2.00
	10.010	10.01	-184.3	0.0082	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : -

- Serial No. : -

Dimension of probe

- Length : 104 mm.

- Diameter : 16 mm.

- Immersion Depth : 90 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor k
15.0	15.002	15.0	-0.002	0.13	2.00
30.0	30.002	30.0	-0.002	0.13	2.00
45.0	45.004	45.0	-0.004	0.13	2.00

Remark : - UUC* = Unit Under Calibration

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

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Certificate of Calibration

Certificate No.: 24H752
Page.: 1 of 2

Equipment : Dial Thermo-Hygrometer

Manufacturer: Berigo

Model : -

Serial No.: -

ID No.: UAE/ANV.004/2548

Condition As-Received: Used item

Received Date: 05 April 2024

Calibration Date: 10 April 2024

to 18 April 2024

Reference: 2404-0247WSC

Ambient Temperature: (25 ± 3) °C

Relative Humidity: (50 ± 20) %

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

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

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

Condition of this result of calibration

1. Reference standards Instruments

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Chilled Mirror Hygrometer	Dew Master	44730	21856	02 Aug 2024
2) Handheld Thermometer With Sensor	1521	A5A339	231238	16 Oct 2024

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

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

- Thunder Scientific Corporation, NVLAP Accreditation No. Calibration 200582-0

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

Calibrated by: Chakrit Waewwanjua
Issue Date: 18 April 2024

Approved Signatory :

[] Chakrit Waewwanjua

[✓] Viporn Tantayawutti

[] Unnopphol Harachal

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Cert. No.: 24H752
Page.: 2 of 2

Result of Calibration:- Without Adjustment

Function: Humidity Measurement.

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Error (%R.H.)	Uncertainty of Measurement (±%R.H.)
25.0	40.1	41	0.9	1.6
25.0	60.0	60	0.0	1.7
25.0	80.0	78	-2.0	1.8

Result of Calibration:- Without Adjustment

Function: Temperature Measurement.

Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (±°C)
20.014	20.5	0.486	0.72
25.033	25.0	-0.033	0.72
30.010	30.0	-0.010	0.72
35.027	34.5	-0.527	0.72
40.013	39.5	-0.513	0.72

UUC* : Unit Under Calibration

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

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Certificate of Calibration

Certificate No.: 24P1250
Page: 1 of 2

Equipment: U Tube Manometer

Manufacturer: Dwyer

Model: 1221-36-W/M

Serial No.: -

ID No.: UAE.EFM.0782586

Condition As-Received: Used Item

Received Date: 03 April 2024

Calibration Date: 10 April 2024

Reference: 2404-0118WSC

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

Ambient Temperature: (23 ± 2) °C

Relative Humidity: (50 ± 15) %

Atmospheric Pressure: 1007 mbar

81 Soi Udomsuk 41, Sukhumvit Road, Bangkok,
Phraekhong, Bangkok 10260

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to calibration procedure CP-P04, using "DKD-R 6-1 : Calibration of Pressure Gauges" as a guidelines.

Condition of this result of calibration

1. Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Pressure Calibrator	PC108P	1189	MP-0176-23	12 Sep 2024

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

3. Scale and conversion factor is 1 kPa = 4.0146293 inH₂O

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

5. This instrument was calibrated by applied pressure to high-port (+) side and low-port (-) side open to atmospheric pressure.

6. This instrument was installed in vertical orientation and top of the pressure port was used as the reference level.

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

8. This Certification is traceable to the International System of Unit maintained through:-

-National Institute of Metrology (Thailand), NSC-ONSC Accredited No. Calibration 0144

Calibrated by: Sukkan Khanaew
Issue Date: 17 April 2024

Approved Signatory:

☐ Phalinee Prabpai
☐ Sura Suwanan
☒ Attapol Panurach

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Cert.No.: 24P1250
Page: 2 of 2

Result of calibration: Without adjustment

Function: Pressure Measurement

Increasing Pressure

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

Applied Pressure	High-port side	Low-port side	ΔP	Error
0.00	0.00	0.00	0.00	0.00
2.00	1.00	-1.00	2.00	0.00
4.00	2.00	-2.00	4.00	0.00
6.00	3.00	-3.00	6.00	0.00
8.00	4.00	-4.00	8.00	0.00
10.00	5.00	-4.95	10.00	0.00
12.00	6.00	-5.95	12.00	0.00
14.00	7.00	-6.95	14.00	0.00
16.00	8.00	-7.95	16.00	0.00
18.00	9.00	-8.95	18.00	0.00
20.00	10.00	-9.95	20.00	0.00
22.00	11.00	-10.95	22.00	0.00
24.00	12.00	-11.95	24.00	0.00
26.00	13.00	-12.95	26.00	0.00
28.00	14.00	-13.95	28.00	0.00
30.00	15.00	-14.95	30.00	0.00
32.00	16.00	-15.95	32.00	0.00
34.00	17.00	-16.95	34.00	0.00
36.00	18.00	-17.70	36.00	0.20

The uncertainty of measurement was ± 0.11 inH₂O

* ΔP = High-port side - Low-port side

* UUC = Unit Under Calibration

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

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Certificate of Calibration

Certificate No.: 24P1367
Page: 1 of 2

Equipment: Aneroid Barometer

Manufacturer: Barigo

Model: -

Serial No.: -

ID No.: UAE.ANV.1522550

Condition As-Received: Used Item

Received Date: 05 April 2024

Calibration Date: 22 April 2024

Reference: 2404-0243WSC

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

Ambient Temperature: (23 ± 2) °C

Relative Humidity: (50 ± 15) %

Atmospheric Pressure: 1007 mbar

81 Soi Udomsuk 41, Sukhumvit Road, Bangkok,
Phraekhong, Bangkok 10260

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

Condition of this result of calibration

1. Reference standards instruments:

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

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

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

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

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

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

7. This Certification is traceable to the International System of Unit maintained through:-

-National Institute of Metrology Thailand (NIMT)

Calibrated by: Sukkan Khanaew
Issue Date: 23 April 2024

Approved Signatory:

☐ Phalinee Prabpai
☐ Sura Suwanan
☒ Attapol Panurach

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Cert.No.: 24P1367
Page: 2 of 2

Result of calibration: Without adjustment

Function: Absolute Pressure Measurement

Increasing Pressure

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

Applied Pressure (hPa)	957.13	968.77	980.13	990.56	1001.26	1011.35	1022.10	1032.81
UUC* Indication (hPa)	960.0	970.0	980.0	990.0	1000.0	1010.0	1020.0	1030.0
Error (hPa)	2.87	1.23	-0.13	-0.56	-1.28	-1.35	-2.10	-2.81

Decreasing Pressure

Applied Pressure (hPa)	1032.81	1021.84	1010.88	1000.82	990.20	979.52	968.48	957.17
UUC* Indication (hPa)	1030.0	1020.0	1010.0	1000.0	990.0	980.0	970.0	960.0
Error (hPa)	-2.61	-1.84	-0.88	-0.82	-0.20	0.48	1.52	2.83

The uncertainty of measurement was ± 0.25 hPa

* UUC = Unit Under Calibration

The reported uncertainty of measurement was based on a standard uncertainty multiplied

by a coverage factor k = 2, providing a level of confidence of approximately 95 %

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MULTI-POINT GAS TEST REPORT

Test Date : Oct 4, 2024

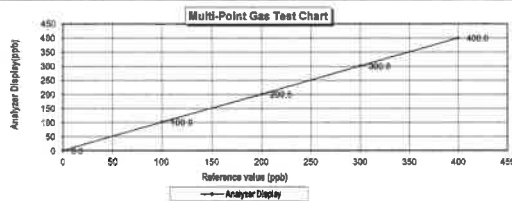
Equipment : Gas Analyzer (NO₂) Model : 42C
Manufacturer : Thermo Electron Corporation Serial Number : 42C-0508011076

Standard Gas Concentration
Sulphur Dioxide (SO₂) 42.89 PPM
Nitric Oxide (NO) 46.77 PPM
Methane (CH₄) - PPM
Carbon Monoxide (CO) 565.9 PPM
Cylinder No.: E80159155
Expiration Date: Nov 6, 2026

Dilutor Detail
Manufacturer: Thermo Scientific
Model: 146
Serial Number: 1180540071

Multi-point gas test data

Reference Value (ppb)			Analyzer Display (ppb)	Difference Error	Percent Error	% Error
Level 1	Zero	0.0	0.0	0.00	0.00	0.00
Level 2	20.00%	100.0	100.9	0.90	0.89	0.89
Level 3	40.00%	200.0	200.5	0.50	0.25	0.25
Level 4	60.00%	300.0	300.8	0.80	0.27	0.27
Level 5	80.00%	400.0	400.0	0.00	0.00	0.00
Remark : Measuring Range			500.0 ppb	Average Difference (%)		0.28



Calculate by
4 10 2567

Approve by
4 Oct, 2024



Certificate of Calibration

Cert.No.: 24CH1419
Page: 1 of 3

Equipment : pH Meter
Manufacturer : EcoSense
Model : pH100A
Serial No.: 24H005157JEN
ID No.: UAE.EFM.039/2567 (EFM.pH.02/67)
Condition As-Received: Used Item
Received Date: 13 November 2024
Calibration Date: 14 November 2024
Reference: 2411-0421WSC-2
Submitted by: United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260

Ambient Temperature : (25 \pm 2.5) °C
Relative Humidity : (50 \pm 15) %
Calibration Procedure : In-house method :
- CP-CH5 by direct measurement with DC voltage standard and direct measurement with certified reference material (CRM)
- CP-CH8 by comparison with temperature standard

Calibrated by: Wanekorn Lemgagrakul

Approved by: Approved Signatory

() Unnophol Horachai
() Ponpen Palpim
(✓) Sathip Meangmai

Issue Date: 20 November 2024

The Uncertainties are for a confidence probability of approximately 95%

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Cert.No.: 24CH1419
Page: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030049	130RC116	24E2759	25 Aug 2025
2) Ref. Standard Thermometer	4982054	110RC044	24I757	14 Jul 2025

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

2. Certified Reference Materials

:The measurement results are traceable to SI through Hach Lange GmbH Ltd.,
Deutsche Akkreditierungsgesellschaft, Accredited No.D-RM-15184-01-00
:The measurement results are traceable to SI through CPA chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	1034203	27 Sep 2026
pH 6.899	Hach Lange GmbH	C03145	28 Feb 2026
pH 10.010	CPA chem	1034205	27 Sep 2025

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

Calibration Results

Function: mV Measurement

Performing standard curve by Document Process Calibrator at pH (4.7)(7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (\pm mV)	Coverage factor k
	pH	mV	mV	pH		
pH Meter S/N.: 24H005157JEN	4.00	177.43	177	4.01	0.58	2.00
	7.00	0.00	0	7.00	0.58	2.00
	7.00	0.00	0	7.00	0.58	2.00
	10.00	-177.48	-177	10.01	0.58	2.00



Cert.No.: 24CH1419
Page: 3 of 3

Calibration Results

Function: pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4.7)(7,10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (\pm)	Coverage factor k
pH Electrode S/N.: 240821SIA805377	4.008	4.01	172	0.0085	2.05
	6.999	6.99	0	0.0085	2.00
	10.010	10.00	-178	0.0085	2.00

Function: Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : -

- Serial No.: 240821SIA805377

Dimension of probe

- Length : 110 mm.

- Diameter : 12 mm.

- Immersion Depth : 100 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (\pm °C)	Coverage factor k
15.0	15.003	15.1	0.097	0.13	2.00
30.0	30.000	30.1	0.100	0.13	2.00
45.0	45.003	45.0	-0.003	0.13	2.00

Remark: - UUC* = Unit Under Calibration

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

Certificate No.: 24-ASP-181
Request No.: Req 2024-0827

Result of Calibration: High (Without Adjustment)

Temperature	Pressure	STD	UUC	Error	Error	SPC	**Back Pressure	Uncertainty	Result
T (°C)	(kPa)	(l/min)	(l/min)	(l/min)	(l/min, %)	(l/min, %)	(kPa, l/min)	(l/min)	
24.20	99.40	1.000	1.000	-0.000	-0.0%	5.1%	5	0.0161	Pass
24.20	99.43	0.988	1.000	-0.012	-1.2%	5.1%	20	0.0158	Pass
24.20	99.50	1.000	1.000	-0.000	-0.0%	5.1%	35	0.0167	Pass
24.20	99.50	1.000	1.000	-0.000	-0.0%	5.1%	50	0.0177	Pass
24.20	99.55	1.000	1.000	-0.000	-0.0%	5.1%	65	0.0187	Pass
24.20	99.60	1.000	1.000	-0.000	-0.0%	5.1%	80	0.0197	Pass
24.20	99.65	1.000	1.000	-0.000	-0.0%	5.1%	95	0.0207	Pass
24.20	99.70	1.000	1.000	-0.000	-0.0%	5.1%	110	0.0217	Pass
24.20	99.75	1.000	1.000	-0.000	-0.0%	5.1%	125	0.0227	Pass
24.20	99.80	1.000	1.000	-0.000	-0.0%	5.1%	140	0.0237	Pass
24.20	99.85	1.000	1.000	-0.000	-0.0%	5.1%	155	0.0247	Pass
24.20	99.90	1.000	1.000	-0.000	-0.0%	5.1%	170	0.0257	Pass
24.20	99.95	1.000	1.000	-0.000	-0.0%	5.1%	185	0.0267	Pass
24.20	100.00	1.000	1.000	-0.000	-0.0%	5.1%	200	0.0277	Pass
24.20	100.05	1.000	1.000	-0.000	-0.0%	5.1%	215	0.0287	Pass
24.20	100.10	1.000	1.000	-0.000	-0.0%	5.1%	230	0.0297	Pass
24.20	100.15	1.000	1.000	-0.000	-0.0%	5.1%	245	0.0307	Pass
24.20	100.20	1.000	1.000	-0.000	-0.0%	5.1%	260	0.0317	Pass
24.20	100.25	1.000	1.000	-0.000	-0.0%	5.1%	275	0.0327	Pass
24.20	100.30	1.000	1.000	-0.000	-0.0%	5.1%	290	0.0337	Pass
24.20	100.35	1.000	1.000	-0.000	-0.0%	5.1%	305	0.0347	Pass
24.20	100.40	1.000	1.000	-0.000	-0.0%	5.1%	320	0.0357	Pass
24.20	100.45	1.000	1.000	-0.000	-0.0%	5.1%	335	0.0367	Pass
24.20	100.50	1.000	1.000	-0.000	-0.0%	5.1%	350	0.0377	Pass
24.20	100.55	1.000	1.000	-0.000	-0.0%	5.1%	365	0.0387	Pass
24.20	100.60	1.000	1.000	-0.000	-0.0%	5.1%	380	0.0397	Pass
24.20	100.65	1.000	1.000	-0.000	-0.0%	5.1%	395	0.0407	Pass
24.20	100.70	1.000	1.000	-0.000	-0.0%	5.1%	410	0.0417	Pass
24.20	100.75	1.000	1.000	-0.000	-0.0%	5.1%	425	0.0427	Pass
24.20	100.80	1.000	1.000	-0.000	-0.0%	5.1%	440	0.0437	Pass
24.20	100.85	1.000	1.000	-0.000	-0.0%	5.1%	455	0.0447	Pass
24.20	100.90	1.000	1.000	-0.000	-0.0%	5.1%	470	0.0457	Pass
24.20	100.95	1.000	1.000	-0.000	-0.0%	5.1%	485	0.0467	Pass
24.20	101.00	1.000	1.000	-0.000	-0.0%	5.1%	500	0.0477	Pass
24.20	101.05	1.000	1.000	-0.000	-0.0%	5.1%	515	0.0487	Pass
24.20	101.10	1.000	1.000	-0.000	-0.0%	5.1%	530	0.0497	Pass
24.20	101.15	1.000	1.000	-0.000	-0.0%	5.1%	545	0.0507	Pass
24.20	101.20	1.000	1.000	-0.000	-0.0%	5.1%	560	0.0517	Pass
24.20	101.25	1.000	1.000	-0.000	-0.0%	5.1%	575	0.0527	Pass
24.20	101.30	1.000	1.000	-0.000	-0.0%	5.1%	590	0.0537	Pass
24.20	101.35	1.000	1.000	-0.000	-0.0%	5.1%	605	0.0547	Pass
24.20	101.40	1.000	1.000	-0.000	-0.0%	5.1%	620	0.0557	Pass
24.20	101.45	1.000	1.000	-0.000	-0.0%	5.1%	635	0.0567	Pass
24.20	101.50	1.000	1.000	-0.000	-0.0%	5.1%	650	0.0577	Pass
24.20	101.55	1.000	1.000	-0.000	-0.0%	5.1%	665	0.0587	Pass
24.20	101.60	1.000	1.000	-0.000	-0.0%	5.1%	680	0.0597	Pass
24.20	101.65	1.000	1.000	-0.000	-0.0%	5.1%	695	0.0607	Pass
24.20	101.70	1.000	1.000	-0.000	-0.0%	5.1%	710	0.0617	Pass
24.20	101.75	1.000	1.000	-0.000	-0.0%	5.1%	725	0.0627	Pass
24.20	101.80	1.000	1.000	-0.000	-0.0%	5.1%	740	0.0637	Pass
24.20	101.85	1.000	1.000	-0.000	-0.0%	5.1%	755	0.0647	Pass
24.20	101.90	1.000	1.000	-0.000	-0.0%	5.1%	770	0.0657	Pass
24.20	101.95	1.000	1.000	-0.000	-0.0%	5.1%	785	0.0667	Pass
24.20	102.00	1.000	1.000	-0.000	-0.0%	5.1%	800	0.0677	Pass
24.20	102.05	1.000	1.000	-0.000	-0.0%	5.1%	815	0.0687	Pass
24.20	102.10	1.000	1.000	-0.000	-0.0%	5.1%	830	0.0697	Pass
24.20	102.15	1.000	1.000	-0.000	-0.0%	5.1%	845	0.0707	Pass
24.20	102.20	1.000	1.000	-0.000	-0.0%	5.1%	860	0.0717	Pass
24.20	102.25	1.000	1.000	-0.000	-0.0%	5.1%	875	0.0727	Pass
24.20	102.30	1.000	1.000	-0.000	-0.0%	5.1%	890	0.0737	Pass
24.20	102.35	1.000	1.000	-0.000	-0.0%	5.1%	905	0.0747	Pass
24.20	102.40	1.000	1.000	-0.000	-0.0%	5.1%	920	0.0757	Pass
24.20	102.45	1.000	1.000	-0.000	-0.0%	5.1%	935	0.0767	Pass
24.20	102.50	1.000	1.000	-0.000	-0.0%	5.1%	950	0.0777	Pass
24.20	102.55	1.000	1.000	-0.000	-0.0%	5.1%	965	0.0787	Pass
24.20	102.60	1.000	1.000	-0.000	-0.0%	5.1%	980	0.0797	Pass
24.20	102.65	1.000	1.000	-0.000	-0.0%	5.1%	995	0.0807	Pass
24.20	102.70	1.000	1.000	-0.000	-0.0%	5.1%	1010	0.0817	Pass
24.20	102.75	1.000	1.000	-0.000	-0.0%	5.1%	1025	0.0827	Pass
24.20	102.80	1.000	1.000	-0.000	-0.0%	5.1%	1040	0.0837	Pass
24.20	102.85	1.000	1.000	-0.000	-0.0%	5.1%	1055	0.0847	Pass
24.20	102.90	1.000	1.000	-0.000	-0.0%	5.1%	1070	0.0857	Pass
24.20	102.95	1.000	1.000	-0.000	-0.0%	5.1%	1085	0.0867	Pass
24.20	103.00	1.000	1.000	-0.000	-0.0%	5.1%	1100	0.0877	Pass
24.20	103.05	1.000	1.000	-0.000	-0.0%	5.1%	1115	0.0887	Pass
24.20	103.10	1.000	1.000	-0.000	-0.0%	5.1%	1130	0.0897	Pass
24.20	103.15	1.000	1.000	-0.000	-0.0%	5.1%	1145	0.0907	Pass
24.20	103.20	1.000	1.000	-0.000	-0.0%	5.1%	1160	0.0917	Pass
24.20	103.25	1.000	1.000	-0.000	-0.0%	5.1%	1175	0.0927	Pass
24.20	103.30	1.000	1.000	-0.000	-0.0%	5.1%	1190	0.0937	Pass
24.20	103.35	1.000	1.000	-0.000	-0.0%	5.1%	1205	0.0947	Pass
24.20	103.40	1.000	1.000	-0.000	-0.0%	5.1%	1220	0.0957	Pass
24.20	103.45	1.000	1.000	-0.000	-0.0%	5.1%	1235	0.0967	Pass
24.20	103.50	1.000	1.000	-0.000	-0.0%	5.1%	1250	0.0977	Pass
24.20	103.55	1.000	1.000	-0.000	-0.0%	5.1%	1265	0.0987	Pass
24.20	103.60	1.000	1.000	-0.000	-0.0%	5.1%	1280	0.0997	Pass
24.20	103.65	1.000	1.000	-0.000	-0.0%	5.1%	1295	0.1007	Pass
24.20	103.70	1.000	1.000	-0.000	-0.0%	5.1%	1310	0.1017	Pass
24.20	103.75	1.000	1.000	-0.000	-0.0%	5.1%	1325	0.1027	Pass
24.20	103.80	1.000	1.000	-0.000	-0.0%	5.1%	1340	0.1037	Pass
24.20	103.85	1.000	1.000	-0.000	-0.0%	5.1%	1355	0.1047	Pass
24.20	103.90	1.000	1.000	-0.000	-0.0%	5.1%	1370	0.1057	Pass
24.20	103.95	1.000	1.000	-0.000	-0.0%	5.1%	1385	0.1067	Pass
24.20	104.00	1.000	1.000	-0.000	-0.0%	5.1%	1400	0.1077	Pass
24.20	104.05	1.000	1.000	-0.000	-0.0%	5.1%	1415	0.1087	Pass
24.20	104.10	1.000	1.000	-0.000	-0.0%	5.1%	1430	0.1097	Pass
24.20	104.15	1.000	1.000	-0.000	-0.0%	5.1%	1445	0.1107	Pass
24.20	104.20	1.000	1.000	-0.000	-0.0%	5.1%	1460	0.1117	Pass
24.20	104.25	1.000	1.000	-0.000	-0.0%	5.1%	1475	0.1127	Pass
24.20	104.30	1.000	1.000	-0.000	-0.0%	5.1%	1490	0.1137	Pass
24.20	104.35	1.000	1.000	-0.000	-0.0%	5.1%	1505	0.1147	Pass
24.20	104.40	1.000	1.000	-0.000	-0.0%	5.1%	1520	0.1157	Pass
24.20	104.45	1.000	1.000	-0.000	-0.0%	5.1%	1535	0.1167	Pass
24.20	104.50	1.000	1.000	-0.000	-0.0%	5.1%	1550	0.1177	Pass
24.20	104.55	1.000	1.000	-0.000	-0.0%	5.1%	1565	0.1187	Pass
24.20	104.60	1.000	1.000	-0.000	-0.0%	5.1%	1580	0.1197	Pass
24.20	104.65	1.000	1.000	-0.000	-0.0%	5.1%	1595	0.1207	Pass
24.20	104.70	1.000	1.000	-0.000	-0.0%	5.1%	1610	0.1217	Pass
24.20	104.75	1.000	1.000	-0.000	-0.0%	5.1%	1625	0.1227	Pass
24.20	104.80	1.000	1.000	-0.000	-0.0%	5.1%	1640	0.1237	Pass
24.20	104.85	1.000	1.000	-0.000	-0.0%	5.1%	1655	0.1247	Pass
24.20	104.90	1.000	1.000	-0.000	-0.0%	5.1%	1670	0.1257	Pass
24.20	104.95	1.000	1.000	-0.000	-0.0%	5.1%	1685	0.1267	Pass
24.20	105.00	1.000	1.000	-0.000	-0.0%	5.1%	1700	0.1277	Pass
24.20	105.05	1.000	1.000	-0.000	-0.0%	5.1%	1715	0.1287	Pass
24.20	105.10	1.000	1.000	-0.000	-0.0%	5.1%	1730	0.1297	Pass
24.20	105.15	1.000	1.000	-0.000	-0.0%	5.1%	1745	0.1307	Pass
24.20	105.20	1.000	1.000	-0.000	-0.0%	5.1%	1760	0.1317	Pass
24.20	105.25	1.000	1.000	-0.000	-0.0%	5.1%	1775	0.1327	Pass
24.20	105.30	1.000	1.000	-0.000	-0.0%	5.1%	1790	0.1337	Pass
24.20	105.35	1.000	1.000	-0.000	-0.0%	5.1%	1805	0.1347	Pass
24.20	105.40	1.000	1.000	-0.000	-0.0%	5.1%	1820	0.1357	Pass
24.20	105.45	1.000	1.000	-0.000	-0.0%	5.1%	1835	0.1367	Pass
24.20	105.50	1.000	1.000	-0.000	-0.0%	5.1%	1850	0.1377	Pass
24.20	105.55	1.000	1.000	-0.000	-0.0%	5.1%	1865	0.1387	Pass
24.20									



Certificate of Calibration

Certificate No.: 24P1847
Page: 1 of 2

Cert. No.: 24P1847
Page: 1 of 2

Equipment: Digital Temperature/Humidity
Manufacturer: Extech
Model: 744200
Serial No.: 452321143
ID No.: UAEJMA2 0182607
Condition As-Received: Broken
Received Date: 13 July 2024
Calibration Date: 16 July 2024
Reference: 24P1847 (2024)
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 10) %

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except with the prior written approval of the head of
Corporate Services & Equipment Calibration and Testing Services.

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

81 Soi Sukhumvit 41, Sukhumvit Road, Bangkok
Pratunhara, Bangkok 10110

Procedure used: Calibration was conducted using in-house calibration procedure CP-P10 according to compliance with ISO/IEC 17025:2017 and ISO 9001:2015 standards.
with certified digital meter service for humidity measurement (relative humidity) and compliance with standard
temperature probe for temperature measurement (absolute humidity) temperature chamber

Condition of this result of calibration

1. Reference standards instruments:

- | Instrument | Model | Serial No. | Certificate No. | Due Date |
|--|-------------|------------|-----------------|-------------|
| 1) Standard Certified Airflow Hygrometer DPH42 | Dew Point 8 | 31585 | 21018 | 20 Dec 2024 |
| 2) Standard Thermometer VDA 1000 | 1000 | 6717004 | 207001 | 16 Nov 2024 |
3. The certificate is valid only to the data submitted on date and place of issuance.
3. This Certificate is traceable to the International System of Unit maintained through:
- Thailand Standards Department, NMIAR Registration No. Calibration 21018260
- Factory: Primary Calibration (Thailand/Japan) NMIAR 21018260 Accredited No. Calibration 21018260

Calibrated by: Surin Prathaporn
Issue Date: 17 July 2024

Approved Signatory: Viporn
[] District Manager
[] North Territory
[] Operations Manager

เอกสารไม่ควบคุม



Result of Calibration: 100% Accuracy
Function: Humidity Measurement

Reference Temperature	Standard Humidity	UUC Reading	Error	Uncertainty of Measurement
(°C)	(g/RH)	(g/RH)	(g/RH)	(g/RH)
25.0	40.1	70	-1.1	1.4
25.0	60.1	60	-1.1	1.4
25.0	80.0	70	-1.2	1.4
25.0	100.0	80	-1.2	1.4

Result of Calibration: 100% Accuracy
Function: Temperature Measurement

Standard Temperature	UUC Reading	Error	Uncertainty of Measurement
(°C)	(°C)	(°C)	(°C)
20.0	20.1	0.26	0.42
24.0	24.1	0.21	0.42
28.0	28.1	0.09	0.42
40.0	40.0	-0.07	0.42

UUC: Unit Under Calibration

The reported uncertainty of measurement was based on standard uncertainty multiplied by coverage factor k = 2 (95% probability confidence level) approximately 95%.

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เอกสารไม่ควบคุม



Certificate of Calibration

Certificate No.: 24P185C
Page: 1 of 2

Cert. No.: 24P185C
Page: 2 of 2

Equipment: Aerotec Barometer
Manufacturer: Parag
Model: -
Serial No.: -
ID No.: UAEJMA2 1102556
Condition As-Received: Used Item
Received Date: 24 May 2024
Calibration Date: 04 June 2024
Reference: 24C-019W3C
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Atmospheric Pressure: 1005 mbar

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except with the prior written approval of the head of
Corporate Services & Equipment Calibration and Testing Services.

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

81 Soi Sukhumvit 41, Sukhumvit Road,
Bangkok, Pratunhara, Bangkok 10110

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

Condition of this result of calibration

1. Reference standards instruments:

- | Instrument | Model | Serial No. | Certificate No. | Due Date |
|-----------------------|-------|------------|-----------------|-------------|
| 1) Standard Barometer | DP142 | 1422555046 | MP-0094-24 | 03 May 2025 |
2. The instrument was installed in vertical orientation and center of the dial was used as the reference level.
3. The result of calibration was made on requested at the point specified by customer.
4. The result of calibration instrument was as absolute pressure.
5. The instrument was used clean air as pressure media.
6. The certificate is valid only to the item calibrated on date and place of calibration.
7. This Certificate is traceable to the International System of Unit maintained through:
- National Institute of Metrology Thailand (NIMT)

Calibrated by: Surin Khairatw
Issue Date: 06 June 2024

Approved Signatory: Athapol P.
[] Phairote Prathaporn
[] Sura Sornthorn
[] Athapol Panarach

เอกสารไม่ควบคุม
0316956



Result of Calibration: Within acceptance
Function: Absolute Pressure Measurement
Range: 720 mmHg to 800 mmHg
Scale Interval: 1 mmHg (The FSR Error is 0.1 mmHg)

Applied Pressure (mmHg)	720.40	726.07	740.34	751.52	758.58	761.83	773.53	798.78
UUC Indication (mmHg)	720.0	720.0	740.0	750.0	755.0	760.0	770.0	790.0
Error (mmHg)	-0.40	-0.07	-0.34	-1.52	-1.58	-1.83	-3.53	-8.78

Applied Pressure (mmHg)	768.11	773.60	781.89	786.06	781.50	740.72	730.68	720.09
UUC Indication (mmHg)	790.0	770.0	760.0	750.0	740.0	730.0	720.0	710.0
Error (mmHg)	21.89	-6.40	-1.89	-1.85	-1.50	-0.72	-0.68	-9.09

The uncertainty of measurement was ± 0.24 mmHg

* UUC: Unit Under Calibration

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

-00-

Athapol P.
เอกสารไม่ควบคุม
1165502



Certificate of Calibration

Certificate No.: 20/TPM-053

Customer: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Name: 81 Soi Udonnuk 41, Sukhumvit Road, Bangkok
Address: Prakaneng, Bangkok 10160
Page: 1/2

Unit Under Calibration Details

Calibration Parameter: Temperature
Instrument Name: Thermal Environmental Monitor
Manufacturer: TSI QUEST
Model: QP-2C
Serial Number: TSI030005
Resolution: 0.1 °C
ID Number: UAE.EPM.000.2561
Range Calibration: 20 °C to 65 °C
Type of Sensor: RTD
Sensor Diameter (mm): 4.5
Calibration Position (mm): 67.5
Instrument Status: Used

Calibration Environment and Details

Temperature: 23 °C ± 0.3 °C
Humidity: 55% RH ± 1% RH
Received Date: 2 August 2024
Calibrated Date: 12 August 2024

Calibration Procedure: In-house method CP-TPM-01 by Comparison with Standard Thermometer.

Reference Standard

Digital Thermometer with Sensor, Manufacturer: GINGO, Model: GT11/RTD10, SN: 0800005, ID: 62-TPM Which was calibrated on 1 March 2024, Calibration Certificate No.: QRC-0478

Traceability

This Certificate is traceable to SI Unit through Quality Reference Co., Ltd. (NSG-ONSF) Accreditation No.: QRC-0292

Note

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

Approved By:
Mr. Noppadon Luangpan
Technical Manager
Issue Date: 12 August 2024

เอกสารไม่ควบคุม

The results relate only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.
PM-949-TPM-01 Rev-01 (Issue date: 11/02/20)



Calibration Note

Unit: As shown

Certificate No.: 25/TPM-053

Request No.: Req-2024-7237

Page: 1/2

Result of Calibration:

Calibration Note	Standard Temperature (°C)	EPF Reading (°C)	Correction (°C)	Uncertainty (°C)
WET	20.039	20.1	+0.1	0.13
	25.032	25.1	+0.1	0.13
	30.174	30.1	+0.1	0.13
	35.037	35.1	+0.1	0.13
	40.037	40.2	+0.2	0.13
	45.040	45.1	+0.1	0.13
	50.042	50.1	+0.1	0.13
	60.043	60.1	+0.1	0.13
DRY	20.039	20.0	-0.1	0.13
	25.032	25.0	-0.1	0.13
	30.174	30.0	-0.1	0.13
	35.037	35.0	-0.1	0.13
	40.037	40.0	-0.1	0.13
	45.040	45.0	-0.1	0.13
	50.042	50.0	-0.1	0.13
	60.043	60.0	-0.1	0.13
GLOBE	20.039	20.0	-0.1	0.13
	25.032	25.0	-0.1	0.13
	30.174	30.1	+0.1	0.13
	35.037	35.1	+0.1	0.13
	40.037	40.1	+0.1	0.13
	45.040	45.1	+0.1	0.13
	50.042	50.1	+0.1	0.13
	60.043	60.1	+0.1	0.13

End of Certificate

Calibrated By:
Mr. Sulechok Jirachitkanchai

เอกสารไม่ควบคุม

The results relate only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.
PM-949-TPM-01 Rev-01 (Issue date: 11/02/20)



Certificate of Calibration

Certificate No.: 25/TPM-053

Customer: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Name: 81 Soi Udonnuk 41, Sukhumvit Road, Bangkok
Address: Prakaneng, Bangkok 10160
Page: 1/2
Request No.: Req-2024-7237

Unit Under Calibration Details

Calibration Parameter: Temperature
Instrument Name: Thermal Environmental Monitor
Manufacturer: TSI QUEST
Model: QP-2C
Serial Number: TSI030005
Resolution: 0.1 °C
ID Number: UAE.EPM.000.2561
Range Calibration: 20 °C to 65 °C
Type of Sensor: RTD
Sensor Diameter (mm): 4.5
Calibration Position (mm): 67.5
Instrument Status: Used

Calibration Environment and Details

Temperature: 23 °C ± 0.3 °C
Humidity: 55% RH ± 1% RH
Received Date: 25 December 2023
Calibrated Date: 28 January 2025

Calibration Procedure: In-house method CP-TPM-01 by Comparison with Standard Thermometer.

Reference Standard

Digital Thermometer with Sensor, Manufacturer: GINGO, Model: GT11/RTD10, SN: 0800005, ID: 62-TPM Which was calibrated on 1 March 2024, Calibration Certificate No.: QRC-0478

Traceability

This Certificate is traceable to SI Unit through Quality Reference Co., Ltd. (NSG-ONSF) Accreditation No.: QRC-0292

Note

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

Approved By:
Mr. Noppadon Luangpan
Technical Manager
Issue Date: 28 January 2025

เอกสารไม่ควบคุม

The results relate only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.
PM-949-TPM-01 Rev-01 (Issue date: 11/02/20)



Calibration Note

Unit: As shown

Certificate No.: 25/TPM-053

Request No.: Req-2024-7237

Page: 1/2

Result of Calibration:

Calibration Note	Standard Temperature (°C)	EPF Reading (°C)	Correction (°C)	Uncertainty (°C)
WET	20.039	20.1	+0.1	0.13
	25.032	25.1	+0.1	0.13
	30.174	30.1	+0.1	0.13
	35.037	35.1	+0.1	0.13
	40.037	40.2	+0.2	0.13
	45.040	45.1	+0.1	0.13
	50.042	50.1	+0.1	0.13
	60.043	60.1	+0.1	0.13
DRY	20.039	20.1	+0.1	0.13
	25.032	25.1	+0.1	0.13
	30.174	30.1	+0.1	0.13
	35.037	35.1	+0.1	0.13
	40.037	40.2	+0.2	0.13
	45.040	45.1	+0.1	0.13
	50.042	50.1	+0.1	0.13
	60.043	60.1	+0.1	0.13
GLOBE	20.039	20.0	-0.1	0.13
	25.032	25.0	-0.1	0.13
	30.174	30.1	+0.1	0.13
	35.037	35.1	+0.1	0.13
	40.037	40.1	+0.1	0.13
	45.040	45.1	+0.1	0.13
	50.042	50.1	+0.1	0.13
	60.043	60.1	+0.1	0.13

End of Certificate

Calibrated By:
Mr. Sulechok Jirachitkanchai

เอกสารไม่ควบคุม

The results relate only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.
PM-949-TPM-01 Rev-01 (Issue date: 11/02/20)



Certificate of Calibration

Cert.No.: 24CH1284/1
Page.: 1 of 3

This Certificate was issued to replace to the Certificate No. 24CH1284

Equipment : pH Meter
Manufacturer : Horiba
Model : LAQUA-PH210
Serial No. : HA4G0080
ID No. : UAE.EFM.202/2564(EFM.pH.10/64)
Condition As-Received: Used Item
Received Date : 11 October 2024
Calibration Date : 15 October 2024
Reference : 2410-0455WSC-1
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260

Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In - house method :
- CP-CH5 by direct measurement with DC voltage standard and direct measurement with certified reference material (CRM)
- CP-CH8 by comparison with temperature standard

Calibrated by : Walelek Sirintheen

Approved by : _____
Approved Signatory

() Unnopphol Harechai
() Ponpan Paipim
(✓) Seithip Meangmai

Issue Date : 1 November 2024

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม



Cert.No.: 24CH1284/1
Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030049	130RC116	24E2759	25 Aug 2025
2) Ref. Standard Thermometer	4982054	110RC044	241757	14 July 2025

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

2. Certified Reference Materials : The measurement results are traceable to SI through Hach Lange GmbH Ltd., Deutsche Akkreditierungsstelle, Accredited No.D-RM-15184-01-00
: The measurement results are traceable to SI through CPA chem Ltd., ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	1034203	27 Sep 2026
pH 6.999	Hach Lange GmbH	C03145	28 Feb 2026
pH 9.997	CPA chem	970853	25 Apr 2025

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

Calibration Results

Function : mV Measurement

Performing standard curve by Document Process Calibrator at pH (4.7)(7.10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (mV)	Coverage factor k
	pH	mV	mV	pH		
pH Meter S/N.: HA4G0080	4.00	177.48	177.1	4.01	0.058	2.00
	7.00	0.00	0.0	7.00	0.058	2.00
	7.00	0.00	0.0	7.00	0.058	2.00
	10.00	-177.48	-177.1	10.01	0.058	2.00

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Cert.No.: 24CH1284/1
Page.: 3 of 3

Calibration Results

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4.7)(7.10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (k)	Coverage factor k
pH Electrode S/N.: Q9AG0067	4.008	4.01	185.0	0.0079	2.00
	6.999	7.00	10.1	0.0084	2.00
	8.999	7.00	10.0	0.0084	2.00
	9.997	10.01	-163.2	0.0092	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : 9652-10D
- Serial No. : Q9AG0067
Dimension of probe
- Length : 107 mm
- Diameter : 15 mm
- Immersion Depth : 65 mm

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor k
20.0	20.002	20.0	-0.002	0.13	2.00
25.0	24.999	25.0	0.001	0.13	2.00
45.0	45.001	44.9	-0.101	0.13	2.00

Remark : - UUC* = Unit Under Calibration

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

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เอกสารไม่ควบคุม



Certificate of Calibration

Cert.No.: 24CH1284/1
Page.: 1 of 3

This Certificate was issued to replace to the Certificate No. 24CH1284

Equipment : pH Meter
Manufacturer : Horiba
Model : LAQUA-PH210
Serial No. : HA4G0080
ID No. : UAE.EFM.202/2564(EFM.pH.10/64)
Condition As-Received: Used Item
Received Date : 11 October 2024
Calibration Date : 15 October 2024
Reference : 2410-0455WSC-1
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260

Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In - house method :
- CP-CH5 by direct measurement with DC voltage standard and direct measurement with certified reference material (CRM)
- CP-CH8 by comparison with temperature standard

Calibrated by : Walelek Sirintheen

Approved by : _____
Approved Signatory

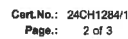
() Unnopphol Harechai
() Ponpan Paipim
(✓) Seithip Meangmai

Issue Date : 1 November 2024

The Uncertainties are for a confidence probability of approximately 95%

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เอกสารไม่ควบคุม



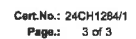
<u>Instrument</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Document Process Calibrator	54030049	130RC116	24E2759	25 Aug 2025
2) Ref. Standard Thermometer	4982054	110RC044	24I757	14 July 2025

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

<u>Buffer Solution</u>	<u>Manufacturer</u>	<u>Lot No.</u>	<u>Exp. date</u>
pH 4.008	CPA chem	1034203	27 Sep 2021
pH 6.999	Hach Lange GmbH	C03145	28 Feb 2022
pH 9.997	CPA chem	970853	25 Apr 2025

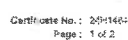
Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (μmV)	Coverage factor k
	pH	mV	mV	pH		
pH Meter	4.00	177.48	177.1	4.01	0.058	2.00
S/N.: HA4G0060	7.00	0.00	0.0	7.00	0.058	2.00
	7.00	0.00	0.0	7.00	0.058	2.00
	10.00	-177.48	-177.1	10.01	0.058	2.00

เอกสารไม่ควบคุม

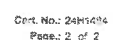


Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (±)	Coverage factor <i>k</i>
pH Electrode S/N.: C9AG0067	4.008	4.01	186.0	0.0079	2.00
	6.999	7.00	10.1	0.0084	2.00
	6.999	7.00	10.0	0.0084	2.00
	9.967	10.01	-163.2	0.0082	2.00

เอกสารไม่ควบคุม



เอกสารไม่ควบคุม



-58-

UUC: Unit Under Calibration
The reported uncertainty of measurement was large (x) standard uncertainty multiplied by coverage factor $k=2.00$, providing confidence level approximately 95%.

-58-

เอกสารไม่ควบบคม

2. Stimulus-response relationship

[illegible][illegible]

2.2.4. Strong weights

[illegible]

3. Linearity of response to steady signals

a. Scale of exposure metric, linearity of response for change of input signal at signal level

FIS Scoring		FISCI, A, B, C											
FISCI	Pos	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
	Revised A	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
	Revised B	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
FISCI	Revised A	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
	Revised B	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
	Revised C	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
FISCI	Revised A	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
	Revised B	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
	Revised C	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
Total FISCI		10										10	
UNCERTAINTY		10										10	
Result		10										10	

b. Sound exposure meter linearity of error

UCC Setting	Time		Exposure Measurement			UNCERTAINTY	Tolerance	Result
Exposure Time (s)	Ref	UCC	Ref	UCC	Error	(%)	μm	mm
Calibration Setting	Ref	UCC	(P ₁) _{Ref}	(P ₁) _{UCC}	(%)			
Exposure Time (s)	27	27	0.00	0.00	0.00			0.00
Exposure Time (s)	28	28	0.00	0.00	0.00			0.00
Exposure Time (s)	30	30	1.00	1.00	+0.00			0.00
Exposure Time (s)	100	100	2.00	2.02	+0.01			0.00
Exposure Time (s)	26	26	5.00	4.93	-0.07			0.00
Exposure Time (s)	72	72	8.00	8.05	+0.03			0.00
Exposure Time (s)	100	100	10.00	10.13	+0.13			0.00
Exposure Time (s)	150	150	20.00	20.22	+0.22			0.00
Exposure Time (s)	300	300	40.00	40.34	+0.34			0.00
Exposure Time (s)	500	500	60.00	60.39	+0.39			0.00

c. Response to short duration

a. Response for sinusoidal signals - reference level

UUC Settling		Time				Expensive Measurement		N.C.R.A.I.S. Y		Tolerances	
for $T = 2.55 \pm 0.10$		Ref	UUC	Ref	UUC	Error		Δ_{UUC}	$\Delta_{\text{N.C.R.A.I.S. Y}}$	Δ_{UUC}	Result
Calibration Settling		1.5	1.6	(1 ± 1)	(0 ± 1)	(± 1)		(± 1)	(± 1)		
$\Delta_{\text{UUC}}/U_{\text{UUC}}$		2.4%	2.4%	1.0%	1.0%	0.3%		0.3%	0.3%	0.3%	Δ_{UUC}

a. Sound exposure meter response for series of longburst impulses

QC Setting	Time		Exposure Measurement			UNCERTAINTY (%)	Tolerance (mm)	Result
1.55 (1.4) / 1.140	Ref	UAC	Ref	UAC	Yield			
Calibrator 10.0 mg	Ref	100	(Pa) h	(Pa) h	(%)			
Beam 1 mm, 95.0 s	2.00	2.00	1.00	1.00	0.00	± 0	± 0.1 / ± 0.4	Pass
Beam 1 mm, 1.00 s	1.00	500	1.00	1.00	0.00		± 0.1 / ± 0.1	Pass
Beam 1 mm, 1.00 s	700	500	1.00	1.00	0.00		± 0.1 / ± 0.1	Pass
Beam 1 mm, 1.00 s	1.00	500	1.00	1.00	0.00		± 0.1 / ± 0.1	Pass

5. Response to unipolar pulse

UUC Setting	Time	Exposure Measurement		UNCERTAINTY (%)	Tolerances Limit (%)	Result
FASTRA (1:14)	UUC	UUC (Pa.h)	Difference (%)			
Calibrator Binding	1s					
Continuous Recirculation	2s	13.3%	D.O.	3.7	±1.5-2.6	Fail
Continuous Recirculation		30.5%				Fail

* Indicates both included

Decision Made for Statements of Conformity

1. The first step is to identify the problem or question that needs to be answered. This involves understanding the context and the specific requirements of the task.

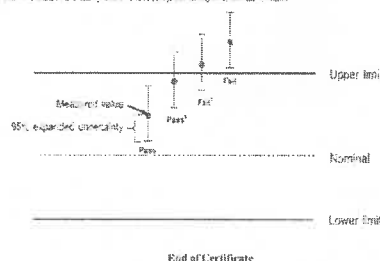
Fig. 1. The dependence of the rate of the reaction of the polymerization of α -methylstyrene on the concentration of the initiator.

[illegible]

1990年12月 第11卷 第1期 总第31期

1. The first part of the document is a list of references. The references are:

- 1. J. H. Van der Meer, *Journal of the Royal Microscopical Society*, **1910**, *vol. 30*, *part 1*, *pp. 1-10*.
- 2. J. H. Van der Meer, *Journal of the Royal Microscopical Society*, **1910**, *vol. 30*, *part 2*, *pp. 1-10*.
- 3. J. H. Van der Meer, *Journal of the Royal Microscopical Society*, **1910**, *vol. 30*, *part 3*, *pp. 1-10*.
- 4. J. H. Van der Meer, *Journal of the Royal Microscopical Society*, **1910**, *vol. 30*, *part 4*, *pp. 1-10*.
- 5. J. H. Van der Meer, *Journal of the Royal Microscopical Society*, **1910**, *vol. 30*, *part 5*, *pp. 1-10*.
- 6. J. H. Van der Meer, *Journal of the Royal Microscopical Society*, **1910**, *vol. 30*, *part 6*, *pp. 1-10*.
- 7. J. H. Van der Meer, *Journal of the Royal Microscopical Society*, **1910**, *vol. 30*, *part 7*, *pp. 1-10*.
- 8. J. H. Van der Meer, *Journal of the Royal Microscopical Society*, **1910**, *vol. 30*, *part 8*, *pp. 1-10*.
- 9. J. H. Van der Meer, *Journal of the Royal Microscopical Society*, **1910**, *vol. 30*, *part 9*, *pp. 1-10*.
- 10. J. H. Van der Meer, *Journal of the Royal Microscopical Society*, **1910**, *vol. 30*, *part 10*, *pp. 1-10*.



Certificate of Calibration

Customer: **PT. CITA KARYA TEKNIK**
Address: **Jl. Raya Cendek, No. 10, Cendek, Aceh Besar, Aceh, Indonesia**

Unit Under Calibration Details

Manufacturer: **SVANTEN**
Model: **SW 581**
Serial Number: **10000000000000000000**
Calibration Due Date: **15/05/2024**

Calibration Experience and Details

Calibration: **15/05/2024**
Location: **PT. CITA KARYA TEKNIK**
Technician: **PT. CITA KARYA TEKNIK**
Review Date: **15/05/2024**
Calibration Plan: **PT. CITA KARYA TEKNIK**
Calibration History: **PT. CITA KARYA TEKNIK**
Calibration Interval: **12 Months**

Parameter	Brand	Unit	Value	Uncertainty	Remarks
Sound Pressure Level	SVANTEN	dB	120.0	±0.5	Pass
Frequency	SVANTEN	Hz	1000	±0.5	Pass
Sound Power Level	SVANTEN	dB	110.0	±0.5	Pass
Sound Pressure	SVANTEN	dB	110.0	±0.5	Pass
Result	PT. CITA KARYA TEKNIK				Pass

Calibration By: **PT. CITA KARYA TEKNIK**
Approved By: **PT. CITA KARYA TEKNIK**
Signature: **PT. CITA KARYA TEKNIK**
Issue Date: **15/05/2024**

เอกสารไม่ควบคุม

1. General Information

UUC Setting	Time	Exposure Measurement	UNCERTAINTY	Tolerance	Result
FAST (A, 120 Hz)	Ref	UUC	Ref	UUC	Ref
Calibrator Setting	(s)	(Pa ² /s)	(Pa ² /s)	(Pa ² /s)	(Pa ² /s)
Calibrator Response	20	100	100	100	100

2. Response to Sinusoidal Signals

UUC Setting	Time	Exposure Measurement	UNCERTAINTY	Tolerance	Result
FAST (A, 120 Hz)	Ref	UUC	Ref	UUC	Ref
Calibrator Setting	(s)	(Pa ² /s)	(Pa ² /s)	(Pa ² /s)	(Pa ² /s)
Calibrator Response	20	100	100	100	100
Calibrator Response	20	100	100	100	100
Calibrator Response	20	100	100	100	100
Calibrator Response	20	100	100	100	100
Calibrator Response	20	100	100	100	100
Calibrator Response	20	100	100	100	100
Calibrator Response	20	100	100	100	100
Calibrator Response	20	100	100	100	100

เอกสารไม่ควบคุม

Calibration No: **24-05000000**
Revision: **01**

3. Uncertainty of response to steady signal

a. Sound exposure meter, uncertainty of response for changes of input sinusoidal signal level

UUC Setting	Time	Exposure Measurement	UNCERTAINTY	Tolerance	Result
FAST (A, 120 Hz)	Ref	UUC	Ref	UUC	Ref
Calibrator Setting	(s)	(Pa ² /s)	(Pa ² /s)	(Pa ² /s)	(Pa ² /s)
Calibrator Response	20	100	100	100	100
Calibrator Response	20	100	100	100	100
Calibrator Response	20	100	100	100	100
Calibrator Response	20	100	100	100	100
Calibrator Response	20	100	100	100	100
Calibrator Response	20	100	100	100	100
Calibrator Response	20	100	100	100	100
Calibrator Response	20	100	100	100	100
Calibrator Response	20	100	100	100	100

b. Sound exposure meter linearity of error

UUC Setting	Time	Exposure Measurement	UNCERTAINTY	Tolerance	Result
FAST (A, 120 Hz)	Ref	UUC	Ref	UUC	Ref
Calibrator Setting	(s)	(Pa ² /s)	(Pa ² /s)	(Pa ² /s)	(Pa ² /s)
Calibrator Response	20	100	100	100	100
Calibrator Response	20	100	100	100	100
Calibrator Response	20	100	100	100	100
Calibrator Response	20	100	100	100	100
Calibrator Response	20	100	100	100	100
Calibrator Response	20	100	100	100	100
Calibrator Response	20	100	100	100	100
Calibrator Response	20	100	100	100	100
Calibrator Response	20	100	100	100	100

เอกสารไม่ควบคุม

Calibration No: **24-05000000**
Revision: **01**

4. Response to short duration

a. Response for sinusoidal signals - reference level

UUC Setting	Time	Exposure Measurement	UNCERTAINTY	Tolerance	Result
FAST (A, 120 Hz)	Ref	UUC	Ref	UUC	Ref
Calibrator Setting	(s)	(Pa ² /s)	(Pa ² /s)	(Pa ² /s)	(Pa ² /s)
Calibrator Response	20	100	100	100	100
Calibrator Response	20	100	100	100	100

b. Sound exposure meter response for series of tonotone impulses

UUC Setting	Time	Exposure Measurement	UNCERTAINTY	Tolerance	Result
FAST (A, 120 Hz)	Ref	UUC	Ref	UUC	Ref
Calibrator Setting	(s)	(Pa ² /s)	(Pa ² /s)	(Pa ² /s)	(Pa ² /s)
Calibrator Response	20	100	100	100	100
Calibrator Response	20	100	100	100	100
Calibrator Response	20	100	100	100	100
Calibrator Response	20	100	100	100	100
Calibrator Response	20	100	100	100	100
Calibrator Response	20	100	100	100	100
Calibrator Response	20	100	100	100	100
Calibrator Response	20	100	100	100	100

5. Response to unipolar pulse

UUC Setting	Time	Exposure Measurement	UNCERTAINTY	Tolerance	Result
FAST (A, 120 Hz)	Ref	UUC	Ref	UUC	Ref
Calibrator Setting	(s)	(Pa ² /s)	(Pa ² /s)	(Pa ² /s)	(Pa ² /s)
Calibrator Response	20	100	100	100	100
Calibrator Response	20	100	100	100	100

* Indicates when exceeded

เอกสารไม่ควบคุม

FM-708-RFM-03 Rev 04 Issue date 17/6/24



Carlisle Services
Page: 1 of 2

Serial of Calibration: 25CH262
Function: pH Measurement
Instrument: pH Meter

Standard	Actual	Uncertainty	Coverage
4.007	4.01	0.0085	2.05
6.999	7.00	0.0092	2.00
10.010	10.01	0.0092	2.00

Standard	Actual	Uncertainty	Coverage
15.003	15.00	0.003	2.00
30.004	30.00	0.004	2.00
45.002	45.00	0.002	2.00

The measurement results are traceable to SI through Hach Lange GmbH Ltd.,
Deutsche Akkreditierungsstelle, Accredited No. D-15184-01-00
The measurement results are traceable to SI through CPA chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

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เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SU1 16, SUANLUANG, SUANLUANG BANGKOK 10250
TEL.0-2717-3000-29 FAX.0-2719-9484



Certificate of Calibration

Cert.No.: 25CH262
Page: 1 of 3

Equipment: pH Meter
Manufacturer: Horiba
Model: LAQUA-PH210
Serial No.: HA1L0035
ID No.: UAE-EFM.0112565(EFM.pH.01/65)
Condition As-Received: Used Item
Received Date: 25 February 2025
Calibration Date: 26 to 28 February 2025
Reference: 2502-0783WSC-2
Submitted by: United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10280

Ambient Temperature: (25 ± 2.6) °C
Relative Humidity: (50 ± 15) %
Calibration Procedure:
- CP-CH5 by direct measurement with DC voltage
standard and direct measurement with
certified reference material (CRM)
- CP-CH8 by comparison with temperature standard

Calibrated by: Werakorn Lemgagrakul

Approved by: _____
Approved Signatory

() Chakrit Waewwanjua
() Ponpan Palpin
(✓) Saitip Meangmai

Issue Date: 28 February 2025

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.

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Cert.No.: 25CH262
Page: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030049	130RC116	24E2759	25 Aug 2025
2) Ref. Standard Thermometer	4862054	110RC044	24I757	14 July 2025

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

2. Certified Reference Materials

The measurement results are traceable to SI through Hach Lange GmbH Ltd.,
Deutsche Akkreditierungsstelle, Accredited No. D-15184-01-00
The measurement results are traceable to SI through CPA chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.007	CPA chem	1086655	18 Jan 2027
pH 6.999	Hach Lange GmbH	C03220	28 Oct 2026
pH 10.010	CPA chem	1086689	18 Jan 2026

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

Calibration Results

Function: mV Measurement

Performing standard curve by Document Process Calibrator at pH (4.7)(7.10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (mV)	Coverage factor k
			mV	pH		
pH Meter S/N.: HA1L0035	4.00	177.48	177.5	4.01	0.058	2.00
	7.00	0.00	0.1	7.02	0.058	2.00
	7.00	0.00	0.1	7.02	0.058	2.00
	10.00	-177.48	-177.4	10.01	0.329	4.53

เอกสารไม่ควบคุม



Cert.No.: 25CH262
Page: 3 of 3

Calibration Results

Function: pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4.7)(7.10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (±)	Coverage factor k
pH Electrode S/N.: -	4.007	4.01	178.3	0.0085	2.05
	6.999	7.00	2.3	0.0092	2.00
	6.999	7.00	2.4	0.0092	2.00
	10.010	10.01	-172.2	0.0092	2.00

Function: Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model: -

- Serial No.: -

Dimension of probe

- Length: 110 mm.

- Diameter: 16 mm.

- Immersion Depth: 80 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor k
15.0	15.003	15.0	-0.003	0.13	2.00
30.0	30.004	30.0	-0.004	0.13	2.00
45.0	45.002	45.0	-0.002	0.13	2.00

Remark: - UUC* = Unit Under Calibration

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

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เอกสารไม่ควบคุม

List of Instrument Certificates for Environmental Quality Analysis

No.	Instrument/Equipment	Manufacturer	Model/Serial No.	Calibrator	Certificate No.	Date of Calibration	Due Date of Calibration*
1	Analytical Balance	FAT OIL AND GREASE	AD304-SF/ACT / 112031010	Technology Promotion Association (Thailand-Japan)	24M022	11 May 24	10 May 25
2	Analytical Balance	TOTAL DISSOLVED SOLIDS	XSP205DU / CT1008334	Nature Food Institute, Ministry of Industry, Thailand	2402783-002-01	2 Apr 24	1 Apr 25
3	Analytical Balance	TOTAL SUSPENDED SOLIDS	XSP205DU / C200021872	Nature Food Institute, Ministry of Industry, Thailand	2402783-001-01	2 Apr 24	1 Apr 25
4	DO Meter	BIOCHEMICAL OXYGEN DEMAND	5100 / 118 10183	Technology Promotion Association (Thailand-Japan)	241W99	21 Feb 24	20 Feb 25
5	Hot Air Oven	TOTAL DISSOLVED SOLIDS	UP55 / B212 0411	Technology Promotion Association (Thailand-Japan)	241W99	1 Apr 24	31 Mar 25
6	pH Meter	pH	pH 100A / J202729	YSI Environmental	24CH1070	27 Aug 24	25 Jul 25

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

List of Instrument Certificates for Environmental Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certificate No.	Date of Calibration	Due Date of Calibration*
1	Analytical Balance	FAT OIL AND GREASE	Mettler Toledo	AD304-SF/ACT / 112031010	Technology Promotion Association (Thailand-Japan)	24M022	11 May 24	10 May 25
2	Analytical Balance	TOTAL DISSOLVED SOLIDS	Mettler Toledo	XSP205DU / CT1008334	Nature Food Institute, Ministry of Industry, Thailand	2402783-002-01	2 Apr 24	1 Apr 25
3	Analytical Balance	TOTAL SUSPENDED SOLIDS	Mettler Toledo	XSP205DU / C200021872	Nature Food Institute, Ministry of Industry, Thailand	2402783-001-01	2 Apr 24	1 Apr 25
4	DO Meter	BIOCHEMICAL OXYGEN DEMAND	YSI	5100 / 118 10183	Technology Promotion Association (Thailand-Japan)	241W99	21 Feb 24	20 Feb 25
5	Hot Air Oven	TOTAL DISSOLVED SOLIDS	Mettler	UP55 / B212 0411	Technology Promotion Association (Thailand-Japan)	241W99	1 Apr 24	31 Mar 25
6	pH Meter	pH	YSI Environmental	pH 100A / J202729	Association (Thailand-Japan)	24CH1070	27 Aug 24	25 Jul 25

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

List of Instrument Certificates for Environmental Quality Analysis

No.	Instrument/Equipment	Manufacturer	Model/Serial No.	Calibrator	Certificate No.	Date of Calibration	Due Date of Calibration*
1	Analytical Balance	FAT OIL AND GREASE	AD304-SF/ACT / 112031010	Technology Promotion Association (Thailand-Japan)	24M022	11 May 24	10 May 25
2	Analytical Balance	TOTAL DISSOLVED SOLIDS	XSP205DU / CT1008334	Nature Food Institute, Ministry of Industry, Thailand	2402783-002-01	2 Apr 24	1 Apr 25
3	Analytical Balance	TOTAL SUSPENDED SOLIDS	XSP205DU / C200021872	Nature Food Institute, Ministry of Industry, Thailand	2402783-001-01	2 Apr 24	1 Apr 25
4	DO Meter	BIOCHEMICAL OXYGEN DEMAND	YSI	5100 / 118 10183	Technology Promotion Association (Thailand-Japan)	241W99	20 Feb 25
5	Hot Air Oven	TOTAL DISSOLVED SOLIDS	Mettler	UP55 / B212 0411	Technology Promotion Association (Thailand-Japan)	241W99	31 Mar 25
6	pH Meter	pH	pH 100A / J202729	YSI Environmental	24CH1070	27 Aug 24	25 Jul 25

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

List of Instrument Certificates for Environmental Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certificate No.	Date of Calibration	Due Date of Calibration*
1	Analytical Balance	FAT OIL AND GREASE	Mettler Toledo	AD304-SF/ACT / 112031010	Technology Promotion Association (Thailand-Japan)	24M022	11 May 24	10 May 25
2	Analytical Balance	TOTAL DISSOLVED SOLIDS	Mettler Toledo	XSP205DU / CT1008334	Nature Food Institute, Ministry of Industry, Thailand	2402783-002-01	2 Apr 24	1 Apr 25
3	Analytical Balance	TOTAL SUSPENDED SOLIDS	Mettler Toledo	XSP205DU / C200021872	Nature Food Institute, Ministry of Industry, Thailand	2402783-001-01	2 Apr 24	1 Apr 25
4	DO Meter	BIOCHEMICAL OXYGEN DEMAND	YSI	5100 / 118 10183	Technology Promotion Association (Thailand-Japan)	241W99	21 Feb 24	20 Feb 25
5	Hot Air Oven	TOTAL DISSOLVED SOLIDS	Mettler	UP55 / B212 0411	Technology Promotion Association (Thailand-Japan)	241W99	1 Apr 24	31 Mar 25
6	pH Meter	pH	YSI Environmental	pH 100A / J202729	Association (Thailand-Japan)	24CH1070	27 Aug 24	25 Jul 25

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

List of Instruments Certification for Environmental Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Next Calibration
1	Analyst Balance (Resolution 0.1 mg)	Form Suspended Particulate (TSP) Particulate	Mettler Toledo	AB204-S/FACT / B108115858	National Food Institute, Ministry of Industry, Thailand	2402420-001-01	19 Mar 25	18 Mar 26

Due Date of Calibration: 1 year on the annual calibration date, at least 1 time per year.

ใบนี้ถูกออกเพื่อรับรองว่าเครื่องมือการวัดได้รับการสอบเทียบ
โดยผู้ให้บริการการสอบเทียบ ISO/IEC 17025

List of Instrument Certificates for Environmental Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Next Calibration
1	Analyst Balance	FAT OIL AND GREASE	Mettler Toledo	AB204-S/FACT / 132051010	Technology Promotion Association (Thailand-Japan)	2402420-001-01	11 May 25	10 May 26
2	Analyst Balance	TOTAL DISSOLVED SOLIDS	Mettler Toledo	XPR205DU / C17080304	National Food Institute, Ministry of Industry, Thailand	2402420-001-01	20 Mar 25	19 Mar 26
3	Analyst Balance	TOTAL SUSPENDED SOLIDS	Mettler Toledo	XPR205DU / C00071872	National Food Institute, Ministry of Industry, Thailand	2402420-001-01	20 Mar 25	19 Mar 26
4	BOD Incubator	BIOCHEMICAL OXYGEN DEMAND	ANCO	UC-1320 / 1021	Technology Promotion Association (Thailand-Japan)	24141113	11 Jul 24	18 Jul 25
5	DO Meter	BIOCHEMICAL OXYGEN DEMAND	YSI	8001 / 18101863	Technology Promotion Association (Thailand-Japan)	251709	18 Feb 25	16 Feb 26
6	Water Condition Unit	TOTAL KURT DIAL NITROGEN	FOSS	KTS / F1802303	FOSS South East Asia	18975	5 Jul 24	4 Jul 25
7	pH Meter	pH	Endress	pH1034 / J020741	Technology promotion association (Thailand-Japan)	2503466	9 Apr 25	2 Apr 26

Due Date of Calibration: 1 year on the annual calibration date, at least 1 time per year.

United Analyst and Engineering Consultant Co., Ltd. (UAE)
Certified Laboratory ISO/IEC 17025

Calibration Certificate

Certificate No.: 2402420-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangcheck, Prakhong, Bangkok 10260

Page 1 of 3

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: AB204-S/FACT

Serial No.: B108115858

ID No.: UAE.AIR.016/2555

Order No.: 2402420

Operation No.: 2402420-001

Date of Receipt: 19 April 2024

Date of Calibration: 19 April 2024

Calibrated by Mr. Phrasphat Tuanjit
Scientist

Approved by *Phrasphat Tuanjit*
(Miss Phreeyorn Jaengiamkit)
Vice President, Department of Laboratory Services
Responsible for the Technical Management Team

Date of Issue: 23 April 2024

The uncertainties are for a confidence probability of approximately 95%

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

F-CS-009 Revision: 01 Date: 20-04-25

Calibration Report

Certificate No.: 2402420-001-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: AB204-S/FACT
Serial No.: B108115858
Capacity: 220 g
Resolution: 0.0001 g
ID No.: UAE.AIR.016/2555

Date of Calibration: 19 April 2024 Page 2 of 3

Environment Condition: Ambient Temperature: 22.1 ± 0.6 °C Relative Humidity: 49 ± 1.9 %

Place of Calibration: Room 206 Balance Room 2, UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-MA-001 In-House Method based on UKAS Lab 14:2019

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1-500mg	15880	TCS	M22113815	28 November 2024
Standard Weight Class E2	1-500g	15882	TCS	M22113825	28 November 2024

Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermogravimetric Meter	600-4H	NFI.BTH.019/23	Quality Return	Q024-0462	4 March 2025

3. This certification is traceable to SI UNIT

4. This certificate has 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 Readings:

Nominal Value (g)	Standard Deviation of Reading (g)
100	0.000057
200	0.000079

2. Off-Center Error:

A mass of 100 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	(Sum of Differences)
(g)	(g)	(g)	(g)	(g)	(g)	(g)
99.9999	99.9997	99.9996	99.9996	100.0000	99.9998	0.00003

F-CS-012 Revision: 01 Date: 20-04-25

Phrasphat Tuanjit
23 April 2024



Calibration Report

Certificate No.: 2402420-001-01

Equipment: Electronic Balance
Model: AB204-S/FACT
Serial No.: E108115858
Capacity: 220 g

Manufacturer: METTLER TOLEDO
Resolution: 0.001 g
ID No.: JAE-ACR-016/2555

Date of Calibration: 19 April 2024

Page 3 of 3

Calibration Results: (Continued)

Calibration Range: 0-200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value:

Nominal Value (μ)	Standard Value (σ)	Average Reading (\bar{x})	Correction ($\bar{x} - \mu$)	Uncertainty (σ/\sqrt{n})	Coverage Factor (k)
Unread	0.00002	0.0000	0.0000	0.0000489	2.00
0.1	0.10000	0.1000	0.0000	0.0000489	2.00
1	0.000028	1.0000	0.0000	0.0000492	2.00
5	0.00007	5.0000	0.0000	0.0000491	2.00
10	0.00003	10.0001	-0.0001	0.000031	2.00
20	0.00002	20.0001	-0.0001	0.000031	2.00
50	0.000005	50.0000	0.0000	0.000012	2.00
100	0.000001	60.9997	0.0001	0.000016	2.00
250	0.000007	100.0000	0.0000	0.000017	2.00
150	0.000001	149.9997	0.0000	0.000012	2.00
300	0.000001	199.9999	0.0000	0.000018	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 %.

F-CS-017 Revision: 01 Date: 20-04-65

2008 3/3 35, Anu Anan Road, Bang Yai, Khet Suanbuang, Bang Phai District Bangkok 10700, Thailand
Tel +66(0) 2422 8868 Fax +66(0) 2422 8840



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.0-2718-9484



Certificate of Calibration

Cert.No.: 24CH1070
Page.: 1 of 3

Equipment :	pH Meter
Manufacturer :	YSI
Model :	pH100A
Serial No. :	JC02729
ID No. :	UAE.EFM.185/2561(ENV.pH.04/61)
Condition As-Received:	Used Item
Received Date :	27 August 2024
Calibration Date :	28 August 2024
Reference :	2408-0882WSC-1
Submitted by :	United Analyst and Engineering Co

Ambient Temperature :	(25 ± 2.5) °C
Relative Humidity :	(50 ± 15) %
Calibration Procedure :	In - house method :
	<ul style="list-style-type: none"> - CP-CH5 by direct measurement with DC voltage standard and direct measurement with certified reference material (CRM) - CP-CH8 by comparison with temperature standard

Calibrated by : Warakorn Lemgagtrakul

Approved by :

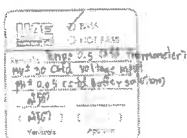
Approved Signatory _____

() Unnophol Harachai
() Ponpen Paipim
(✓) Saithip Meangmai

Issue Date : 29 August 2024

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

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



Cart.No.: 24CH1070
Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

<u>Instrument</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Document Process Calibrator	43180086	130RC092	24E1320	22 Apr 2025
2) Ref. Standard Thermometer	2188080	130RC044	2311216	10 Oct 2024

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

2. Certified Reference Materials

:The measurement results are traceable to SI through Hach Lenge GmbH LI
Deutsche Akkreditierungsstelle, Accredited No.D-RM-15184-01-00

: The measurement results are traceable to SI through CPA chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

<u>Buffer Solution</u>	<u>Manufacturer</u>	<u>Lot No.</u>	<u>Exp. date</u>
pH 4.005	Hach Lange GmbH	C03146	23 Feb 2026
pH 6.999	Hach Lange GmbH	C03145	28 Feb 2026
pH 9.987	CPA chem	970853	25 Apr 2025

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

Calibration Results

Function : mV Measurement

Performing standard curve by Document Process Calibrator at pH (4,7)(7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (μmV)	Coverage factor k
			mV	pH		
	pH Meter	4.00	177.48	177	4.01	0.58
S/N: JC02729	7.00	0.00	0	7.00	0.58	2.00
	7.00	0.00	0	7.00	0.58	2.00
	10.00	-177.48	-177	10.01	0.58	2.00



Cert.No.: 24CH1070
Page: 3 of 3

Calibration Results

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4.7)(7.10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (±)	Coverage factor k
pH Electrode S/N: 231018SIA605377	4.006	4.01	173	0.0080	2.05
	6.999	7.00	-1	0.0084	2.00
	6.999	7.00	-1	0.0085	2.00
	9.997	10.00	-176	0.0092	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model :

- Serial No. : 231018SIA605377

Dimension of probe

- Length : 110 mm.

- Diameter : 12 mm.

- Immersion Depth : 100 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor k
20.0	20.002	20.1	0.098	0.13	2.00
25.0	25.003	25.1	0.097	0.13	2.00
45.0	45.002	45.0	-0.002	0.13	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 %.

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 16, SUANLUANG, SUANLUANG BANGKOK 10250
TEL:0-2717-3000-29 FAX:0-2719-9484



Certificate of Calibration

Cert.No.: 24MM292
Page: 1 of 3

Equipment : Electronic Balance

Manufacturer : Mettler Toledo

Model : AB204-S/FACT

Serial No. : 1129381010

ID No. : UAE.WAS.002/2552

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

Location : Balance Room (108)

Received order : 11 May 2024

Calibration Date : 11 May 2024

Ambient Temperature : 15 °C to 40 °C

Relative Humidity : 30 % to 90 %

Calibrated by : Khit Rutanaprapachai

Approved by :

() Ponpan Paipim

() Suwit Injai

(✓) Kunchit Promrat

Issue Date : 15 May 2024

The Uncertainties are for a confidence probability of approximately 95%

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

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Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2405-0166OC-1

Cert.No.: 24MM292
Page: 2 of 3

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

Condition of this result of calibration

1. Reference standard instruments:-

Instruments	Model	Serial No.	ID No.	Test report No.	Due date
1) Standard Weight Set (E2)	15884	24053	70RC007	MM-0013-24	25 Jan 2026

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 220 g Resolution 0.0001 g

Before Adjustment :

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (± mg)	Coverage Factor (k)
100	100.0000	0.0000	0.19	2.03
200	200.0006	-0.0006	0.30	2

After Adjustment :

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

Applied Weight (g)	Standard Deviation of Reading (g)
100	0.00007
200	0.00005



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2405-0166OC-1

Cert.No.: 24MM292
Page: 3 of 3

Result of calibration

2. Effect of off-center loading

A mass of 100 g was placed to various position on the pan.

The weighing machine reading error obtained is given in the table

Position 1 (g)	Position 2 (g)	Position 3 (g)	Position 4 (g)	Position 5 (g)	Maximum difference between off-center and central loading (g)
-0.0004	-0.0004	-0.0003	-0.0003	-0.0004	0.0001

3. Departure from nominal value

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (± mg)	Coverage Factor (k)
Unloaded	0.0000	0.0000	0.15	2.13
0.01	0.0100	0.0000	0.15	2.13
0.05	0.0500	0.0000	0.15	2.13
0.1	0.1000	0.0000	0.15	2.13
0.5	0.5000	0.0000	0.15	2.13
1	1.0000	0.0000	0.15	2.13
10	10.0000	0.0000	0.15	2.11
50	49.9999	+0.0001	0.17	2.05
100	99.9999	+0.0001	0.19	2.03
150	149.9998	+0.0002	0.29	2
200	199.9990	+0.0010	0.30	2

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

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เอกสารไม่ควบคุม

เอกสารไม่ควบคุม



Cert. No.: 24TM589
Page : 1 of 3

Certificate of Calibration

Equipment : Hot Air Oven

Manufacturer : Memmert

Model : UF 55

Serial No. : B212.0415

ID No. : UAE.WAO.005/2556

Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10280

Location : Lab Floor 2

Received Order : 01 April 2024

Calibration Date : 01 - 02 April 2024

Ambient Temperature : $(26 \pm 10) ^\circ\text{C}$

Relative Humidity : $(50 \pm 30) \%$

Calibrated by : Krisda Malee

Approved by : 
Approved Signatory

() Ponpan Paipim

(✓) Suwit Imjai

() Kunchit Promprat

Issue Date : 5 April 2024

The Uncertainties are for a confidence probability of approximately 95%

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

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A 0065065



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2404-00040C-3
Procedure Used :-

Cert. No.: 24TM589
 Page : 2 of 3

Calibration were conducted using calibration procedure CP-QT02 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD) and Thermocouple Type T.

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

<u>Instrument</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Traceable</u>	<u>Due Date</u>
1) Data Acquisition	MY57013711	23LM15	TPA	11 Jul 2024

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

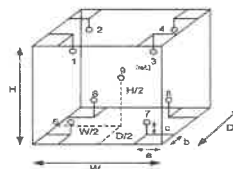
3. This certification is traceable to the International System of Unit

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

Result of Calibration :- (") Without Adjustment

Function of UUC⁺ : Temperature Source

Fresh air setting : Close



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 =	0.75 m
		Capacity =	0.30 m ³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	27	26
REL.Humid. (%)	47	48
AC Supply (Volt)	221	220

Ref. Std. ID No.: @ Calibration Point		
Position :	(120 to 180) °C	(104) °C
1	21-18TC-01	22-18TD-21
2	21-18TC-02	18RTD-2/2
3	21-18TC-03	18RTD-2/3
4	21-18TC-04	18RTD-2/4
5	21-18TC-05	18RTD-2/5
6	21-18TC-06	18RTD-2/6
7	21-18TC-07	18RTD-2/7
8	21-18TC-08	18RTD-2/8
9 (ref.)	21-18TC-09	18RTD-2/9

เอกสารไม่ควบคุม
a 1209739



Equipment :	Hot Air Oven
Condition As-Received :	Used Item
Reference :	2404-0004OC-3
<u>Result of Calibration :-</u>	(*) Without Adjustment
Function of UUC* :	Temperature Source
Fresh air setting :	Close

Cert. No.: 24TM589
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
104.0	104.0	104.0	0.032	0.47	0.84	2
120.0	120.0	120.0	0.12	0.72	1.3	2
180.0	180.0	180.0	0.13	1.2	1.5	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (°C)
	Position									
	1	2	3	4	5	6	7	8	9 (ref.)	
104.0	104.464	103.847	104.226	104.232	104.108	103.691	104.275	104.127	104.013	0.42
120.0	120.486	120.089	120.635	120.595	119.531	119.644	120.364	120.144	120.156	1.1
180.0	180.574	179.769	180.265	180.870	179.594	179.790	180.287	179.981	179.802	1.1

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

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

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a 1209738



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOT 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-9000 FAX. 0-2719-9484

Cart.No.: 24TW39
Page: 1 of 2

Certificate of Testing

Equipment : DO Meter
Manufacturer : YSI
Model : 5100
Serial No. : 11B 101863
ID No. : UAE.WAO.004/2564
Received Date : 20 February 2024
Test Date : 21 February 2024
Reference : 2402-0829/DSC-1
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangkok,
Phraekhanong, Bangkok 10260
Laboratory Condition : Temperature (25 ± 5) °C
Humidity (50 ± 20) %
Test Procedure : In - house method : CP-CH7
by Comparison Technique with Azide Modification Method
Tested by : Watsak Sirithan
Approved by : 
Approved Signatory
() Pornthiphe Tameyakul
() Unnophol Harsachai
(✓) Saisith Moengmai
Issue Date : 22 February 2024

22 February 2024

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Cert.No.: 24TW39
Page: 2 of 2

Condition of this result of calibration

- Reference Standard Instruments :
This certification is traceable to the International System of Unit through the reference standards laboratory of Industrial Calibration Center, Technology Promotion Association (Thailand-Japan).

Instruments	Serial No.	ID No.	Certificate No.	Due Date
1. Burette	-	130BU10	23OG1172	22 Mar 2025
2. Balance	14233821	110RC001	23MM405	16 July 2024

2. Standard Material :-

Material	Manufacturer	Lot.No.	Assay
Sodium Thiosulfate pentahydrate	Merck	AM1783316	100.2%

Result : Dissolved Oxygen Meter Adjustment With Air 100 %
Dissolved Oxygen Probe No.: 22B100125

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.20	8.19	0.0055

This report was certified only for the instrument we tested. It is allowable to use for study intend to use for advertising and referral purpose is prohibited. This report may not be reproduced other in full, without written approval of the laboratory

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Calibration Certificate

Certificate No.: 2402283-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakhonong, Bangkok 10260

Page 1 of 4

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: XSR205DU

Serial No.: C009071872

ID No.: UAE.WAO.012/2563

Order No.: 2402283

Operation No.: 2402283-001

Date of Receipt: 2 April 2024

Date of Calibration: 2 April 2024

Calibrated by Mr.Jerawut Prapawuttipong
Scientist

Approved by
(Mr.Pheraphat Tuenjit)

Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team

Date of Issue: 9 April 2024

The uncertainties are for a confidence probability of approximately 95%

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

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



Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C009071872
Capacity: 220 g

Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.012/2563

Date of Calibration: 2 April 2024

Page 3 of 4

Calibration Results: (Continued)

Calibration Range: 0 - 80 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 0 - 80 g; Resolution: 0.00001 g)

Nominal Value	Standard Value	Average Reading	Correction	Uncertainty	Coverage Factor
Unloaded	0.000000	0.00000	0.00000	0.0000068	2.00
0.001	0.001003	0.00101	-0.00001	0.0000091	2.00
0.005	0.005003	0.00500	0.00001	0.0000094	2.00
0.01	0.010003	0.01000	0.00001	0.0000091	2.00
0.05	0.049996	0.05000	0.00000	0.0000098	2.00
0.1	0.100011	0.10000	0.00001	0.000011	2.00
0.5	0.500015	0.50001	0.00001	0.000014	2.00
1	1.000002	1.00002	-0.00002	0.000016	2.00
2	2.000023	2.00001	0.00001	0.000017	2.00
5	5.000017	5.00002	0.00000	0.000020	2.00
10	10.000009	10.00000	0.00001	0.000026	2.00
20	20.000021	20.00002	0.00001	0.000037	2.00
30	30.000040	30.00003	0.00001	0.000052	2.00
50	50.000028	50.00004	-0.00001	0.000068	2.00
80	80.000060	80.00005	0.00002	0.00011	2.00



Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C009071872
Capacity: 220 g

Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.012/2563

Date of Calibration: 2 April 2024

Page 2 of 4

Environment Condition: Ambient Temperature: 24.5 ± 0.4 °C; Relative Humidity: 47.5 ± 2.5 %

Place of Calibration: Laboratory, UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NIST Method W-NA-001 In-House Method based on UKAS Lab 14 : 2019

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1mg to 200g	BS05567572	TCS	H23040535	8 April 2024
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	668-H1	H1.87H 016723	Quality Reborn	QK24-0343	9 February 2025

3. This certification is traceable to SI UNIT

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

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

Calibration Results:

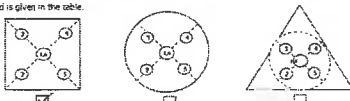
1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
40	0.000052
80	0.000063
100	0.000048
200	0.000053

2. Off-Center Error:

A mass of 100 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)	(g)
100.0002	100.0001	100.0002	99.9999	100.0001	100.0001	0.0003

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

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



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



Calibration Report

Certificate No.: 2402283-001-01

Equipment:

Electronic Balance
Model: XSR205DU
Serial No.: C069071872
Capacity: 220 g

Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g / 0.0001 g
ID No.: UAE.WAO.010/2565

Date of Calibration: 2 April 2024

Page 4 of 4

Calibration Results: (Continued)

Calibration Range: 81 - 200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 81 - 200 g; Resolution: 0.0001 g)

Nominal Value	Standard Value	Average Reading	Correction	Uncertainty	Coverage Factor
90	90.00019	90.00000	0.0001	0.00015	2.00
100	100.00006	100.00000	0.0001	0.00015	2.00
110	110.00007	110.00000	0.0001	0.00017	2.00
120	120.00009	120.00000	0.0001	0.00018	2.00
130	130.00011	130.00000	0.0001	0.00019	2.00
140	140.00014	140.00000	0.0001	0.00020	2.00
150	150.00009	150.00000	0.0001	0.00020	2.00
160	160.00010	160.00000	0.0001	0.00021	2.00
170	170.00012	170.00000	0.0001	0.00023	2.00
200	200.00016	200.00000	0.0002	0.00028	2.00

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor 4, providing a level of confidence of approximately 95 %.

***** End *****

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

2008 ซอย 35, ถนนสุขุมวิท แขวงคลองเตย เขตวัฒนา กรุงเทพมหานคร 10110
2008 Soi 35, Ann Amien Road, Bang Yai Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand
Tel: +66(0) 2-22 8568 Fax: +66(0) 2-22 8545



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



Calibration Certificate

Certificate No.: 2402283-002-01

Client name:

UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Address:

3 SOI UDOMSUK 41, SUKHUMVIT ROAD,
Bangchack, Prakhonong, Bangkok 10260

Equipment:

Electronic Balance

Manufacturer:

METTLER TOLEDO

Model:

XSR205DU

Serial No.:

C210685394

ID No.:

UAE.WAO.010/2565

Order No.:

2402283

Operation No.:

2402283-002

Date of Receipt:

2 April 2024

Date of Calibration:

2 April 2024

Calibrated by Mr.Jararut Prasertwattipong
Scientist

Approved by

(Mr.Pheraphat Tuanjit)

Manager, Division of Calibration Laboratory

Date of Issue: 9 April 2024

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: 20-04-65

2008 ซอย 35, ถนนสุขุมวิท แขวงคลองเตย เขตวัฒนา กรุงเทพมหานคร 10110
2008 Soi 35, Ann Amien Road, Bang Yai Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand
Tel: +66(0) 2-22 8568 Fax: +66(0) 2-22 8545



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Food Industrial Laboratory Service Center



Calibration Report

Certificate No.: 2402283-002-01

Equipment:

Electronic Balance
Model: XSR205DU
Serial No.: C210685394
Capacity: 220 g

Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.010/2565

Date of Calibration: 2 April 2024

Page 2 of 4

Environment Condition: Ambient Temperature: 24.5 °C ± 0.5 °C Relative Humidity: 47.5 % ± 2.5 %

Place of Calibration: Laboratory, UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-HA-001 In-House Method based on UKAS Lab 14: 2019

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1mg to 200g	B505567572	TCS	M23040535	8 April 2024
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	608-H1	NFI 5TH 016/23	Quality Reborn	QRT4-0347	9 February 2025

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)
40	0.0000042
80	0.0000052
100	0.0000048
200	0.0000048

2. Off-Center Error:

A mass of 100 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)
100.0000	100.0001	99.9999	99.9999	100.0001	100.0000	0.0001

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

2008 ซอย 35, ถนนสุขุมวิท แขวงคลองเตย เขตวัฒนา กรุงเทพมหานคร 10110
2008 Soi 35, Ann Amien Road, Bang Yai Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand
Tel: +66(0) 2-22 8568 Fax: +66(0) 2-22 8545



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



Calibration Report

Certificate No.: 2402283-002-01

Equipment:

Electronic Balance
Model: XSR205DU
Serial No.: C210685394
Capacity: 220 g

Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.010/2565

Date of Calibration: 2 April 2024

Page 3 of 4

Calibration Results: (Continued)

Calibration Range: 0 - 80 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 0 - 80 g; Resolution: 0.00001 g)

Nominal Value	Standard Value	Average Reading	Correction	Uncertainty	Coverage Factor
Unloaded	0.0000000	0.000000	0.00000	0.0000000	2.00
0.001	0.0010002	0.001001	0.00001	0.0000007	2.00
0.005	0.0050003	0.005000	0.00000	0.0000002	2.00
0.01	0.0100003	0.010000	0.00000	0.0000003	2.00
0.05	0.0500000	0.050000	0.00000	0.0000005	2.00
0.1	0.1000001	0.100000	0.00000	0.0000011	2.00
0.5	0.5000016	0.500001	0.00000	0.0000014	2.00
1	1.0000000	1.000002	0.00000	0.0000016	2.00
2	2.0000023	2.000001	0.00000	0.0000017	2.00
5	5.0000017	5.000002	0.00000	0.0000020	2.00
10	10.0000004	10.000000	0.00000	0.0000026	2.00
20	20.0000003	20.000000	0.00000	0.0000037	2.00
30	30.0000004	30.000001	0.00000	0.0000050	2.00
50	50.0000028	50.000002	0.00000	0.0000058	2.00
80	80.0000008	80.000002	0.00000	0.000011	2.00

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

2008 ซอย 35, ถนนสุขุมวิท แขวงคลองเตย เขตวัฒนา กรุงเทพมหานคร 10110
2008 Soi 35, Ann Amien Road, Bang Yai Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand
Tel: +66(0) 2-22 8568 Fax: +66(0) 2-22 8545

Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C210665394
Capacity: 270 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g / 0.001 g
ID No.: UAE.AJR.016/2555

Date of Calibration: 2 April 2024 Page 4 of 4

Calibration Results: (Continued)

Calibration Range: 81 - 200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 81 - 200 g; Resolution: 0.0001 g)

Nominal Value	Standard Value	Average Reading	Correction	Uncertainty	Coverage Factor
90	90.00016	90.0001	0.0000	0.00019	2.00
100	100.00005	100.0001	0.0000	0.00015	2.00
110	110.00007	110.0001	0.0000	0.00016	2.00
120	120.00005	120.0000	0.0001	0.00017	2.00
130	130.00010	130.0000	0.0001	0.00019	2.00
140	140.00011	140.0000	0.0001	0.00020	2.00
150	150.00009	150.0001	0.0000	0.00019	2.00
160	160.00010	160.0001	0.0000	0.00022	2.00
170	170.00012	170.0001	0.0000	0.00023	2.00
200	200.00016	200.0002	0.0000	0.00028	2.00

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

----- End -----

F-C5-012 Revision: 01 Date: 20-04-65

Calibration Certificate

Certificate No.: 2402420-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomsak 41, Sukhumvit Road, Bangkok, Prakhneng, Bangkok 10260

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: AB204-S/FACT

Serial No.: B108115858

ID No.: UAE.AJR.016/2555

Order No.: 2402420

Operation No.: 2402420-001

Date of Receipt: 19 April 2024

Date of Calibration: 19 April 2024

Calibrated by Mr. Phraphat Tuanjit
Scientist

Approved by *Phraphat Tuanjit*
(Miss Proeyaporn Jaengkarnkit)
Vice President, Department of Laboratory Services
Responsible for the Technical Management Team

Date of Issue: 23 April 2024

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

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

F-C5-009 Revision: 01 Date: 20-04-65

Calibration Report

Certificate No.: 2402420-001-01
Equipment: Electronic Balance
Model: AB204-S/FACT
Serial No.: B108115858
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g
ID No.: UAE.AJR.016/2555

Date of Calibration: 19 April 2024 Page 2 of 3

Environment Condition: Ambient Temperature: 22.1 ± 0.6 °C Relative Humidity: 46 ± 1.9 %

Place of Calibration: Room 206 Balance Room 2, UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-MA-001 In-House Method based on UGAS Lab 14 : 2019

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1-500g	15880	TCS	M23111815	28 November 2024
Standard Weight Class E2	1-500g	15862	TCS	M23111825	28 November 2024
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	600-H1	NFI.BTN 019/23	Quality Room	QR24-0192	4 March 2025

3. This certification is traceable to SI UNIT

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

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

Calibration Results:

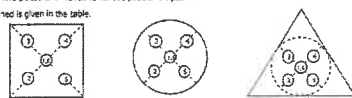
1. Repeatability of Readings:

Nominal Value (g)	Standard Deviation of Reading (g)
100	0.00057
200	0.00079

2. Off-Center Error:

A mass of 100 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	(Max. diff. D/T to max.)
99.9999	99.9997	99.9995	99.9998	100.0000	99.9998	0.0003

F-C5-012 Revision: 01 Date: 20-04-65

Calibration Report

Certificate No.: 2402420-001-01
Equipment: Electronic Balance
Model: AB204-S/FACT
Serial No.: B108115858
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g
ID No.: UAE.AJR.016/2555

Date of Calibration: 19 April 2024 Page 3 of 3

Calibration Results: (Continued)

Calibration Range: 0-200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value:

Nominal Value	Standard Value	Average Reading	Correction	Uncertainty	Coverage Factor
Unloaded	0.00000	0.0000	0.0000	0.000099	2.00
0.1	0.10000	0.1000	0.0000	0.000099	2.00
1	0.99998	1.0000	0.0000	0.000092	2.00
5	4.99997	5.0000	0.0000	0.000091	2.00
10	10.00002	10.0001	-0.0001	0.00012	2.00
20	20.00003	20.0001	-0.0001	0.00014	2.00
50	49.99998	50.0000	0.0000	0.00012	2.00
70	70.00006	70.0000	0.0001	0.00016	2.00
100	99.99997	100.0000	0.0000	0.00017	2.00
150	149.99994	149.9997	0.0002	0.00022	2.00
200	200.00001	199.9995	0.0005	0.00028	2.00

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

----- End -----

F-C5-012 Revision: 01 Date: 20-04-65



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



Certificate of Calibration

Cert.No.: 24CH1070
Page.: 1 of 3

Equipment : pH Meter
Manufacturer : YSI
Model : pH100A
Serial No. : JCO2729
ID No. : UAE.EFM.195/2561(ENV.pH.04/81)
Condition As-Received: Used Item
Received Date : 27 August 2024
Calibration Date : 28 August 2024
Reference : 2406-0682WSC-1
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260

Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In - house method :
- CP-CH5 by direct measurement with DC voltage
standard and direct measurement with
certified reference material (CRM)
- CP-CH8 by comparison with temperature standard

Calibrated by : Warakorn Lemagatrekul

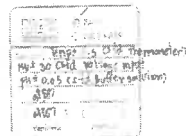
Approved by : _____
Approved Signatory

() Unnopphol Harschai
() Ponpen Paipim
(✓) Saithip Meangmai

Issue Date : 28 August 2024

The Uncertainties are for a confidence probability of approximately 95%

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



Cert.No.: 24CH1070
Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	43160066	130RC092	24E1320	22 Apr 2025
2) Ref. Standard Thermometer	2188080	130RC044	23I1216	10 Oct 2024

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

2. Certified Reference Materials

: The measurement results are traceable to SI through Hach Lange GmbH L:
Deutsche Akkreditierungsstelle, Accredited No.D-RM-16184-01-00
: The measurement results are traceable to SI through CPA chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. AR-1836

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.006	Hach Lange GmbH	C03146	23 Feb 2026
pH 6.999	Hach Lange GmbH	C03145	28 Feb 2026
pH 9.997	CPA chem	970653	25 Apr 2025

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

Calibration Results

Function : mV Measurement

Performing standard curve by Document Process Calibrator at pH (4,7)(7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (±mV)	Coverage factor k
			mV	pH		
pH Meter S/N.: JCO2729	4.00	177.48	177	4.01	0.58	2.00
	7.00	0.00	0	7.00	0.58	2.00
	7.00	0.00	0	7.00	0.58	2.00
	10.00	-177.48	-177	-10.01	0.58	2.00



Cert.No.: 24CH1070
Page.: 3 of 3

Calibration Results

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4,7)(7,10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (±)	Coverage factor k
pH Electrode S/N.: 231016SIA605377	4.006	4.01	173	0.0090	2.05
	6.999	7.00	-1	0.0084	2.00
	9.997	7.00	-1	0.0085	2.00
		10.00	-178	0.0092	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe.

- Model : _____
- Serial No. : 231016SIA605377

Dimension of probe

- Length : 110 mm.

- Diameter : 12 mm.

- Immersion Depth : 100 mm

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor k
20.0	20.002	20.1	0.098	0.13	2.00
25.0	25.003	25.1	0.097	0.13	2.00
45.0	45.002	45.0	-0.002	0.13	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 %.

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Certificate of Calibration

Cert.No.: 24MM292
Page: 1 of 3

Equipment : Electronic Balance
Manufacturer : Mettler Toledo
Model : AB204-S/FACT
Serial No. : 1128351010
ID No. : UAE.WAS.002/2552
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Sol Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Balance Room (108)
Received order : 11 May 2024
Calibration Date : 11 May 2024
Ambient Temperature : 15 °C to 40 °C
Relative Humidity : 30 % to 90 %
Calibrated by : Khit Rutanapachai
Approved by :
() Ponpan Paipim
() Suwit Imjai
(✓) Kunchit Promprat

Issue Date : 15 May 2024

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced either 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 : 2405-01660C-1
Procedure used :-

Cert.No.: 24MM292
Page: 2 of 3

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

Condition of this result of calibration

1. Reference standard instruments:-

Instruments	Model	Serial No.	ID No.	Test report No.	Due date
1) Standard Weight Set (E2)	15884	24053	70RC007	MM-0013-24	25 Jan 2026

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 220 g Resolution 0.0001 g

Before Adjustment :

Applied Weight	Balance Reading	Correction	Measurement Uncertainty	Coverage Factor
(g)	(g)	(g)	(± mg)	(k)
100	100.0000	0.0000	0.19	2.03
200	200.0006	-0.0006	0.30	2

After Adjustment :

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

Applied Weight	Standard Deviation of Reading (g)
(g)	(g)
100	0.00007
200	0.00005

เอกสารไม่ควบคุม



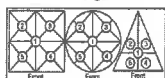
Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2405-01660C-1

Cert.No.: 24MM292
Page: 3 of 3

Result of calibration

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

Position 1	Position 2	Position 3	Position 4	Position 5
(g)	(g)	(g)	(g)	(g)
-0.0004	-0.0004	-0.0003	-0.0003	-0.0004



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

3. Departure from nominal value

Applied Weight	Balance Reading	Correction	Measurement Uncertainty	Coverage Factor
(g)	(g)	(g)	(± mg)	(k)
Unload	0.0000	0.0000	0.15	2.13
0.01	0.0100	0.0000	0.15	2.13
0.05	0.0500	0.0000	0.15	2.13
0.1	0.1000	0.0000	0.15	2.13
0.5	0.5000	0.0000	0.15	2.13
1	1.0000	0.0000	0.15	2.13
10	10.0000	0.0000	0.15	2.11
50	49.9999	+0.0001	0.17	2.06
100	99.9999	+0.0001	0.19	2.03
150	149.9998	+0.0002	0.29	2
200	199.9990	+0.0010	0.30	2

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

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เอกสารไม่ควบคุม



Certificate of Calibration

Cert. No.: 24TM589
Page: 1 of 3

Equipment : Hot Air Oven
Manufacturer : Memmert
Model : UF 55
Serial No. : B212.0411
ID No. : UAE.WAO.005/2556
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Sol Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Lab Floor 2
Received Order : 01 April 2024
Calibration Date : 01 - 02 April 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Krinda Maise
Approved by :
() Ponpan Paipim
(✓) Suwit Imjai
() Kunchit Promprat
Issue Date : 5 April 2024

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม
A 0065065



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2404-0004OC-3

Cert. No.: 24TM589
Page : 2 of 3

Procedure Used :-

Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD) and Thermocouple Type T.

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

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

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

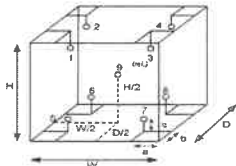
3. This certification is traceable to the International System of Unit.

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

Result of Calibration :- () Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



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 = 0.75 m
Capacity = 0.30 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	27	26
REL.Humid. (%)	47	48
AC Supply (Volt)	221	220

Ref. Std. ID No.: @ Calibration Point		
Position :	(120 to 150) °C	(104) °C
1	21-18TC-01	22-18RTD-2/1
2	21-18TC-02	18RTD-2/2
3	21-18TC-03	18RTD-2/3
4	21-18TC-04	18RTD-2/4
5	21-18TC-05	18RTD-2/5
6	21-18TC-06	18RTD-2/6
7	21-18TC-07	18RTD-2/7
8	21-18TC-08	18RTD-2/8
9 (ref.)	21-18TC-09	18RTD-2/9

เอกสารไม่ควบคุม
a 1209739



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2404-0004OC-3

Cert. No.: 24TM589
Page : 3 of 3

Result of Calibration :- () Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
104.0	104.0	104.0	0.032	0.47	0.84	2
120.0	120.0	120.0	0.12	0.72	1.3	2
180.0	180.0	180.0	0.13	1.2	1.5	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
104.0	104.484	103.847	104.226	104.232	104.106	103.891	104.275	104.127	104.013	0.42
120.0	120.486	120.089	120.635	120.596	119.531	119.644	120.364	120.144	120.168	1.1
180.0	180.574	179.769	180.285	180.670	179.594	179.780	180.287	179.981	179.902	1.1

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 1209739



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 FAX. 0-2719-9484

Cert.No.: 24TW39
Page: 1 of 2

Certificate of Testing

Equipment : DO Meter
Manufacturer : YSI
Model : 5100
Serial No. : 11B 101863
ID No. : UAE.WAO.004/2554
Received Date : 20 February 2024
Test Date : 21 February 2024
Reference : 2402-0629OC-1
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10250
Laboratory Condition : Temperature (25 ± 5) °C
Humidity (50 ± 20) %
Test Procedure : In - house method : CP-CH9
by Comparison Technique with Azide Modification Method
Tested by : Watlak Sirithuan

Approved by :
Approved Signatory

() Ponnhippa Termeyskul
() Unnopphol Harachai
(✓) Sathip Meangmai

Issue Date : 22 February 2024

เอกสารไม่ควบคุม



Cert.No.: 24TW39
Page: 2 of 2

Condition of this result of calibration

1. Reference Standard Instruments :

This certification is traceable to the International System of Unit through the reference standards laboratory of Industrial Calibration Center, Technology Promotion Association (Thailand-Japan).

Instruments	Serial No.	ID No.	Certificate No.	Due Date
1. Burette	-	130BU10	23OG1172	22 Mar 2025
2. Balance	14233821	110RC001	23MM405	16 July 2024

2. Standard Material :-

Material	Manufacturer	Lot.No.	Assay
Sodium Thiosulfate pentahydrate	Merck	AM1763316	100.2%

Result : Dissolved Oxygen Meter Adjustment With Air 100 %
Dissolved Oxygen Probe No.: 22B100125

Titration Method (Azide Modification Method)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.20	8.19	0.0055

This report was certified only for the instrument we tested. It is allowable to use for study intend to use for advertising and referral purpose is prohibited. This report may not be reproduced other in full, without written approval of the laboratory

-00-

เอกสารไม่ควบคุม

Calibration Certificate

Certificate No.: 2402283-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udumuk 41, Sukhumvit Road,
Bangchack, Prakhong, Bangkok 10260

Page 1 of 4

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: XSR205DU

Serial No.: C009071872

ID No.: UAE.WAO.012/2563

Order No.: 2402283

Operation No.: 2402283-001

Date of Receipt: 2 April 2024

Date of Calibration: 2 April 2024

Calibrated by: Mr.Jerawut Prapawuttipong
Scientist

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

Date of Issue: 9 April 2024

The uncertainties are for a confidence probability of approximately 95%

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

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

2008 ถนนสุขุมวิท ซ. 41 แขวงคลองตัน เขตคลองเตย กรุงเทพมหานคร 10110
2008 Soi 41, Khlong Tan, Bang Klong District, Bangkok 10110, Thailand
Tel: +66(0) 2-22 0560 Fax: +66(0) 2-22 0565

Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C009071872
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.012/2563

Page 2 of 4

Date of Calibration: 2 April 2024
Environment Condition: Ambient Temperature: 24.5 ± 0.5 °C Relative Humidity: 47.5 ± 2.5 %

Place of Calibration: Laboratory, UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-PA-001 In-House Method based on UKAS Lab 14: 2019

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weigh. Class E2	1mg to 200g	B505567572	TC5	M3040535	8 April 2024

Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	608 HI	NFI.BTH.016/23	Quality Reborn	Q424.0343	9 February 2025

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)
40	0.000032
80	0.000063
160	0.000048
200	0.000053

2. Off-Center Error:

A mass of 100 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)
100.0002	100.0001	100.0002	99.9999	100.0001	100.0001	0.0002

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

2008 ถนนสุขุมวิท ซ. 41 แขวงคลองตัน เขตคลองเตย กรุงเทพมหานคร 10110
2008 Soi 41, Khlong Tan, Bang Klong District, Bangkok 10110, Thailand
Tel: +66(0) 2-22 0560 Fax: +66(0) 2-22 0565

Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C009071872
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.012/2563

Page 3 of 4

Date of Calibration: 2 April 2024

Calibration Results: (Continued)

Calibration Range: 0 - 80 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 0 - 80 g; Resolution: 0.00001 g)

Nominal Value	Standard Value	Average Reading	Correction	Uncertainty	Coverage Factor
Unloaded	0.000000	0.00000	0.00000	0.0000088	2.00
0.001	0.0010003	0.00101	-0.00001	0.0000091	2.00
0.005	0.0050002	0.00499	0.00001	0.0000094	2.00
0.01	0.0100003	0.01000	0.00000	0.0000091	2.00
0.05	0.0499996	0.05000	0.00000	0.0000098	2.00
0.1	0.1000011	0.10000	0.00001	0.000011	2.00
0.5	0.5000016	0.50001	0.00001	0.000014	2.00
1	1.0000003	1.00002	-0.00002	0.000016	2.00
2	2.0000023	2.00001	0.00001	0.000017	2.00
5	5.0000017	5.00002	0.00002	0.000020	2.00
10	10.000009	10.00000	0.00001	0.000026	2.00
20	20.000021	20.00002	0.00001	0.000037	2.00
30	30.000040	30.00003	0.00001	0.000052	2.00
50	50.000028	50.00004	-0.00001	0.000066	2.00
80	80.000068	80.00005	0.00002	0.00011	2.00

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

2008 ถนนสุขุมวิท ซ. 41 แขวงคลองตัน เขตคลองเตย กรุงเทพมหานคร 10110
2008 Soi 41, Khlong Tan, Bang Klong District, Bangkok 10110, Thailand
Tel: +66(0) 2-22 0560 Fax: +66(0) 2-22 0565

Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C009071872
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.012/2563

Page 4 of 4

Date of Calibration: 2 April 2024

Calibration Results: (Continued)

Calibration Range: 81 - 200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 81 - 200 g; Resolution: 0.0001 g)

Nominal Value	Standard Value	Average Reading	Correction	Uncertainty	Coverage Factor
90	90.000010	90.00000	0.00001	0.000015	2.00
100	100.000005	100.00000	0.00001	0.000015	2.00
110	110.000007	110.00001	0.00000	0.000017	2.00
120	120.000009	120.00002	0.00001	0.000018	2.00
130	130.000010	130.00002	0.00001	0.000019	2.00
140	140.000014	140.00000	0.00001	0.000020	2.00
150	150.000009	150.00001	0.00000	0.000020	2.00
160	160.000010	160.00001	0.00000	0.000022	2.00
170	170.000012	170.00001	0.00000	0.000023	2.00
200	200.000018	200.00000	0.00002	0.000028	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 %.

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

2008 ถนนสุขุมวิท ซ. 41 แขวงคลองตัน เขตคลองเตย กรุงเทพมหานคร 10110
2008 Soi 41, Khlong Tan, Bang Klong District, Bangkok 10110, Thailand
Tel: +66(0) 2-22 0560 Fax: +66(0) 2-22 0565



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



Calibration Certificate

Certificate No.: 2402283-002-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 SOI UDOMSUK 41, SUKHUMVIT ROAD,
Bangchack, Prakhonong, Bangkok 10260

Page 1 of 4

Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Serial No.: C210685394
ID No.: UAE.WAO.010/2565

Order No.: 2402283
Operation No.: 2402283-002
Date of Receipt: 2 April 2024
Date of Calibration: 2 April 2024

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

Date of Issue: 9 April 2024

The uncertainties are for a confidence probability of approximately 95%

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

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

2008 ๒๕๕๓-๒๕๖๓ ๓๕ หมู่บ้านสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร เอกสารไม่ควบคุม
2008 Soi 35, Aun Aun Road, Bang Yai Khan Subdistrict, Bang Yai District, Bangkok 10700, Thailand
Tel +66(0)2 242 8598 Fax +66(0)2 242 8545



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



Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C210685394
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.010/2565

Page 2 of 4

Date of Calibration: 2 April 2024
Environment Condition: Ambient Temperature: 24.5 ± 0.5 °C Relative Humidity: 47.5 ± 2.5 %
Place of Calibration: Laboratory, UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NIST Method W-PA-001 2+ House Method based on UKAS Lab 14: 2019

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1mg to 200g	B505567972	TCS	M23040535	8 April 2024
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	606 H1	NFI.BTH 016/23	Quality Reborn	QCR4-0343	9 February 2025

3. This certificate is traceable to SI UNIT

4. This certificate is certified only for the instrument was 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)
40	0.000042
80	0.000052
100	0.000048
200	0.000048

2. Off-Center Error:

A mass of 100 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)
100.0000	100.0001	99.9999	99.9999	100.0001	100.0000	0.0001

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

2008 ๒๕๕๓-๒๕๖๓ ๓๕ หมู่บ้านสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร เอกสารไม่ควบคุม
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Tel +66(0)2 242 8598 Fax +66(0)2 242 8545



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



Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C210685394
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.010/2565

Page 3 of 4

Date of Calibration: 2 April 2024

Calibration Results: (Continued)

Calibration Range: 0 - 80 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 0 - 80 g; Resolution: 0.00001 g)

Nominal Value	Standard Value	Average Reading	Correction	Uncertainty	Coverage Factor
(g)	(g)	(g)	(g)	(g)	k
Unlabeled	0.000000	0.00000	0.00000	0.0000296	2.00
0.001	0.001003	0.00101	-0.00001	0.0000089	2.00
0.005	0.005003	0.00500	0.00000	0.0000092	2.00
0.01	0.010003	0.01000	0.00000	0.0000089	2.00
0.05	0.050003	0.05000	0.00000	0.0000096	2.00
0.1	0.100011	0.10000	0.00001	0.000011	2.00
0.5	0.500016	0.50001	0.00001	0.000014	2.00
1	1.000023	1.00002	-0.00002	0.000016	2.00
2	2.000023	2.00001	0.00001	0.000017	2.00
5	5.000017	5.00002	0.00001	0.000020	2.00
10	10.000009	10.00000	0.00001	0.000026	2.00
20	20.000031	20.00000	0.00003	0.000037	2.00
30	30.000040	30.00001	0.00003	0.000050	2.00
50	50.000026	50.00002	0.00001	0.000066	2.00
80	80.000068	80.00002	0.00005	0.00011	2.00

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

2008 ๒๕๕๓-๒๕๖๓ ๓๕ หมู่บ้านสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร เอกสารไม่ควบคุม
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Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C210685394
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.010/2565

Page 4 of 4

Date of Calibration: 2 April 2024

Calibration Results: (Continued)

Calibration Range: 81 - 200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 81 - 200 g; Resolution: 0.00001 g)

Nominal Value	Standard Value	Average Reading	Correction	Uncertainty	Coverage Factor
(g)	(g)	(g)	(g)	(g)	k
90	90.00010	90.0001	0.0000	0.0000	2.00
100	100.00006	100.0001	0.0000	0.00015	2.00
110	110.00007	110.0001	0.0000	0.00015	2.00
120	120.00009	120.0000	0.0001	0.00017	2.00
130	130.00010	130.0000	0.0001	0.00019	2.00
140	140.00014	140.0000	0.0001	0.00020	2.00
150	150.00006	150.0001	0.0000	0.00020	2.00
160	160.00010	160.0001	0.0000	0.00022	2.00
170	170.00012	170.0001	0.0000	0.00023	2.00
200	200.00015	200.0002	0.0000	0.00028	2.00

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

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

2008 ๒๕๕๓-๒๕๖๓ ๓๕ หมู่บ้านสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร เอกสารไม่ควบคุม
2008 Soi 35, Aun Aun Road, Bang Yai Khan Subdistrict, Bang Yai District, Bangkok 10700, Thailand
Tel +66(0)2 242 8598 Fax +66(0)2 242 8545

Calibration Certificate

Certificate No.: 2402420-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakhonong, Bangkok 10260

Page 1 of 3

Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: AB204-S/FACT
Serial No.: B108115858
ID No.: UAE.AIR.016/2555
Order No.: 2402420
Operation No.: 2402420-001
Date of Receipt: 19 April 2024
Date of Calibration: 19 April 2024

Calibrated by Mr. Phraphat Tuanjit
Scientist
Approved by (Miss Praeyaporn Jaengkarnit)
Vice President, Department of Laboratory Services
Responsible for the Technical Management Team
Date of Issue: 23 April 2024

The uncertainties are for a confidence probability of approximately 95%
This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full, except with the prior written approval of the National Food Institute.

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

Calibration Report

Certificate No.: 2402420-001-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: AB204-S/FACT
Serial No.: B108115858
Capacity: 220 g
Resolution: 0.0001 g
ID No.: UAE.AIR.016/2555

Page 2 of 3

Date of Calibration: 19 April 2024
Environment Condition: Ambient Temperature: 22.1 ± 0.5 °C Relative Humidity: 48 ± 1.9 %

Place of Calibration: Room 206, Beano Room 2, UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: IP1 Method WMA-001 In-House Method based on UKAS Lab 14: 2019

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1-50mg	15866	TCS	M2311815	28 November 2024
Standard Weight Class E2	1-500mg	15863	TCS	M2311815	28 November 2024
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	600-H1	NFI BTH 019/23	Quality Room	QR24-0492	4 March 2025

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 Readings:

Nominal Value (g)	Standard Deviation of Reading (g)
100	0.000027
200	0.000079

2. Off-Center Error:

A mass of 100 g was placed and moved to various position on pan.

This balance reading obtained is given in the table.

1	2	3	4	5	6	(Max. in any 6 Readings)
(g)	(g)	(g)	(g)	(g)	(g)	(g)
99.9999	99.9997	99.9996	99.9998	100.0000	99.9998	0.00003

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

Calibration Report

Certificate No.: 2402420-001-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: AB204-S/FACT
Serial No.: B108115858
Capacity: 220 g
Resolution: 0.0001 g
ID No.: UAE.AIR.016/2555

Date of Calibration: 19 April 2024

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	Average Reading	Correction	Uncertainty	Coverage Factor
Unload	0.00000	0.0000	0.0000	0.000089	2.00
0.1	0.10000	0.1000	0.0000	0.000089	2.00
1	0.99999	1.0000	0.0000	0.000092	2.00
5	4.99997	5.0000	0.0000	0.000091	2.00
10	10.00002	10.0001	-0.0001	0.00012	2.00
20	20.00003	20.0001	-0.0001	0.00014	2.00
50	49.99999	50.0000	0.0000	0.00012	2.00
70	70.00000	69.9999	0.0001	0.00016	2.00
100	99.99997	100.0000	0.0000	0.00017	2.00
150	149.99994	149.9997	0.0002	0.00022	2.00
200	200.00001	199.9995	0.0005	0.00028	2.00

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

***** End *****

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

Certificate of Calibration

Cert.No.: 24CH1070
Page: 1 of 3

Equipment: pH Meter
Manufacturer: YSI
Model: pH100A
Serial No.: JC02729
ID No.: UAE.EFM.195/2561(ENV.pH.04/81)
Condition As-Received: Used Item
Received Date: 27 August 2024
Reference Date: 28 August 2024
Reference: 2408-0882WSC-1
Submitted by: United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakhonong, Bangkok 10260

Ambient Temperature: (25 ± 2.5) °C
Relative Humidity: (50 ± 15) %
Calibration Procedure: In-house method:
- CP-CH5 by direct measurement with DC voltage standard and direct measurement with certified reference material (CRM)
- CP-CH8 by comparison with temperature standard

Calibrated by: Warakorn Lemagatrakul

Approved by: Approved Signatory

() Unnopphol Herachai
() Ponpan Palpin
(✓) Saithip Meangmai

Issue Date: 29 August 2024

The Uncertainties are for a confidence probability of approximately 95%

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Cert.No.: 24CH1070
Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	43160068	130RC062	24E1320	22 Apr 2025
2) Ref. Standard Thermometer	2188080	130RC044	231216	10 Oct 2024

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

2. Certified Reference Materials

The measurement results are traceable to SI through Hach Lange GmbH Li
Deutsche Akkreditierungsstelle, Accredited No.D-RM-15184-01-00

The measurement results are traceable to SI through CPA chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.006	Hach Lange GmbH	C03146	23 Feb 2026
pH 6.999	Hach Lange GmbH	C03145	28 Feb 2026
pH 9.997	CPA chem	970853	25 Apr 2025

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

Calibration Results

Function : mV Measurement

Performing standard curve by Document Process Calibrator at pH (4,7)(7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (\pm mV)	Coverage factor k
	pH	mV	mV	pH		
pH Meter S/N.: JC02729	4.00	177.48	177	4.01	0.58	2.00
	7.00	0.00	0	7.00	0.58	2.00
	7.00	0.00	0	7.00	0.58	2.00
	10.00	-177.48	-177	10.01	0.58	2.00



Cert.No.: 24CH1070
Page.: 3 of 3

Calibration Results

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4,7)(7,10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (\pm)	Coverage factor k
pH Electrode S/N.: 231018SIA605377	4.006	4.01	173	0.0090	2.05
	6.999	7.00	-1	0.0084	2.00
	6.999	7.00	-1	0.0085	2.00
	9.997	10.00	-178	0.0092	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model :

- Serial No. : 231018SIA605377

- Dimension of probe

- Length : 110 mm.

- Diameter : 12 mm.

- Immersion Depth : 100 mm

Calibration Point ($^{\circ}$ C)	Standard Temperature ($^{\circ}$ C)	UUC* Reading ($^{\circ}$ C)	Error ($^{\circ}$ C)	Uncertainty of measurement (\pm $^{\circ}$ C)	Coverage factor k
20.0	20.002	20.1	0.098	0.13	2.00
25.0	25.003	25.1	0.097	0.13	2.00
45.0	45.002	45.0	-0.002	0.13	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 %.

-000-



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
584/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL:0-2717-3000-29 FAX:0-2718-9484



Certificate of Calibration

Cert.No.: 24MM292
Page.: 1 of 3

Equipment : Electronic Balance
Manufacturer : Mettler Toledo
Model : AB204-S/FACT
Serial No. : 1128361010
ID No. : UAE.WAS.002/2552
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomeuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Balance Room (108)
Received order : 11 May 2024
Calibration Date : 11 May 2024
Ambient Temperature : 15 $^{\circ}$ C to 40 $^{\circ}$ C
Relative Humidity : 30 % to 80 %
Calibrated by : Khit Rutanaprapachai
Approved by : Kunchit Promrat
() Ponpan Palpin
() Suwit Imjai
(☒) Kunchit Promrat
Issue Date : 15 May 2024

The Uncertainty are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2405-0188OC-1

Cert.No.: 24MM292
Page: 2 of 3

Calibration were conducted using In-house calibration procedure CP-0801 based on UKAS LAB 14 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-0013-24	25 Jan 2026

- This certificate is valid only to the item calibrated on date and place of calibration.
- This result of calibration was made on requested at the point specified by customer.
- This certificate is not certified for any commercial transaction.
- 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 220 g Resolution 0.0001 g

Before Adjustment :

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (± mg) (k)	Coverage Factor
100	100.0000	0.0000	0.19	2.03
200	200.0006	-0.0006	0.30	2

After Adjustment :

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

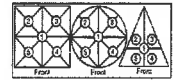
Applied Weight (g)	Standard Deviation of Reading (g)
100	0.0007
200	0.0005

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Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2405-0188OC-1

Cert.No.: 24MM292
Page: 3 of 3



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)
-0.0004	-0.0004	-0.0003	-0.0003	-0.0004

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

3. Departure from nominal value

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (± mg) (k)	Coverage Factor
Unload	0.0000	0.0000	0.15	2.13
0.01	0.0100	0.0000	0.15	2.13
0.05	0.0500	0.0000	0.15	2.13
0.1	0.1000	0.0000	0.15	2.13
0.5	0.5000	0.0000	0.15	2.13
1	1.0000	0.0000	0.15	2.13
10	10.0000	0.0000	0.15	2.11
50	49.9999	+0.0001	0.17	2.06
100	99.9998	+0.0001	0.19	2.03
150	149.9998	+0.0002	0.29	2
200	199.9990	+0.0010	0.30	2

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

-00-

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
314/4 PATTANAKARN ROAD SOI 18, PHANFANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3040-39 FAX. 0-2719-9454



Cert. No.: 24TM589
Page : 1 of 3

Certificate of Calibration

Equipment : Hot Air Oven
Manufacturer : Memmert
Model : UF 55
Serial No. : B212.0411
ID No. : UAE.WAO.005/2566
Submitted by : United Analyst and Engineering Consultant Co., Ltd.
3 Sol Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Lab Floor 2
Received Order : 01 April 2024
Calibration Date : 01 - 02 April 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Krisda Malen
Approved by :
() Ponpan Pajpim
(✓) Suwit Injai
() Kunchit Promprat

Issue Date : 5 April 2024

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม
A 0065065



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2404-0004CC-3
Procedure Used :-

Cert. No.: 24TM589
Page : 2 of 3

Calibration were conducted using calibration procedure CP-0T02 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD) and Thermocouple Type T.

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

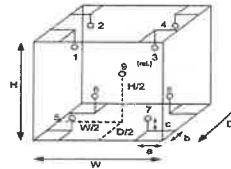
Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY57013711	23LM115	TPA	11 Jul 2024

- 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.

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

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

Environment during calibration		
	Beginning	Finished
Temp. (°C)	27	26
REL.Humid. (%)	47	48
AC Supply (Volt)	221	220



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 = 0.75 m
Capacity = 0.30 m³

Ref. Std. ID No.: @ Calibration Point		
Position :	(120 to 160) °C	(104) °C
1	21-18TC-01	22-18RTD-2/1
2	21-18TC-02	18RTD-2/2
3	21-18TC-03	18RTD-2/3
4	21-18TC-04	18RTD-2/4
5	21-18TC-05	18RTD-2/5
6	21-18TC-06	18RTD-2/6
7	21-18TC-07	18RTD-2/7
8	21-18TC-08	18RTD-2/8
9 (ref.)	21-18TC-09	18RTD-2/9

เอกสารไม่ควบคุม
a 1209739



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2404-0004OC-3
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 24TM589
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
104.0	104.0	104.0	0.032	0.47	0.84	2
120.0	120.0	120.0	0.12	0.72	1.3	2
180.0	180.0	180.0	0.13	1.2	1.5	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
104.0	104.484	103.847	104.226	104.232	104.108	103.691	104.275	104.127	104.013	9.42
120.0	120.496	120.089	120.635	120.596	119.531	119.644	120.384	120.144	120.158	1.1
180.0	180.574	179.769	180.285	180.670	179.584	179.790	180.287	179.961	179.902	1.1

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 1209738



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 16, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000 FAX. 0-2719-9484

Cert.No.: 24TW39
Page: 1 of 2

Certificate of Testing

Equipment : DO Meter
Manufacturer : YSI
Model : 5100
Serial No. : 11B 101863
ID No. : UAE.WAO.004/2554
Received Date : 20 February 2024
Test Date : 21 February 2024
Reference : 2402-0628DSC-1
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangkok,
Prakhong, Bangkok 10260
Laboratory Condition : Temperature (25 ± 5) °C
Humidity (60 ± 20) %
Test Procedure : In - house method : GP-CH9
by Comparison Technique with Azide Modification Method
Tested by : Walalek Sirithuan
Approved by :
Approved Signatory
() Pornthippa Tameyakul
() Unnophol Harachai
(x) Sathip Meengmai
Issue Date : 22 February 2024

เอกสารไม่ควบคุม



Cert.No.: 24TW39
Page.: 2 of 2

Condition of this result of calibration

1. Reference Standard Instruments :
This certification is traceable to the International System of Unit through the reference standards laboratory of Industrial Calibration Center, Technology Promotion Association (Thailand-Japan).

Instruments	Serial No.	ID No.	Certificate No.	Due Date
1. Burette	-	130BU10	23CG1172	22 Mar 2025
2. Balance	14233821	110RC001	23NM405	16 July 2024

2. Standard Material :-

Material	Manufacturer	Lot No.	Assay
Sodium Thiosulfate pentahydrate	Merck	AM1763316	100.2%

Result : Dissolved Oxygen Meter Adjustment With Air 100 %
Dissolved Oxygen Probe No.: 22B100125

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.20	8.19	0.0055

This report was certified only for the instrument we tested. It is allowable to use for study
Intend to use for advertising and referral purpose is prohibited. This report may not be reproduced
other in full, without written approval of the laboratory

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มูลนิธิส่งเสริมวิทยาศาสตร์และเทคโนโลยีในภาค
อุตสาหกรรมและการเกษตร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



Calibration Certificate

Certificate No.: 2402283-001-01
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: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Serial No.: C069871872
ID No.: UAE.WAO.012/2563
Order No.: 2402283
Operation No.: 2402283-001
Date of Receipt: 2 April 2024
Date of Calibration: 2 April 2024

Calibrated by Mr.Jerawut Prapewittipong
Scientist
Approved by
(Mr.Pheraphat Tungsit)
Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team
Date of Issue: 9 April 2024

The uncertainties are for a confidence probability of approximately 95%
This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme
which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the
units of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other
than in full, except with the prior written approval of the National Food Institute.
F-CS-009 Revision: 01 Date: 20-04-05

2009 ถนนสุขุมวิท 25 แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110
2008 So 25, Asoy Avenue Road, Bang Y Khan Subdistrict, Bang Phat District, Bangkok 10700, Thailand
☎ +66(0) 2-262 8509 ☎ +66(0) 2-262 8505
เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C09071872
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.012/2563

Date of Calibration: 2 April 2024 Page 2 of 4

Environment Condition: Ambient Temperature: 24.5 ± 0.5 °C Relative Humidity: 47.5 ± 2.5 %

Place of Calibration: Laboratory, UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-MA-001 In-House Method based on UKAS Lab 14 : 2015

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1mg to 200g	B95567572	TCS	H23040335	8 April 2024

Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	600-H1	NFI.BTH 016/23	Quality Reborn	0424 0343	9 February 2025

3. This certification is traceable to SI UNIT

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

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

Calibration Results:

1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
40	0.000052
80	0.000063
100	0.000048
200	0.000053

2. Off-Center Error:

A mass of 100 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)
100.0002	100.0001	100.0002	99.9999	100.0001	100.0001	0.0003

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

Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C09071872
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.012/2563

Date of Calibration: 2 April 2024 Page 4 of 4

Calibration Results: (Continued)

Calibration Range: 81 - 200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 81 - 200 g; Resolution: 0.0001 g)

Nominal Value	Standard Value	Average Reading	Correction	Uncertainty	Coverage Factor
80	80.00010	80.0000	0.0001	0.00015	2.00
100	100.00005	100.0000	0.0001	0.00015	2.00
110	110.00007	110.0001	0.0000	0.00017	2.00
120	120.00009	120.0000	0.0001	0.00018	2.00
130	130.00010	130.0000	0.0001	0.00019	2.00
140	140.00014	140.0000	0.0001	0.00020	2.00
150	150.00009	150.0001	0.0000	0.00020	2.00
160	160.00010	160.0001	0.0000	0.00022	2.00
170	170.00012	170.0001	0.0000	0.00023	2.00
200	200.00016	200.0000	0.0002	0.00028	2.00

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

----- End -----

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

Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C09071872
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.012/2563

Date of Calibration: 2 April 2024 Page 3 of 4

Calibration Results: (Continued)

Calibration Range: 0 - 80 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 0 - 80 g; Resolution: 0.00001 g)

Nominal Value	Standard Value	Average Reading	Correction	Uncertainty	Coverage Factor
Unloaded	0.000000	0.00000	0.00000	0.0000088	2.00
0.001	0.001003	0.00101	-0.00001	0.0000091	2.00
0.005	0.005002	0.00500	0.00001	0.0000094	2.00
0.01	0.010003	0.01000	0.00000	0.0000091	2.00
0.05	0.049996	0.05000	0.00000	0.0000093	2.00
0.1	0.100011	0.10000	0.00001	0.000011	2.00
0.5	0.500016	0.50001	0.00001	0.000014	2.00
1	1.000002	1.00002	-0.00002	0.000016	2.00
2	2.000023	2.00001	0.00001	0.000017	2.00
5	5.000017	5.00002	0.00000	0.000020	2.00
10	10.000009	10.00000	0.00001	0.000026	2.00
20	20.000031	20.00002	0.00001	0.000037	2.00
30	30.000040	30.00003	0.00001	0.000052	2.00
50	50.000070	50.00004	0.00003	0.000068	2.00
80	80.000067	80.00003	0.00004	0.000101	2.00

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

Calibration Certificate

Certificate No.: 2402283-002-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 SOI UDOMSUK 41, SUKHUMVIT ROAD, Bangkok, Prakhonong, Bangkok 10260

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: XSR205DU

Serial No.: C210685394

ID No.: UAE.WAO.010/2565

Order No.: 2402283

Operation No.: 2402283-002

Date of Receipt: 2 April 2024

Date of Calibration: 2 April 2024

Calibrated by Mr.Jerawut Prapawuttipong
Scientist

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

Date of Issue: 9 April 2024

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



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



Calibration Report

Certificate No.: 2402283-002-01

Equipment:

Electronic Balance

Manufacturer: METTLER TOLEDO

Model: XSR205DU

Resolution: 0.00001 g / 0.0001 g

Serial No.: C210685394

ID No.: UAE WAO.016/2585

Capacity: 220 g

Date of Calibration: 2 April 2024

Page 2 of 4

Environment Condition: Ambient Temperature: 24.5 ± 0.5 °C Relative Humidity: 47.5 ± 2.5 %

Place of Calibration: Laboratory, UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-HA-001 In-House Method based on UKAS Lab 14 - 2019

2. Reference Standards:

Reference Standard Model Serial No. Calibrated By Certificate No. Due Date

Standard Weight Class C2 1mg to 200g 0605567572 TCS M236A0335 8 April 2024

Instrument Model Serial No. Calibrated By Certificate No. Due Date

Thermo-Hygro Meter 600-H1 NFI 87H 016/23 QUINCY REBORN QRC24 0343 9 February 2023

3. This certification is traceable to SI UNIT

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

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

Calibration Results:

1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
40	0.000042
80	0.000057
100	0.000048
200	0.000048

2. Off-Center Error:

A mass of 100 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)
100.0000	100.0001	99.9999	99.9999	100.0000	100.0000	0.0001

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

2008 ถนนสุขุมวิท ซ. 36 แขวงคลองตันใต้ เขตวัฒนา กรุงเทพมหานคร 10110
2008 Soi 36, Aun Amarin Road, Bang Na Khan Subdistrict, Bang Na District, Bangkok 10700, Thailand
Tel: +66(0) 2-282 8588 Fax: +66(0) 2-282 8545



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



Calibration Report

Certificate No.: 2402283-002-01

Equipment:

Electronic Balance

Manufacturer: METTLER TOLEDO

Model: XSR205DU

Resolution: 0.00001 g / 0.0001 g

Serial No.: C210685394

ID No.: UAE WAO.016/2585

Capacity: 220 g

Date of Calibration: 2 April 2024

Page 3 of 4

Calibration Results: (Continued)

Calibration Range: 0 - 80 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 0 - 80 g; Resolution: 0.00001 g)

Nominal Value	Standard Value	Average Reading	Correction	Uncertainty	Coverage Factor
Uncal	0.000000	0.000000	0.000000	0.000000	2.00
0.001	0.001003	0.001001	-0.000001	0.000009	2.00
0.005	0.005003	0.005000	-0.000003	0.000009	2.00
0.01	0.010003	0.010000	-0.000003	0.000009	2.00
0.05	0.050003	0.050000	-0.000003	0.000009	2.00
0.1	0.100003	0.100000	-0.000003	0.000009	2.00
0.5	0.500006	0.500001	-0.000005	0.000011	2.00
1	1.000007	1.000002	-0.000005	0.000016	2.00
2	2.000002	2.000001	-0.000001	0.000017	2.00
5	5.000012	5.000002	-0.000010	0.000019	2.00
10	10.000009	10.000006	-0.000003	0.000020	2.00
20	20.000031	20.000000	-0.000031	0.000037	2.00
30	30.000049	30.000001	-0.000048	0.000040	2.00
50	50.000025	50.000002	-0.000023	0.000068	2.00
80	80.000058	80.000002	-0.000056	0.000111	2.00

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

2008 ถนนสุขุมวิท ซ. 36 แขวงคลองตันใต้ เขตวัฒนา กรุงเทพมหานคร 10110
2008 Soi 36, Aun Amarin Road, Bang Na Khan Subdistrict, Bang Na District, Bangkok 10700, Thailand
Tel: +66(0) 2-282 8588 Fax: +66(0) 2-282 8545



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



Calibration Report

Certificate No.: 2402283-002-01

Equipment:

Electronic Balance

Manufacturer: METTLER TOLEDO

Model: XSR205DU

Resolution: 0.00001 g / 0.0001 g

Serial No.: C210685394

ID No.: UAE WAO.016/2585

Capacity: 220 g

Date of Calibration: 2 April 2024

Page 4 of 4

Calibration Results: (Continued)

Calibration Range: 81 - 200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 81 - 200 g; Resolution: 0.0001 g)

Nominal Value	Standard Value	Average Reading	Correction	Uncertainty	Coverage Factor
90	90.00019	90.00001	-0.00018	0.00019	2.00
100	100.00005	100.00001	-0.00004	0.00015	2.00
110	110.00007	110.00001	-0.00006	0.00016	2.00
120	120.00009	120.00000	-0.00009	0.00017	2.00
130	130.00010	130.00000	-0.00010	0.00019	2.00
140	140.00014	140.00000	-0.00014	0.00020	2.00
150	150.00009	150.00001	-0.00008	0.00020	2.00
160	160.00010	160.00001	-0.00009	0.00022	2.00
170	170.00012	170.00001	-0.00011	0.00023	2.00
200	200.00016	200.00002	-0.00014	0.00028	2.00

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

***** End *****

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

2008 ถนนสุขุมวิท ซ. 36 แขวงคลองตันใต้ เขตวัฒนา กรุงเทพมหานคร 10110
2008 Soi 36, Aun Amarin Road, Bang Na Khan Subdistrict, Bang Na District, Bangkok 10700, Thailand
Tel: +66(0) 2-282 8588 Fax: +66(0) 2-282 8545



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



Calibration Certificate

Certificate No.: 2402420-001-01

Client name:

UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Address:

3 Soi Udumuk 41, Sukhumvit Road,
Bangchack, Prakhong, Bangkok 10260

Equipment:

Electronic Balance

Manufacturer:

METTLER TOLEDO

Model:

AB204-S/FACT

Serial No.:

B108115888

ID No.:

UAE.AJR.016/2585

Order No.:

2402420

Operation No.:

2402420-001

Date of Receipt:

19 April 2024

Date of Calibration:

19 April 2024

Calibrated by

Mr. Pheraphat Tuanjit
Scientist

Approved by

(Mae Preesaporn Jeengkamdit)

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

Date of Issue:

23 April 2024

The uncertainties are for a confidence probability of approximately 95%

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement defined 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

2008 ถนนสุขุมวิท ซ. 36 แขวงคลองตันใต้ เขตวัฒนา กรุงเทพมหานคร 10110
2008 Soi 36, Aun Amarin Road, Bang Na Khan Subdistrict, Bang Na District, Bangkok 10700, Thailand
Tel: +66(0) 2-282 8588 Fax: +66(0) 2-282 8545



Cert.No.: 24CH1070
Page: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	43160066	130RC092	24E1320	22 Apr 2025
2) Ref. Standard Thermometer	2188080	130RC044	231216	10 Oct 2024

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

2. Certified Reference Materials

- The measurement results are traceable to SI through Hach Lange GmbH LI Deutsche Akkreditierungsstelle, Accredited No.D-RM-15184-01-00

- The measurement results are traceable to SI through CPA chem Ltd., ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.006	Hach Lange GmbH	C03146	23 Feb 2026
pH 6.999	Hach Lange GmbH	C03145	28 Feb 2026
pH 9.997	CPA chem	970853	25 Apr 2025

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

Calibration Results

Function : mV Measurement

Performing standard curve by Document Process Calibrator at pH (4,7)(7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement	Coverage factor
	pH	mV	mV	pH	(\pm mV)	k
pH Meter S/N.: JC02728	4.00	177.48	177	4.01	0.56	2.00
	7.00	0.00	0	7.00	0.56	2.00
	7.00	0.00	0	7.00	0.56	2.00
	10.00	-177.48	-177	10.01	0.58	2.00



Cert.No.: 24CH1070
Page: 3 of 3

Calibration Results

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4,7)(7,10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (\pm)	Coverage factor k
pH Electrode S/N.: 231018SIA605377	4.006	4.01	173	0.0090	2.05
	6.999	7.00	-1	0.0084	2.00
	6.999	7.00	-1	0.0085	2.00
	9.997	10.00	-178	0.0092	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model :

231018SIA605377

- Serial No. :

Dimension of probe

- Length : 110 mm.

- Diameter : 12 mm.

- Immersion Depth : 100 mm.

Calibration Point ($^{\circ}$ C)	Standard Temperature ($^{\circ}$ C)	UUC* Reading ($^{\circ}$ C)	Error ($^{\circ}$ C)	Uncertainty of measurement (\pm $^{\circ}$ C)	Coverage factor k
20.0	20.002	20.1	0.098	0.13	2.00
25.0	25.003	25.1	0.097	0.13	2.00
45.0	45.002	45.0	-0.002	0.13	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 %.

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



Certificate of Calibration

Cert.No.: 24MM292
Page: 1 of 3

Equipment : Electronic Balance

Manufacturer : Mettler Toledo

Model : AB204-S/FACT

Serial No. : 1129361010

ID No. : UAE.WAS.002/2552

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

Location : Balance Room (108)

Received order : 11 May 2024

Calibration Date : 11 May 2024

Ambient Temperature : 15 $^{\circ}$ C to 40 $^{\circ}$ C

Relative Humidity : 30 % to 90 %

Calibrated by : Khit Ruttanaprasachai

Approved by :
Approved Signatory

() Pongpan Paipim
() Suwit Injai
(x) Khit Ruttanaprasachai

Issue Date : 15 May 2024

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



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2405-01660C-1

Cert.No.: 24MM292
Page: 2 of 3

Procedure used :-

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

Condition of this result of calibration

1. Reference standard instruments:-

Instruments	Model	Serial No.	ID No.	Test report No.	Due date
1) Standard Weight Set (E2)	15884	24053	70RC007	MM-0013-24	25 Jan 2026

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 220 g Resolution 0.0001 g

Before Adjustment :

Applied Weight	Balance Reading	Correction	Measurement Uncertainty	Coverage Factor
(g)	(g)	(g)	(\pm mg)	(k)
100	100.0000	0.0000	0.18	2.03
200	200.0006	-0.0006	0.30	2

After Adjustment :

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

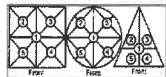
Applied Weight	Standard Deviation
(g)	(g)
100	0.00007
200	0.00005

เอกสารไม่ควบคุม



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2405-0160C-1

Cert.No.: 24MM292
Page: 3 of 3



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

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	Position 2	Position 3	Position 4	Position 5
(g)	(g)	(g)	(g)	(g)
-0.0004	-0.0004	-0.0003	-0.0003	-0.0004

3. Departure from nominal value

Applied Weight	Balance Reading	Correction	Measurement Uncertainty	Coverage Factor
(g)	(g)	(g)	(± mg)	(k)
Unloaded	0.0000	0.0000	0.15	2.13
0.01	0.0100	0.0000	0.15	2.13
0.05	0.0500	0.0000	0.15	2.13
0.1	0.1000	0.0000	0.15	2.13
0.5	0.5000	0.0000	0.15	2.13
1	1.0000	0.0000	0.15	2.13
10	10.0000	0.0000	0.15	2.11
50	48.9999	+0.0001	0.17	2.05
100	99.9999	+0.0001	0.19	2.03
150	149.9998	+0.0002	0.29	2
200	199.9990	+0.0010	0.30	2

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

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, BUNYATJANG, SILENUANG BANGKOK 10250
TEL: 0-2711-3000-29 FAX: 0-2710-9481



Cert. No.: 24TM589
Page : 1 of 3

Certificate of Calibration

Equipment : Hot Air Oven
Manufacturer : Mammert
Model : UF 55
Serial No. : B212.0411
ID No. : UAE.WAO.0052556
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Odonsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Lab Floor 2
Received Order : 01 April 2024
Calibration Date : 01 - 02 April 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Kriade Maiee
Approved by :
() Ponpan Palpin
(✓) Suwit Imjai
() Kunchit Promprat

Issue Date : 5 April 2024

The Uncertainties are for a confidence probability of approximately 95%

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

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A 0065065



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2404-0004OC-3

Cert. No.: 24TM589
Page : 2 of 3

Procedure Used :-

Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD) and Thermocouple Type T.

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY57013711	Z3LM115	TPA	11 Jul 2024

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

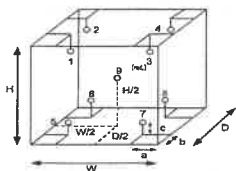
3. This certification is traceable to the International System of Unit.

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

Result of Calibration :- () Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



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 = 0.75 m
Capacity = 0.30 m³

Environment during calibration	
	Beginning Finished
Temp. (°C)	27 26
REL.Humid. (%)	47 48
AC Supply (Volt)	221 220

Ref. Std. ID No.: @ Calibration Point	
Position :	(120 to 180) (104) °C
1	21-18TC-01 22-18RTD-2/1
2	21-18TC-02 18RTD-2/2
3	21-18TC-03 18RTD-2/3
4	21-18TC-04 18RTD-2/4
5	21-18TC-05 18RTD-2/5
6	21-18TC-06 18RTD-2/6
7	21-18TC-07 18RTD-2/7
8	21-18TC-08 18RTD-2/8
9 (ref.)	21-18TC-09 18RTD-2/9



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2404-0004OC-3
Result of Calibration :- () Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 24TM589
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
104.0	104.0	104.0	0.032	0.47	0.84	2
120.0	120.0	120.0	0.12	0.72	1.3	2
180.0	180.0	180.0	0.13	1.2	1.5	2

Measured Temperature (°C)		Uncertainty (± °C)
Point (°C)	Position	
104.0	1 2 3 4 5 6 7 8 9 (ref.)	0.42
120.0	120.486 103.847 104.226 104.232 104.106 103.891 104.275 104.127 104.013	1.1
180.0	180.486 120.089 120.635 120.596 119.531 119.844 120.364 120.144 120.158	1.1

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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a 1209739

เอกสารไม่ควบคุม
a 1209738



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD 801 18, SUANLIANG, SUANLIANG BANGKOK 10250
TEL. 0-2717-1000 FAX. 0-2719-9484

Cert.No.: 24TW39
Page.: 1 of 2

Certificate of Testing

Equipment : DO Meter
Manufacturer : YSI
Model : 5100
Serial No. : 11B 101663
ID No. : UAE.WAO.004/2554
Received Date : 20 February 2024
Test Date : 21 February 2024
Reference : 2402-0529DSC-1
Submitted by : United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangkok,
Phrakhanong, Bangkok 10250
Laboratory Condition : Temperature (25 ± 5) °C
Humidity (60 ± 20) %
Test Procedure : In - house method : CP-CH9
by Comparison Technique with Azide Modification Method

Tested by : Walelak Sirthean

Approved by : 
Approved Signatory

() Pornthippa Tameyakul
() Uthopphol Harachai
(✓) Sathip Meangmai

Issue Date : 22 February 2024

เอกสารไม่ควบคุม



Cert.No.: 24TW39
Page.: 2 of 2

Condition of this result of calibration

1. Reference Standard Instruments :
This certification is traceable to the International System of Unit through the reference standards
laboratory of Industrial Calibration Center, Technology Promotion Association (Thailand-Japan).

Instruments	Serial No.	ID No.	Certificate No.	Due Date
1. Burette	-	130BU10	23CG1172	22 Mar 2025
2. Balance	14233621	110RC001	23MM405	16 July 2024

2. Standard Material :-

Material	Manufacturer	Lot.No.	Assay
Sodium Thiosulfate pentahydrate	Merck	AM1763316	100.2%

Result : Dissolved Oxygen Meter Adjustment With Air 100 %
Dissolved Oxygen Probe No.: 22B100125

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.20	8.19	0.0056

This report was certified only for the instrument we tested, it is allowable to use for study
intend to use for advertising and referral purpose is prohibited. This report may not be reproduced
other in full, without written approval of the laboratory

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มูลนิธิส่งเสริมและพัฒนาอาหาร
ศูนย์บริการห้องปฏิบัติการอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center




Calibration Certificate

Certificate No.: 2402283-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakhonong, Bangkok 10260

Page 1 of 4

Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Serial No.: C069071872
ID No.: UAE.WAO.012/2563
Order No.: 2402283
Operation No.: 2402283-001
Date of Receipt: 2 April 2024
Date of Calibration: 2 April 2024

Calibrated by Mr.Jerawut Prapawuttipong
Scientist

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

Date of Issue: 9 April 2024

The uncertainties are for a confidence probability of approximately 95%

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme
which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the
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F-CS-009 Revision: 01 Date: 20-04-65

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2008 Soi 36, Asoke Road, Bang Yai Khan Suktet, Bang Phat District, Bangkok 10700, Thailand
Tel : 0-2610-2-22 0-2610-2-22 Fax : 0-2610-2-22 0-2610-2-22



มูลนิธิส่งเสริมและพัฒนาอาหาร
ศูนย์บริการห้องปฏิบัติการอาหาร
Foundation for Industrial Development National Food Institute
Food Industrial Laboratory Service Center



Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Serial No.: C069071872
Capacity: 220 g
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.012/2563

Page 2 of 4

Date of Calibration: 2 April 2024
Environment Condition: Ambient Temperature: 24.5 °C Relative Humidity: 47.5 %
Place of Calibration: Laboratory, UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

- Calibration Method: NFI Method WI-PA-001 In-House Method based on UKAS Lab 14 : 2019
- Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1mg to 200g	056557572	TC5	M23040535	8 April 2024
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygros Meter	608-411	NFI.07H 016/22	Quality Reborn	QR24-0343	9 February 2025
- This certification is traceable to SI UNIT
- This certificate was certified only for the instrument we calibrated.
- This result of calibration was found accurate as shown on date and place of calibration only.

Calibration Results:

5. Repeatability of Reading:

Normal Value (g)	Standard Deviation of Reading (g)
40	0.000052
80	0.000063
120	0.000048
200	0.000052

2. Off-Center Error:

A mass of 100 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)
100.0007	100.0001	100.0002	99.9999	100.0001	100.0001	0.0002

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

2008 ถนนสุขุมวิท 36 แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร เอกสารไม่ควบคุม
2008 Soi 36, Asoke Road, Bang Yai Khan Suktet, Bang Phat District, Bangkok 10700, Thailand
Tel : 0-2610-2-22 0-2610-2-22 Fax : 0-2610-2-22 0-2610-2-22

Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C09071072
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g / 0.0001 g
ID No.: UAE.WAO.012/2563

Date of Calibration: 2 April 2024 Page 3 of 4

Calibration Results: (Continued)

Calibration Range: 0 - 80 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 0 - 80 g; Resolution: 0.00001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (g)	Coverage Factor k
Unloaded	0.000000	0.000000	0.000000	0.0000048	2.00
0.001	0.001003	0.001001	-0.000001	0.0000091	2.00
0.005	0.005003	0.004999	0.000004	0.0000094	2.00
0.01	0.010003	0.010000	0.000003	0.0000091	2.00
0.05	0.049996	0.050000	0.000004	0.0000098	2.00
0.1	0.100011	0.100000	0.000011	0.000011	2.00
0.5	0.500016	0.500001	0.000015	0.000014	2.00
1	1.000003	1.000002	-0.000001	0.000016	2.00
2	2.000023	2.000001	0.000022	0.000017	2.00
5	5.000017	5.000002	0.000015	0.000020	2.00
10	10.000009	10.000000	0.000009	0.000026	2.00
20	20.000031	20.000002	0.000029	0.000037	2.00
30	30.000044	30.000003	0.000041	0.000052	2.00
50	50.000028	50.000004	0.000024	0.000068	2.00
80	80.000082	80.000005	0.000077	0.00011	1.91

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

2009 ถนนสุขุมวิท 36 แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110
2009 Soi 36, Asoke Road, Bang Yi Khan Subdistrict, Bang Phra District, Bangkok 10110, Thailand
Tel: +66(0) 2428 8888 Fax: +66(0) 2428 8545

Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C09071072
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.012/2563

Date of Calibration: 2 April 2024 Page 4 of 4

Calibration Results: (Continued)

Calibration Range: 81 - 200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 81 - 200 g; Resolution: 0.0001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (g)	Coverage Factor k
90	90.00010	90.00000	0.00010	0.00015	2.00
100	100.00006	100.00000	0.00006	0.00015	2.00
110	110.00007	110.00001	0.00006	0.00017	2.00
120	120.00009	120.00000	0.00009	0.00018	2.00
130	130.00010	130.00000	0.00010	0.00019	2.00
140	140.00014	140.00000	0.00014	0.00020	2.00
150	150.00002	150.00001	0.00001	0.00020	2.00
160	160.00010	160.00001	0.00009	0.00022	2.00
170	170.00012	170.00001	0.00011	0.00023	2.00
200	200.00016	200.00000	0.00016	0.00028	2.00

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

----- End -----

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

2009 ถนนสุขุมวิท 36 แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110
2009 Soi 36, Asoke Road, Bang Yi Khan Subdistrict, Bang Phra District, Bangkok 10110, Thailand
Tel: +66(0) 2428 8888 Fax: +66(0) 2428 8545

Calibration Certificate

Certificate No.: 2402283-002-01
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: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: XSR205DU

Serial No.: C210685394

ID No.: UAE.WAO.010/2565

Order No.: 2402283

Operation No.: 2402283-002

Date of Receipt: 2 April 2024

Date of Calibration: 2 April 2024

Calibrated by: Mr.Jerawut Prapawuttipong
Scientist

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

Date of Issue: 9 April 2024

The uncertainties are for a confidence probability of approximately 95%

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

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

Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C210685394
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g / 0.0001 g
ID No.: UAE.WAO.010/2565

Date of Calibration: 2 April 2024 Page 2 of 4

Environment Condition: Ambient Temperature: 24.5 ± 0.5 °C Relative Humidity: 47.5 ± 2.5 %

Place of Calibration: Laboratory, UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-FA-001 In-house Method based on UKAS Lab 14 : 2019

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1mg to 200g	805557572	TCS	H03040335	8 April 2024
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	606 H1	NFL8TH 015/23	Quality Reborn	QR24-0343	9 February 2025

3. This certification is traceable to SI UNIT

4. This certificate was certified only for the instrument was 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)
40	0.0000542
80	0.0000552
100	0.000048
200	0.000048

2. Off-Center Error:

A mass of 100 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)
100.0000	100.0001	99.9999	99.9999	100.0001	100.0000	0.0001

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

2009 ถนนสุขุมวิท 36 แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110
2009 Soi 36, Asoke Road, Bang Yi Khan Subdistrict, Bang Phra District, Bangkok 10110, Thailand
Tel: +66(0) 2428 8888 Fax: +66(0) 2428 8545



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



Calibration Report

Certificate No.: 2402283-002-01

Equipment:

Electronic Balance

Model: XSR205C/U

Serial No.: C210685394

Capacity: 220 g

Manufacturer: METTLER TOLEDO

Resolution: 0.0001 g / 0.0001 g

ID No.: UAE.WAO.010/2555

Date of Calibration: 2 April 2024

Page 3 of 4

Calibration Results: (Continued)

Calibration Range: 0 - 80 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 0 - 80 g; Resolution: 0.0001 g)

Nominal Value	Standard Value	Average Reading	Correction	Uncertainty	Coverage Factor
Unloaded	0.000000	0.000000	0.000000	0.000000	2.00
0.00	0.001003	0.001001	-0.000002	0.000009	2.00
0.005	0.005003	0.005000	-0.000003	0.000009	2.00
0.01	0.010003	0.010000	-0.000003	0.000009	2.00
0.05	0.050003	0.050000	-0.000003	0.000009	2.00
0.1	0.100011	0.100000	-0.000011	0.000011	2.00
0.5	0.500016	0.500001	-0.000015	0.000014	2.00
1	1.000003	1.000002	-0.000001	0.000016	2.00
2	2.000023	2.000011	-0.000012	0.000017	2.00
5	5.000017	5.000000	-0.000017	0.000020	2.00
10	10.000009	10.000000	-0.000009	0.000026	2.00
20	20.000021	20.000000	-0.000021	0.000037	2.00
30	30.000040	30.000001	-0.000039	0.000049	2.00
50	50.000011	50.000000	-0.000011	0.000064	2.00
80	80.000058	80.000000	-0.000058	0.000111	2.00

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

2008 ซอย 36, ถนนสุขุมวิท แขวงคลองตัน เขตคลองเตย กรุงเทพมหานคร 10110
2008 So 36, Aun Anan Road, Bang Yai Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand
Tel: +66(0) 2-262 8588 Fax: +66(0) 2-262 8545



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



Calibration Report

Certificate No.: 2402283-002-01

Equipment:

Electronic Balance

Model: XSR205C/U

Serial No.: C210685394

Capacity: 220 g

Manufacturer: METTLER TOLEDO

Resolution: 0.0001 g / 0.0001 g

ID No.: UAE.WAO.010/2555

Date of Calibration: 2 April 2024

Page 4 of 4

Calibration Results: (Continued)

Calibration Range: 81 - 200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 81 - 200 g; Resolution: 0.0001 g)

Nominal Value	Standard Value	Average Reading	Correction	Uncertainty	Coverage Factor
90	90.000010	90.000001	-0.000009	0.000015	2.00
100	100.000006	100.000001	-0.000005	0.000015	2.00
110	110.000007	110.000001	-0.000006	0.000016	2.00
120	120.000005	120.000000	-0.000005	0.000017	2.00
130	130.000010	130.000000	-0.000010	0.000019	2.00
140	140.000014	140.000000	-0.000014	0.000020	2.00
150	150.000009	150.000001	-0.000008	0.000020	2.00
160	160.000010	160.000001	-0.000009	0.000022	2.00
170	170.000012	170.000000	-0.000012	0.000023	2.00
200	200.000016	200.000000	-0.000016	0.000028	2.00

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

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

2008 ซอย 36, ถนนสุขุมวิท แขวงคลองตัน เขตคลองเตย กรุงเทพมหานคร 10110
2008 So 36, Aun Anan Road, Bang Yai Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand
Tel: +66(0) 2-262 8588 Fax: +66(0) 2-262 8545



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



Calibration Certificate

Certificate No.: 2402420-001-01

Client name:

UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Address:

3 Soi Udonsuk 41, Sukhumvit Road,

Bangchack, Prakanong, Bangkok 10260

Page 1 of 3

Equipment:

Electronic Balance

Manufacturer:

METTLER TOLEDO

Model:

AB204-S/FACT

Serial No.:

B108115858

ID No.:

UAE.AIR.016/2555

Order No.:

2402420

Operation No.:

2402420-001

Date of Receipt:

19 April 2024

Date of Calibration:

19 April 2024

Calibrated by

Mr. Phraphat Tuanjit

Scientist

Approved by

(Miss Preesaporn Jaengkarnkit)

Vice President, Department of Laboratory Services

Date of Issue:

23 April 2024

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 when 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 accord with the prior written approval of the National Food Institute.

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

2008 ซอย 36, ถนนสุขุมวิท แขวงคลองตัน เขตคลองเตย กรุงเทพมหานคร 10110
2008 So 36, Aun Anan Road, Bang Yai Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand
Tel: +66(0) 2-262 8588 Fax: +66(0) 2-262 8545



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Food Industrial Laboratory Service Center



Calibration Report

Certificate No.: 2402420-001-01

Equipment:

Electronic Balance

Model: AB204-S/FACT

Serial No.: B108115858

Capacity: 220 g

Manufacturer: METTLER TOLEDO

Resolution: 0.0001 g

ID No.: UAE.AIR.016/2555

Date of Calibration: 19 April 2024

Page 2 of 3

Environment Condition: Ambient Temperature: 22.1 ± 0.6 °C Relative Humidity: 46 ± 1.9 %

Place of Calibration: Room 206 Baanra Room 2, UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-HA-001 In-House Method based on UKAS Lab 14 : 2019

2. Reference Standard:

Reference Standard Model Serial No. Calibrated By Certificate No. Due Date

Standard Weight Class E2 1-500mg 15880 TCS M2311815 28 November 2024

Standard Weight Class E2 1-500g 15882 TCS M2311825 28 November 2024

Instrument Model Serial No. Calibrated By Certificate No. Due Date

Thermo-Hygro Meter 608-H1 NFI.BTH 019/23 Quality Room QK24-0402 4 March 2025

3. This certificate is traceable to SI UNIT

4. This certificate was issued 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 Readings:

Nominal Value (g) Standard Deviation of Reading (g)

100 0.000017

200 0.000019

2. Off-Center Error:

A mass of 100 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	(Average) Difference
99.9999	99.9997	99.9995	99.9995	100.0000	99.9999	0.0001

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

2008 ซอย 36, ถนนสุขุมวิท แขวงคลองตัน เขตคลองเตย กรุงเทพมหานคร 10110
2008 So 36, Aun Anan Road, Bang Yai Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand
Tel: +66(0) 2-262 8588 Fax: +66(0) 2-262 8545



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



Calibration Report

Certificate No.: 2402420-001-01

Equipment: Electronic Balance
Model: AB204-S/FACT
Serial No.: B108115858
Capacity: 220 g

Manufacturer: METTLER TOLEDO
Resolution: 0.001 g
ID No.: UAEATP.016/2355

Date of Calibration: 19 April 2024

Page 3 of 3

Calibration Results: (Continued)

Calibration Range: 0-200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value:

Interval Value	Standard Value	Average Reading	Correction	Uncertainty	Coverage Factor
Uncal	0.0000	0.0000	0.0000	0.000089	2.00
0.1	0.10000	0.1000	0.0000	0.000089	2.00
1	0.99999	1.0000	0.0000	0.000092	2.00
5	4.99997	5.0000	0.0000	0.000093	2.00
10	10.00002	10.0001	-0.0001	0.00011	2.00
20	20.00002	20.0001	-0.0001	0.00014	2.00
50	49.99998	50.0000	0.0000	0.00012	2.00
70	70.00003	69.9999	0.0001	0.00016	2.00
100	99.99997	100.0000	0.0000	0.00017	2.00
150	149.99994	149.9997	0.0002	0.00022	2.00
220	208.00001	199.9995	0.0005	0.00028	2.00

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

----- End -----

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

8308 ถนนสุขุมวิท 35 แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110
8308 Soi 35, Anant Aram Road, Bang Vithan Subdang, BangPhai Estate, Bangkok 10110, Thailand
Tel: +662 2552 8581 Fax: +662 2552 8545

nfi.com

เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
58/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL.0-2717-3000-29 FAX.0-2719-8484



Certificate of Calibration

Cert.No.: 24MM292
Page: 1 of 3

Equipment: Electronic Balance

Manufacturer: Mettler Toledo

Model: AB204-S/FACT

Serial No.: 1129361010

ID No.: UAE.WAS.002/2552

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

Location: Balance Room (108)

Received order: 11 May 2024

Calibration Date: 11 May 2024

Ambient Temperature: 15 °C to 40 °C

Relative Humidity: 30 % to 90 %

Calibrated by: Khit Rutanaprapachai

Approved by:

() Ponpen Palipim
() Suwit Imjai
(✓) Kunchit Prompratt

Approved Signatory

Issue Date: 15 May 2024

The Uncertainties are for a confidence probability of approximately 95%

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

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Equipment: Electronic Balance
Condition As-Received: Used Item
Reference: 2405-0168OC-1

Cert.No.: 24MM292
Page: 2 of 3

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

Condition of this result of calibration

1. Reference standard Instruments:-

- | Instruments | Model | Serial No. | ID No. | Test report No. | Due date |
|-----------------------------|-------|------------|---------|-----------------|-------------|
| 1) Standard Weight Set (E2) | 15884 | 24053 | 70RC007 | MM-0013-24 | 25 Jan 2026 |
- This certificate is valid only to the item calibrated on date and place of calibration.
 - This result of calibration was made on requested at the point specified by customer.
 - This certificate is not certified for any commercial transaction.
 - 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 220 g Resolution 0.0001 g

Before Adjustment:

Applied Weight	Balance Reading	Correction	Measurement Uncertainty	Coverage Factor
(g)	(g)	(g)	(± mg)	(k)
100	100.0000	0.0000	0.19	2.03
200	200.0006	-0.0006	0.30	2

After Adjustment:

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

Applied Weight	Standard Deviation of Reading (g)
(g)	
100	0.00007
200	0.00005



Equipment: Electronic Balance
Condition As-Received: Used Item
Reference: 2405-0168OC-1

Cert.No.: 24MM292
Page: 3 of 3

Result of calibration

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

Position 1	Position 2	Position 3	Position 4	Position 5	Maximum difference between off-center and central loading
(g)	(g)	(g)	(g)	(g)	(g)
-0.0004	-0.0004	-0.0003	-0.0003	-0.0004	0.0001

3. Departure from nominal value

Applied Weight	Balance Reading	Correction	Measurement Uncertainty	Coverage Factor
(g)	(g)	(g)	(± mg)	(k)
Uncal	0.0000	0.0000	0.15	2.13
0.01	0.0100	0.0000	0.15	2.13
0.05	0.0500	0.0000	0.15	2.13
0.1	0.1000	0.0000	0.15	2.13
0.5	0.5000	0.0000	0.15	2.13
1	1.0000	0.0000	0.15	2.13
10	10.0000	0.0000	0.15	2.11
50	49.9999	+0.0001	0.17	2.06
100	99.9999	+0.0001	0.19	2.03
150	149.9998	+0.0002	0.29	2
200	199.9990	+0.0010	0.30	2

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

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เอกสารไม่ควบคุม



Certificate of Calibration

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

Equipment : BOD Incubator
Manufacturer : ARCO
Model : UC4-1320
Serial No. :
ID No. : UAE.WAO.002/2550
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phraekhanong,
Bangkok 10260
Location : Lab Floor 2
Received Order : 11 July 2024
Calibration Date : 11 July 2024
Ambient Temperature : $(26 \pm 10) ^\circ\text{C}$
Relative Humidity : $(50 \pm 30) \%$

Calibrated by : Tawatchai Pama

Approved by :

Approved Signatory

() Porpan Palpin
(✓) Suwit Injai
() Kunchit Promprat

Issue Date : 14 July 2024

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม



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

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

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

Condition of this result of calibration

1. Reference standard Instrument:-

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

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

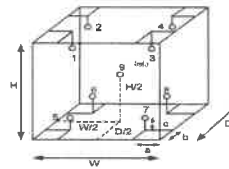
3. This certification is traceable to the International System of Unit.

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

Result of Calibration :- () Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available



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	32
REL.Humid. (%)	78	65
AC Supply (Volt)	233	234

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

เอกสารไม่ควบคุม



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

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

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
20.0	20.0	19.8	0.55	0.88	1.5	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (±°C)
	1	2	3	4	5	6	7	8	9 (ref.)	
20.0	20.210	20.331	20.182	19.645	20.287	20.070	19.838	19.781	19.954	0.79

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

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

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

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

UUC* : Unit Under Calibration

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

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

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เอกสารไม่ควบคุม



Certificate of Calibration

Cert.No.: 25CH408
Page: 1 of 3

Equipment : pH Meter
Manufacturer : EcoSense
Model : pH100A
Serial No. : JC04744
ID No. : UAE.EFM.058/2568 (EFM.pH01/86)
Condition As-Received : Used Item
Received Date : 01 April 2025
Calibration Date : 03 April 2025
Reference : 2504-0031WSC-1
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangchak,
Phraekhanong, Bangkok 10260
Ambient Temperature : $(25 \pm 2.5) ^\circ\text{C}$
Relative Humidity : $(50 \pm 15) \%$
Calibration Procedure : In - house method :
- CP-CH5 by direct measurement with DC voltage standard and direct measurement with certified reference material (CRM)
- CP-CH8 by comparison with temperature standard

Calibrated by : Waleak Sirinthean

Approved by :

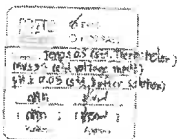
Approved Signatory

() Chakrit Waewwanjua
() Porpan Palpin
(✓) Sathip Meengmai

Issue Date : 4 April 2025

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.



Cert.No.: 25CH408
Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030049	130RC115	24E2759	25 Aug 2025
2) Ref. Standard Thermometer	4882054	110RC044	24I757	14 July 2025

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

2. Certified Reference Materials

:The measurement results are traceable to SI through Hach Lenge GmbH Ltd.,
Deutsche Akkreditierungsstelle, Accredited No.D-RM-15184-01-00

:The measurement results are traceable to SI through CPA chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.007	CPA chem	1066665	18 Jan 2027
pH 6.999	Hach Lenge GmbH	C03220	29 Oct 2026
pH 10.010	CPA chem	1066669	18 Jan 2026

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

Calibration Results

Function : mV Measurement

Performing standard curve by Document Process Calibrator at pH (4,7)(7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (\pm mV)	Coverage factor k
			mV	pH		
pH Meter S/N.: JC04744	4.00	177.48	177	4.01	0.58	2.00
	7.00	0.00	0	7.00	0.58	2.00
	7.00	0.00	0	7.00	0.58	2.00
	10.00	-177.48	-177	10.01	0.58	2.00



Cert.No.: 25CH408
Page.: 3 of 3

Calibration Results

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4,7)(7,10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (\pm)	Coverage factor k
pH Electrode S/N.: 240710SIA605377	4.007	4.01	173	0.0085	2.05
	6.999	7.00	-2	0.0095	2.00
	6.999	7.00	-2	0.0085	2.00
	10.010	10.00	-176	0.0095	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe,

- Model :

- Serial No. : 240710SIA605377

Dimension of probe

- Length : 110 mm

- Diameter : 12 mm

- Immersion Depth : 100 mm

Calibration Point ($^{\circ}$ C)	Standard Temperature ($^{\circ}$ C)	UUC* Reading ($^{\circ}$ C)	Error ($^{\circ}$ C)	Uncertainty of measurement (\pm $^{\circ}$ C)	Coverage factor k
15.0	15.000	14.9	-0.100	0.13	2.00
30.0	30.001	29.9	-0.101	0.13	2.00
45.0	45.002	45.0	-0.002	0.13	2.00

Remark : - UUC* = Unit Under Calibration

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

-00-



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 FAX. 0-2719-9484

Certificate of Testing

Cert.No.: 25TW29
Page.: 1 of 2

Equipment : DO Meter
Manufacturer : YSI
Model : 5100
Serial No. : 11B 101863
ID No. : UAE.WAO.004/2554
Received Date : 14 February 2025
Test Date : 17 February 2025
Reference : 2502-0473DSC-1
Submitted by : United Analyset and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangkok,
Phrakhanong, Bangkok 10260
Laboratory Condition : Temperature (25 ± 5) $^{\circ}$ C
Humidity (50 ± 20) %
Test Procedure : In - house method : CP-CH9
by Comparison Technique with Azide Modification Method
Tested by : Watlak Sirthean
Approved by :
Approved Signatory
() Chakrit Waewwanjui
() Ponpan Paipim
(☒) Saitip Meangmai
Issue Date : 18 February 2025

เอกสารไม่ควบคุม

നിരവധി

Calibration Report

Certificate No.: 2502226-001-01

Equipment:

Electronic Balance

Model: XSR205DU

Serial No.: C009071872

Capacity: 82 g / 220 g

Manufacturer: METTLER TOLEDO

Resolution: 0.0001 g / 0.0001 g

ID No.: UAE.WAO.012/2563

Date of Calibration: 20 March 2025

Page 2 of 4

Environment Condition: Ambient Temperature: 23.2 ± 0.6 °C Relative Humidity: 48 ± 3.5 %

Place of Calibration: 208 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 W-9A-001 In-house Method based on NIS Lab 14 : 2019

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	Imp to 250g	8595567572	TCS	PD4041005	19 April 2025
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	608-H1	NFI BTH 017/21	Quality Reborn	QR25-0542	10 February 2026

3. This certification is traceable to SI UNIT

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.

Calibration Results:

1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
40	0.000052
80	0.000042
100	0.000000
200	0.000000

2. Off-Center Error:

A mass of 100 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)
100.0001	100.0001	100.0001	100.0001	100.0001	100.0002	0.0001

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

2008 Soi 36, Anur Achana Road, Bang Yai Khan Subdistrict, Bang Yai District, Bangkok 10700 Thailand
Tel: +662 042 6565 Fax: +662 042 6565เอกสารไม่ควบคุม
nfi.co.th

Calibration Report

Certificate No.: 2502226-001-01

Equipment:

Electronic Balance

Model: XSR205DU

Serial No.: C009071872

Capacity: 82 g / 220 g

Manufacturer: METTLER TOLEDO

Resolution: 0.0001 g / 0.0001 g

ID No.: UAE.WAO.012/2563

Date of Calibration: 20 March 2025

Page 3 of 4

Calibration Results: (Continued)

Calibration Range: 0-80 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 0 - 82 g ; Resolution: 0.00001 g)

Nominal Value	Standard Value	Average Reading	Correction	Uncertainty	Coverage Factor
(g)	(g)	(g)	(g)	(g)	K
Unload	0.000000	0.00000	0.00000	0.0000089	2.00
0.001	0.001003	0.00100	0.00000	0.0000092	2.00
0.005	0.005002	0.00500	0.00000	0.0000099	2.00
0.01	0.010007	0.01000	0.00000	0.000011	2.00
0.05	0.049996	0.05000	0.00000	0.0000093	2.00
0.1	0.100011	0.10000	0.00001	0.000011	2.00
0.5	0.500018	0.50000	0.00002	0.000014	2.00
1	1.000022	1.00001	-0.00001	0.000018	2.00
2	2.000023	2.00005	-0.00003	0.000017	2.00
5	5.000015	5.00005	-0.00003	0.000021	2.00
10	10.000009	10.00005	-0.00004	0.000026	2.00
20	20.000030	20.00012	-0.00009	0.000037	2.00
30	30.000039	30.00012	-0.00008	0.000040	2.00
50	50.000028	50.00014	-0.00011	0.000068	2.00
80	80.000057	80.00020	-0.00017	0.00011	2.00

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

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Calibration Report

Certificate No.: 2502226-001-01

Equipment:

Electronic Balance

Model: XSR205DU

Serial No.: C009071872

Capacity: 82 g / 220 g

Manufacturer: METTLER TOLEDO

Resolution: 0.00001 g / 0.0001 g

ID No.: UAE.WAO.012/2563

Date of Calibration: 20 March 2025

Page 4 of 4

Calibration Results: (Continued)

Calibration Range: >80-200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: >80 - 200 g ; Resolution: 0.0001 g)

Nominal Value	Standard Value	Average Reading	Correction	Uncertainty	Coverage Factor
(g)	(g)	(g)	(g)	(g)	K
90	90.00019	90.0002	-0.00001	0.000019	2.00
100	100.00006	100.0001	0.00000	0.000016	2.00
110	110.00007	110.0001	0.00000	0.000017	2.00
120	120.00009	120.0002	-0.00001	0.000018	2.00
130	130.00010	130.0002	-0.00001	0.000019	2.00
140	140.00013	140.0002	-0.00001	0.000019	2.00
150	150.00009	150.0002	-0.00001	0.000021	2.00
160	160.00010	160.0002	-0.00001	0.000022	2.00
170	170.00012	170.0002	-0.00001	0.000023	2.00
200	200.00013	200.0002	-0.00001	0.000028	2.00

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

----- End -----

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

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Calibration Certificate

Certificate No.: 2502226-002-01

Client name:

UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.

Address:

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

Equipment:

Electronic Balance

Manufacturer:

METTLER TOLEDO

Model:

XSR205DU

Serial No.:

C210685394

ID No.:

UAE.WAO.010/2565

Order No.:

2502226

Operation No.:

2502226-002

Date of Receipt:

19 March 2025

Date of Calibration:

20 March 2025

Calibrated by Mr.Yothin Charoensuk
ScientistApproved by Mr. N. Nigrobat
(Mr. Phraphat Tuanjit)

Manager, Division of Calibration Laboratory

Date of Issue: 25 March 2025

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: 20-04-65

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Tel: +662 042 6565 Fax: +662 042 6565เอกสารไม่ควบคุม
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List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Ambient									
1	Office Transfer Standard Calibrator	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Anderson Instruments, Inc.	G25A 1862	Jianfater Association Co., Ltd. (Thailand-Japan)	CFP-602-66 2491251	14 Jul 23 11 Apr 24	13 Jul 25 10 Apr 25	-
2	Li-Tube Aerosolmeter	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Dwyer	1221-36-A/MS -	Technology Promotion Association (Thailand-Japan)	2491251	11 Apr 24	10 Apr 25	-
3	Personal Barometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Baigis, Germany	-	Technology Promotion Association (Thailand-Japan)	2491247	22 Apr 24	21 Apr 25	-
4	Real Time-Thermo-Hygrometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Baigis, Germany	-	Technology Promotion Association (Thailand-Japan)	2491253	10 Apr 24	9 Apr 25	-
5	Vibration Meter	Vibration Level Acceleration Level	Insipirel Inc.	Insipirel 721A392U/721A3391	Calibration Laboratory Co.Ltd (Thailand-Japan)	25200637	12 Jun 24	11 Jun 25	-
6	Sound Level Calibrator	Calibrate Sound Level Meter	Swetech	S106 107224	Innovative Instrument Co.Ltd	24-AC1-691	26 Jun 24	25 Jun 25	-
7	Sound Level Meter	Sound Level Meter	Larson Davis	0007302	Innovative Instrument Co.Ltd	CF20240324EA	28 Aug 24	27 Aug 25	-

List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Ambient									
1	Office Transfer Standard Calibrator	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Anderson Instruments, Inc.	G25A 1901	Jianfater Association Co., Ltd. (Thailand-Japan)	CFP-602-66	14 Jul 23	13 Jul 25	-
2	Li-Tube Aerosolmeter	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Dwyer	1221-36-W/M	Technology Promotion Association (Thailand-Japan)	2491251	11 Apr 24	10 Apr 25	-
3	Personal Barometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Baigis, Germany	-	Technology Promotion Association (Thailand-Japan)	2491247	22 Apr 24	21 Apr 25	-
4	Real Time-Thermo-Hygrometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Baigis, Germany	-	Technology Promotion Association (Thailand-Japan)	2491253	10 Apr 24	9 Apr 25	-
5	Vibration Meter	Vibration Level Acceleration Level	Insipirel Inc.	Insipirel 721A392U/721A3391	Calibration Laboratory Co.Ltd (Thailand-Japan)	25200637	17 Jun 24	11 Jun 25	-
6	Sound Level Calibrator	Calibrate Sound Level Meter	Swetech	S106 107224	Innovative Instrument Co.Ltd	24-AC1-691	26 Jun 24	25 Jun 25	-
7	Sound Level Meter	Sound Level Meter	Larson Davis	0007302	Innovative Instrument Co.Ltd	CF20240324EA	28 Aug 24	27 Aug 25	-

List of Instruments Certification for Water Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Water									
1	pH Meter	pH	Hanna	LAQUA-PH210 H9900046	Technology Promotion Association (Thailand-Japan)	24C140	10 Jan 24	9 Jan 25	-

List of Instruments Certification for Water Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Water									
1	pH Meter	pH	Hanna	LAQUA-PH210 H9900046	Technology Promotion Association (Thailand-Japan)	24C140	10 Jan 24	9 Jan 25	-



Cert. No.: 24H750
Page: 2 of 2

Result of Calibration: Without Adjustment
Function: Humidity Measurement

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Error (%R.H.)	Uncertainty of Measurement (±%R.H.)
25.0	40.1	40	-0.1	1.6
25.0	60.0	60	0.0	1.7
25.0	80.0	81	1.0	1.8

Result of Calibration: Without Adjustment
Function: Temperature Measurement

Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (±°C)
20.014	21.0	0.986	0.72
25.033	25.0	-0.033	0.72
30.010	28.5	-0.510	0.72
35.027	34.0	-1.027	0.72
40.013	38.5	-1.513	0.72

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

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
501 PATTANAKARN ROAD SOI 11, SUKHUMVIT, BANGKOK 10110
TEL: 0-2717-1000-24 FAX: 0-2716-4544



Certificate of Calibration

Certificate No.: 24P1650
Page: 1 of 2

Equipment: Aneroid Barometer

Manufacturer: Dwyer

Model:

Serial No:

ID No:

Condition As-Received: Used Item

Received Date: 24 July 2024

Calibration Date: 24 July 2024

Reference:

Ambient Temperature: $(23 \pm 2) ^\circ\text{C}$

Relative Humidity: $(65 \pm 15) \%$

Atmospheric Pressure: 1016 mbar

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

81 Soi Udomsak 41, Sukhumvit Road, Bangkok,

Phraechang, Bangkok 10260

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to in-house calibration procedure CP-P13, using "DKD-R 6-1: Calibration of Pressure Gauges, Edition 03/2014" as a guideline.

Condition of this result of calibration

1. Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard Barometer	DP1142	142250404	MP-004-24	07 May 2025

2) This equipment was maintained in vertical orientation and centered the dial was used as the reference level.

3) The result of calibration was made on request of the point specified by customer.

4) The result of calibration is traceable to the national standard.

5) The instrument was used clean air as pressure media.

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

7) The Calibration is traceable to the International System of Unit maintained through

National Institute of Metrology, Thailand (NIMT).

Calibrated by: Suran Kuanwattana
Issue Date: 26 June 2024

Approved Signatory: Atitap P.
[] Phatinee Pritsopha
[] Suran Kuanwattana
[] Atitap Pritsopha

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Cert. No.: 24P1656
Page: 2 of 2

Result of Calibration: Without Adjustment
Function: Absolute Pressure Measurement
Range: 720 mmHg to 820 mmHg
Scale Interval: 1 mmHg (The First Estimate)

Applied Pressure (mmHg)	720.40	730.87	740.24	751.62	759.96	751.63	773.53	798.76
UUC* Indication (mmHg)	720.0	730.0	740.0	750.0	758.0	765.0	770.0	790.0
Error (mmHg)	-0.40	-0.87	-0.24	-1.62	-1.96	-1.63	-3.53	-8.76

Decreasing Pressure	796.10	773.60	751.89	736.65	751.59	746.72	730.69	720.98
UUC* Indication (mmHg)	796.0	773.0	750.0	735.0	750.0	740.0	730.0	720.0
Error (mmHg)	-0.10	-0.60	-1.89	-1.65	-1.59	-6.72	-0.69	-0.98

The uncertainty of measurement was ± 0.24 mmHg

* UUC: Unit Under Calibration

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

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Atitap P.
เอกสารไม่ควบคุม
1165502



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
501 PATTANAKARN ROAD SOI 11, SUKHUMVIT, BANGKOK 10110
TEL: 0-2717-1000-24 FAX: 0-2716-4544

Certificate of Calibration

Certificate No.: 25P112
Page: 1 of 2

Equipment: U-Tube Manometer

Manufacturer: Dwyer

Model: 121-30-WM

Serial No:

ID No:

Condition As-Received: Used Item

Received Date: 10 February 2025

Calibration Date: 19 February 2025

Reference:

Ambient Temperature: $(28 \pm 2) ^\circ\text{C}$

Relative Humidity: $(60 \pm 15) \%$

Atmospheric Pressure: 1012 mbar

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

81 Soi Udomsak 41, Sukhumvit Road, Bangkok,

Phraechang, Bangkok 10260

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to in-house calibration procedure CP-P04, using "DKD-R 6-1: Calibration of Pressure Gauges, Edition 03/2014" as a guideline.

Condition of this result of calibration

1. Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Pressure Calibrator	PC106P	1189	MP-0113-24	10 Jul 2025

2) The result of calibration was made on request of the point specified by customer.

3) Scale and conversion factor is $1 \text{ kPa} = 4.0146263 \text{ mmHg}$

4) The instrument was used clean air as pressure media.

5) This instrument was installed in vertical orientation and center of connector was used as the reference level.

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

7) The Calibration is traceable to the International System of Unit maintained at:

National Institute of Metrology, Thailand (NIMT)

Calibrated by: Hoppal Phangam
Issue Date: 21 February 2025

Approved Signatory: Atitap P.
[] Phatinee Pritsopha
[] Suran Kuanwattana
[] Atitap Pritsopha

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Cert.No.: 25P112
Page: 2 of 2

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

Range: 0 kPa to 36 kPa
Scale Interval: 0.1 kPa (The Full Scale)

Applied Pressure (kPa)	UUC Indication		ΔP (kPa)	Error (kPa)
	High-port side (kPa)	Low-port side (kPa)		
0.00	0.00	0.00	0.00	0.00
2.00	1.99	-0.08	1.98	-0.02
4.00	2.00	-1.05	3.00	-0.02
6.00	3.00	-3.00	6.00	0.02
8.00	4.00	-4.02	8.00	0.02
10.00	5.00	-5.04	10.00	0.04
12.00	6.00	-6.04	12.00	0.04
14.00	7.00	-7.06	14.00	0.06
16.00	8.00	-8.08	16.00	0.00
18.00	9.00	-9.05	18.00	0.00
20.00	10.00	-10.06	20.00	0.00
22.00	11.00	-11.08	22.00	0.08
24.00	12.00	-12.08	24.00	0.08
26.00	13.00	-13.10	26.00	0.12
28.00	14.00	-14.10	28.00	0.12
30.00	15.00	-15.10	30.00	0.10
32.00	16.00	-16.10	32.00	0.12
34.00	17.00	-17.08	34.00	0.10
36.00	17.86	-17.82	35.75	0.28

The uncertainty of measurement was ± 0.11 kPa.

* UUC = Unit Under Calibration

* ΔP = High-port side - Low-port side

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

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NAC - TISI - TIS 17025
CALIBRATION 0307

CERTIFICATE OF CALIBRATION

Certificate No.: 009-002-01

Page 1 of 2 Pages

MEASUREMENT ITEM
MANUFACTURER
MODEL/TYPE
SERIAL NUMBER
ID NUMBER
CONDITION AS-RECEIVED
CUSTOMER

1. Test Load Cell
2. Anderson Instruments
3. GNS
4. 1501
5. 1501
6. 1501
7. United Analyst and Engineering Consultant Co., Ltd.
8. 81 Soi Udomsuk 41, Sukhumvit Road, Bang Chak, Bangkok 10260

Calibration procedure:
The Calibration is performed in accordance with the requirements of the International Standard ISO 9001:2015 and the requirements of the Thai Standard TIS 17025:2017.

Traceability:
The calibration is traceable to the International Standard ISO 9001:2015 and the requirements of the Thai Standard TIS 17025:2017.

RECEIVED DATE
MEASUREMENT DATE
ISSUE DATE

17.10.2023
14.10.2023
16.10.2023

ENVIRONMENTAL CONDITIONS:

Air-blast condition in the laboratory air is as follows:
Temperature: 23.0 ± 0.5 °C
Relative Humidity: 55.0 ± 1.0 %RH
Atmospheric Pressure: 1010 ± 10 hPa

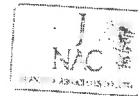
CALIBRATION CONDITION:

Measurement:
Measurement Condition: 23.0 ± 0.5 °C and 54.5 ± 0.5 hPa

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

TABULATION OF RESULTS:

The table on next page gives the measurement results.



Approved by: _____
Signature of the Calibration Department Manager

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

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Continuation of Certificate of Calibration number 009-002-01

Page 2 of 2 Pages

MEASUREMENT RESULTS:

The flow rate was calibrated by direct comparison method with the Standard Primary Calibrated Flowmeter (NAC Model). The flow rate was measured in the system. The standard conditions are 25 °C (77 °F) and 1013.25 hPa (29.92 inHg) for standard temperature and standard pressure respectively.

Table 1: Results of standard calibration data

Flow rate (m³/min)	Pressure (Pa)	Temperature (°C)	Temperature (°F)	ΔP meter (Pa)	ΔP Orifice (Pa)	γ	Standard Flow (Qs) (m³/min)
0.791	754.115	23.27	73.89	55.600	1.431	1.075	0.644
0.997	754.083	23.20	73.76	55.650	1.786	1.785	0.934
1.121	754.005	23.15	73.67	55.670	4.336	3.079	1.077
1.172	754.004	23.12	73.62	55.681	4.861	2.706	1.132
1.410	753.974	23.10	73.58	55.655	7.352	1.671	1.382

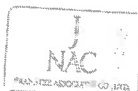
Slope (m): 1.90463
Intercept (b): -0.00634
Correlation coefficient (r): 0.99972
Uncertainty (1-sigma): 0.025 m³/min

Table 2: Results of actual calibration data

Flow rate (m³/min)	Pressure (Pa)	Temperature (°C)	Temperature (°F)	ΔP meter (Pa)	ΔP Orifice (Pa)	γ	Standard Flow (Qs) (m³/min)
0.791	754.115	23.27	73.89	55.600	1.431	1.075	0.644
0.997	754.083	23.20	73.76	55.650	1.786	1.785	0.934
1.121	754.005	23.15	73.67	55.670	4.336	3.079	1.077
1.172	754.004	23.12	73.62	55.681	4.861	2.706	1.132
1.410	753.974	23.10	73.58	55.655	7.352	1.671	1.382

Slope (m): 1.90463
Intercept (b): -0.00634
Correlation coefficient (r): 0.99972
Uncertainty (1-sigma): 0.025 m³/min

End of Certificate of Calibration



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ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

975 Moo 4, Bangpoo Industrial Estate, Soi 8, Sukhumvit Road km 37,

Phraek Sa, Mueang Samut Prakan, Samut Prakan 10280

Tel: +66 2709 4860 Fax: +66 2324 0917



Certificate No.: CP20240324EA
Operation No.: CP2024080295

Certificate of Calibration

Equipment: Sound Level Meter
Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)
Model/Type: LxT1 (Meter), 377B02 (Microphone), PRLxT1 (Preamplifier)
Serial No.: 0007302 (Meter), 344896 (Microphone), 0776637 (Preamplifier)
ID No.: UAE.EFM.035/2566
Customer: United Analyst and Engineering Consultant Co., Ltd.
Address: 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak Phrakhanong, Bangkok 10260
Received Date: 9 August 2024
Calibrated Date: 22 - 27 August 2024
Issued Date: 28 August 2024
Calibrated by: Ms. Juntaporn Kunhakom

Approved by: _____
(Mr. Sittichai Swaksuriyawong)
Group Manager

This report was prepared electronically using applicable electronic signature. Printing or copy of file are considered as a copy of the document.

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor (k) providing a level of confidence of approximately 95%. This certificate may not be reproduced other than in full except with the prior written approval of the Electrical and Electronics Institute, Foundation for Industrial Development.

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เอกสารไม่ควบคุม

F-CAL-004 Ed.1



ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20240324EA

Calibration Report

Equipment: Sound Level Meter
Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)
Model/Type: LX71 (Meter), 377802 (Microphone), PRLX71 (Preamplifier)
Serial No.: 0007302 (Meter), 344896 (Microphone), 0776637 (Preamplifier)
ID No.: UAE.FM.035/2566
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Pressure: (101.3 ± 1.5) kPa

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

Condition of this result of calibration

1. Reference standards instrument :-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Standard microphone	G180	2787490	AA-1012-23	12 November 2024
2) Arbitrary Function Generator	AFG2021	C010063	CK20240048EA	23 June 2025
3) Programmable Attenuator	PA5	2755	EF-0040-23	1 October 2024
4) 6.5 Digit precision multimeter	8846A	9610014	CB20230200EA	15 November 2024
5) Pressure humidity and Temperature Transmitter	PTU301	L3950483	CL1-P240023	24 March 2025
6) Pressure humidity and Temperature Transmitter	PTU301	L3950484	CL1-P240030	11 April 2025
7) Performance Audio Analyzer	U8903B	MY56510003	CB20240035EB	13 February 2025
			CK20230072EA	13 September 2024

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

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

Reference standards instrument for Acoustic function

- National Institute of Metrology (Thailand)

Reference standards instrument for Electrical function

- National Institute of Metrology (Thailand)

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

Result of Calibration:-

Function : 1. Indication at the calibration check frequency

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

เอกสารไม่ควบคุม

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F-CAL-005 Ed.1



ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20240324EA

Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone Installed

Measured value (dB)
28.8

2.2 Microphone replaced by the electrical input signal device

Frequency Weighting	Measured value (dB)
A-weighting	28.6
C-weighting	28.4
Z-weighting	34.3

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

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

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
125	0.1	0.1	0.1	±1.0
1000	0.0	0.0	0.0	±0.7
8000	-0.2	-0.2	-0.1	+1.5; -2.5

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
63	-0.1	0.0	0.0	±1.0
125	0.0	0.0	-0.1	±1.0
250	-0.1	0.0	-0.1	±1.0
500	0.0	0.0	-0.1	±1.0
1000	0.0	0.0	0.0	±0.7
2000	0.0	0.0	0.0	±1.0
4000	0.0	0.0	0.0	±1.0
8000	-0.1	0.0	0.0	+1.5; -2.5
16000	0.0	0.0	-0.1	+2.5; -16.0

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F-CAL-005 Ed.1



ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20240324EA

Calibration Report

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

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

5.2 Time weighting at 1 kHz

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

Function : 6. Long-Term Stability

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

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
30	94.0	94.0	0.0	±0.1

Function : 7. Level Linearity on the reference level range

7.1 Level Linearity on the reference level range, Upper

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±0.8
99.0	99.0	0.0	±0.8
104.0	104.0	0.0	±0.8
109.0	109.0	0.0	±0.8
114.0	114.0	0.0	±0.8
119.0	119.0	0.0	±0.8
124.0	124.0	0.0	±0.8
129.0	129.0	0.0	±0.8
134.0	134.0	0.0	±0.8
139.0	139.0	0.0	±0.8

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F-CAL-005 Ed.1



ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20240324EA

Calibration Report

7.2 Level Linearity on the reference level range, Lower

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	54.0	0.0	±0.8
49.0	49.0	0.0	±0.8
44.0	44.1	0.1	±0.8
39.0	39.4	0.4	±0.8

Function : 8. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	200	136.0	0.0	±0.5
	2	118.8	-0.2	+1.0; -1.5
	0.25	109.7	-0.3	+1.0; -3.0
Slow	200	129.5	-0.1	±0.5
	2	109.9	-0.1	+1.0; -3.0
	0.25	100.9	-0.1	+1.0; -3.0

Function : 9. Peak C sound level

Number of cycles in test signal	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Complete cycle	135.4	134.8	-0.6	±2.0
Positive half cycle	134.4	134.0	-0.4	±1.0
Negative half cycle	134.4	134.1	-0.3	±1.0

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F-CAL-005 Ed.1



ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20240324EA

Calibration Report

Function : 10. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limits (dB)
Positive one-half cycle	Negative one-half cycle		
143.6	143.4	-0.2	±1.5

Function : 11. High-Level Stability

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

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
5	139.0	139.0	0.0	±0.1

Uncertainty of measurement

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

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

-- End of Report --

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F-CAL-005 Ed.1



CALIBRATION LABORATORY Co., LTD.

210-11, 14, 65 Soi Praset Muead 24 Yeark 4, Praset Muead Rd., Ladphrao, Bangkok 10010
Tel: 02-578-0333-4 Fax: 02-578-2572 www.cali-lab.com E-mail: info@cali-lab.com



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM11058/UM11058 [UAE.EFM.025/2562]
CLID. NO. : 252000350
JOB CONTROL NO. : 250331038315
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
81 SOI UDOMSUK 41, SUKHUMVIT ROAD,
BANGCHAK, PHRAKHANONG, BANGKOK 10260

DATE OF RECEIVED : 31 March 2025

DATE OF ISSUED : 05 April 2025

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Suwit Phuanbusabong
Calibration Engineer

[Signature]



Approved By : Mongkol Yotsontorn
Authorized Signatory
05 April 2025

This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q25038315

F3-011-05/12-23



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Page 1 of 4



CALIBRATION LABORATORY Co., LTD.

210-11, 14, 65 Soi Praset Muead 24 Yeark 4, Praset Muead Rd., Ladphrao, Bangkok 10010
Tel: 02-578-0333-4 Fax: 02-578-2572 www.cali-lab.com E-mail: info@cali-lab.com



REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM11058/UM11058 [UAE.EFM.025/2562]
DATE OF CALIBRATION : 01 April 2025

ENVIRONMENT CONDITIONS :

Temperature : $(23 \pm 2) ^\circ\text{C}$

Relative Humidity : $(55 \pm 15) \% \text{RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline.

The calibration was performed by using Digital Multimeter, Programmable Timer/Counter, Accelerometer with Measuring Amplifier which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Programmable Timer/Counter, Philips Model PM6680B S/N. SM607101.
2. Digital Multimeter, Keysight Technologies Model 3458A S/N. MY59352733.
3. Accelerometer with Measuring Amplifier, Bruel & Kjaer Model 8305, 2625 S/N. 397018, 2434988.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0050/24, Due Date 13 May 2025.
2. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. EE-0060-24, Due Date 26 June 2025.
3. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0056-24, Due Date 14 December 2025.

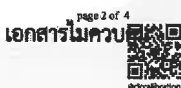
UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2.00$ which for a normal distribution corresponds to a coverage probability of approximately 95 %.

It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

Certificate No. Q25038315

F3-011-05/12-23



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Page 2 of 4



CALIBRATION LABORATORY Co., LTD.

210-11, 14, 65 Soi Praset Muead 24 Yeark 4, Praset Muead Rd., Ladphrao, Bangkok 10010
Tel: 02-578-0333-4 Fax: 02-578-2572 www.cali-lab.com E-mail: info@cali-lab.com



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

1. ACCELERATION RESULT

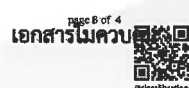
Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(g)	(frequency)		(g)	(g)	(g)	\pm (% of rdg.)
0.3	50 Hz	peak	0.300	0.295	+0.005	1.9
0.4	50 Hz		0.400	0.394	+0.006	1.3
0.5	50 Hz		0.500	0.492	+0.008	1.3
0.6	50 Hz		0.600	0.591	+0.009	2.5
0.7	50 Hz		0.700	0.689	+0.011	2.5
0.3	100 Hz	peak	0.300	0.294	+0.006	1.9
0.4	100 Hz		0.400	0.393	+0.007	1.3
0.5	100 Hz		0.500	0.493	+0.007	1.3
0.6	100 Hz		0.600	0.592	+0.008	2.5
0.7	100 Hz		0.700	0.690	+0.010	2.5

2. VELOCITY RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(mm/s)	(frequency)		(mm/s)	(mm/s)	(mm/s)	\pm (% of rdg.)
3	50 Hz	peak	3.000	2.983	+0.017	1.8
4	50 Hz		4.000	3.976	+0.024	1.8
5	50 Hz		5.000	4.955	+0.045	1.8
6	50 Hz		6.000	5.929	+0.071	1.8
7	50 Hz		7.000	6.918	+0.082	1.8
3	100 Hz	peak	3.000	2.978	+0.022	2.7
4	100 Hz		4.000	3.962	+0.038	1.3
5	100 Hz		5.000	4.951	+0.049	1.3
6	100 Hz		6.000	5.922	+0.078	1.0
7	100 Hz		7.000	6.911	+0.089	1.0

Certificate No. Q25038315

F3-011-05/12-23



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Page 6 of 4



CALIBRATION LABORATORY CO., LTD.

210-11 16, 55 Soi Prasad Manulit 21 Yek 4, Praset Manulit Rd., Lardbhai, Bangkok 10220
Tel: 02-579-0955-6 Fax: 02-578-2072 www.cal-lab.co.th E-mail: info@cal-lab.co.th



CALIBRATION DATA

3. DISPLACEMENT RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(mm)	(frequency)		(mm)	(mm)	(mm)	± (% of rdg.)
0.03	50 Hz	peak	0.030	0.030	0.000	2.1
0.04	50 Hz		0.040	0.040	0.000	1.7
0.05	50 Hz		0.050	0.050	0.000	1.4
0.06	50 Hz		0.060	0.060	0.000	1.3
0.07	50 Hz		0.070	0.069	+0.001	1.1
0.03	100 Hz	peak	0.030	0.030	0.000	2.1
0.04	100 Hz		0.040	0.040	0.000	1.7
0.05	100 Hz		0.050	0.050	0.000	1.4
0.06	100 Hz		0.060	0.059	+0.001	1.3
0.07	100 Hz		0.070	0.069	+0.001	1.1

Note: The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 015 Page 1,2 of 68

This report is valid for the above stated instrument/s only.

End of Certificate

Certificate No. Q25038315
F3-011-05/12-23

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id:calibration



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.: 24CH40
Page: 1 of 3

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Horiba
Model : LAQUA-PH210
Serial No. : HA8M0046
ID No. : UAE.EFM.001/2583(EFM, pH 0.1/63)
Condition As-Received : Used item
Received Date : 09 January 2024
Calibration Date : 10 January 2024
Reference : 2401-0219WSC-3
Submitted by : United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udumak 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260
Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In-house method :
- CP-CH5 by direct measurement with standard
voltage calibrator and direct measurement with
certified reference material (CRM)
- CP-CH8 by comparison with standard thermometer

Calibrated by : Warakorn Lemgagrakul

Approved by :
Approved Signatory

(✓) Sathip Meangmal
() Warakorn Lemgagrakul
() Ponpan Paipim

Issue Date : 15 January 2024

The Uncertainties are for a confidence probability of approximately 95%

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

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Cert.No.: 24CH40
Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument :-

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030049	130RC116	23E2802	27 Aug 2024
2) Ref. Standard Thermometer	4982054	110RC044	23I808	26 July 2024

This certification is traceable to the International System of Unit maintained through:-
- Technology Promotion Association (Thailand-Japan)

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

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	940102	27 Nov 2025
pH 6.986	CPA chem	831859	01 Oct 2024
pH 9.997	CPA chem	940106	02 Nov 2024

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

Calibration Results

Function : mV Measurement

Performing standard curve by Fluke at pH (4.7)(7.10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (mV)	Coverage factor k
	pH	mV	mV	pH		
pH Meter S/N.: HA8M0046	4.00	177.48	177.5	4.01	0.058	2.00
	7.00	0.00	0.2	7.00	0.058	2.00
	7.00	0.00	0.2	7.00	0.058	2.00
	10.00	-177.48	-177.0	10.01	0.058	2.00



Cert.No.: 24CH40
Page.: 3 of 3

Calibration Results

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4.7)(7.10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement (±)	Coverage factor k
pH Electrode S/N.: -	4.008	4.01	171.9	0.0079	2.00
	6.986	6.99	-2.2	0.0093	2.00
	6.986	6.98	-3.6	0.0093	2.00
	9.997	10.01	-171.0	0.011	2.07

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : -
- Serial No. : -
Dimension of probe;
- Length : 103 mm
- Diameter : 16 mm
- Immersion Depth : 90 mm

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor k
25.0	25.002	25.0	-0.002	0.13	2.00
30.0	30.002	30.0	-0.002	0.13	2.00
35.0	35.003	35.0	-0.003	0.13	2.00

Remark : - UUC* = Unit Under Calibration

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

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Cert. No.: 24H753
Page: 2 of 2

Result of Calibration:- Without Adjustment
Function: Humidity Measurement.

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Error (%R.H.)	Uncertainty of Measurement (±%R.H.)
25.0	40.1	43	2.9	1.6
25.0	60.0	60	0.0	1.7
25.0	80.0	78	-2.0	1.8

Result of Calibration:- Without Adjustment
Function: Temperature Measurement.

Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (±°C)
20.014	20.0	-0.014	0.72
25.033	25.0	-0.033	0.72
30.010	30.0	-0.010	0.72
35.027	34.5	-0.527	0.72
40.013	39.5	-0.513	0.72

UUC* : Unit Under Calibration

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

-00-

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

Certificate of Calibration

Certificate No.: 24P1251
Page: 1 of 2

Equipment : U Tube Manometer
Manufacturer : Dwyer
Model : 1221-36-WM
Serial No. : -

ID No.: UAE.EFM.077/2566

Condition As-Received: Used Item

Received Date: 03 April 2024

Calibration Date: 11 April 2024

Reference: 2404-0118WSC

Ambient Temperature: (23 ± 2) °C

Relative Humidity: (50 ± 15) %

Atmospheric Pressure: 1012 mbar

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

81 Soi Udomsuk 41, Sukhumvit Road, Bangkok,

Phrakhanong, Bangkok 10260

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to calibration procedure CP-P04, using " DKD-R 6-1 : Calibration of Pressure Gauges " as a guidelines.

Condition of this result of calibration

1.Reference standards Instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Pressure Calibrator	PC106P	1189	MP-0176-23	12 Sep 2024

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

3.Scale and conversion factor is 1 kPa = 4.0146293 inH₂O

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

5.This instrument was calibrated by applied pressure to high-port (+) side and low-port (-) side open to atmospheric pressure.

6.This instrument was installed in vertical orientation and top of the pressure port was used as the reference level.

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

8.This Certification is traceable to the International System of Unit maintained through:-

-National Institute of Metrology (Thailand), NSG-ONSC Accredited No. Calibration 0144

Calibrated by : Suksan Khankaew

Issue Date : 17 April 2024

Approved Signatory :

[] Phalinee Prabpaipal

[] Sura Suwannasri

[✓] Atapol Panurach

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Cert.No.: 24P1251
Page: 2 of 2

Result of calibration:- Without adjustment

Function:- Pressure Measurement

Increasing Pressure

Range: 0 inH₂O to 36 inH₂O

Scale Interval: 0.1 inH₂O (The Second Estimate)

Applied Pressure	High-port side	UUC Indication Low-port side	ΔP	Error
0.00	0.00	0.00	0.00	0.00
2.00	1.00	-1.00	2.00	0.00
4.00	2.00	-2.00	4.00	0.00
6.00	3.00	-3.00	6.00	0.00
8.00	4.00	-4.00	8.00	0.00
10.00	5.00	-5.00	10.00	0.00
12.00	6.00	-6.00	12.00	0.00
14.00	7.00	-7.00	14.00	0.10
16.00	8.00	-8.00	16.00	0.10
18.00	9.00	-9.00	18.00	0.10
20.00	10.00	-10.00	20.00	0.10
22.00	11.00	-11.00	22.00	0.10
24.00	12.00	-12.00	24.00	0.10
26.00	13.00	-13.00	26.00	0.10
28.00	14.00	-14.00	28.00	0.10
30.00	15.00	-15.00	30.00	0.10
32.00	16.00	-16.00	32.00	0.15
34.00	17.00	-17.00	34.00	0.15
35.80	18.00	-18.00	38.00	0.20

The uncertainty of measurement was ± 0.11 inH₂O

* ΔP = High-port side - Low-port side

* UUC = Unit Under Calibration

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

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

Certificate of Calibration

Certificate No.: 24P1367
Page: 1 of 2

Equipment : Aneroid Barometer
Manufacturer : Barigo
Model : -

Serial No.: -

ID No.: UAE.ANV.152/2550

Condition As-Received: Used Item

Received Date: 05 April 2024

Calibration Date: 08 April 2024

Reference: 2404-0243WSC

Ambient Temperature: (23 ± 2) °C

Relative Humidity: (50 ± 15) %

Atmospheric Pressure: 1007 mbar

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

81 Soi Udomsuk 41, Sukhumvit Road, Bangkok,

Phrakhanong, Bangkok 10260

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

Condition of this result of calibration

1.Reference standards Instruments :

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

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

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

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

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

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

7.This Certification is traceable to the International System of Unit maintained through:-

-National Institute of Metrology (Thailand) (NIMT)

Calibrated by : Suksan Khankaew

Issue Date : 23 April 2024

Approved Signatory :

[] Phalinee Prabpaipal

[] Sura Suwannasri

[✓] Atapol Panurach

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Cert.No.: 24P1367
Page: 2 of 2

Result of calibration:- Without adjustment
Function:- Absolute Pressure Measurement
Range: 980 hPa to 1030 hPa
Scale Interval: 1 hPa (The Fifth Estimate)

Increasing Pressure								
Applied Pressure (hPa)	957.13	968.77	980.13	990.56	1001.26	1011.35	1022.10	1032.61
UUC* Indication (hPa)	960.0	970.0	980.0	990.0	1000.0	1010.0	1020.0	1030.0
Error (hPa)	2.87	1.23	-0.13	-0.56	-1.26	-1.35	-2.10	-2.61

Decreasing Pressure								
Applied Pressure (hPa)	1032.61	1021.84	1010.88	1000.82	990.20	979.52	968.48	957.17
UUC* Indication (hPa)	1030.0	1020.0	1010.0	1000.0	990.0	980.0	970.0	960.0
Error (hPa)	-2.61	-1.84	-0.88	-0.82	-0.20	0.48	1.52	2.83

The uncertainty of measurement was ± 0.25 hPa
* UUC = Unit Under Calibration
The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95 %.

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CERTIFICATE OF CALIBRATION

Certificate No.: CCF-492-04

Page 2 of 2 Page

MEASUREMENT ITEM: Tag Load Office
MANUFACTURER: J. Anderson Instruments
MODEL/TYPE: C25A
SERIAL NUMBER: 13812
ID NUMBER: 1001, ADDRESS 12547
CONDITION AS-RECEIVED: Used item
CUSTOMER: United Analyst and Engineering Consultant Co., Ltd.
61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 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1223, 1224, 1225, 1226, 1227, 1228, 1229, 1230, 1231, 1232, 1233, 1234, 1235, 1236, 1237, 1238, 1239, 1240, 1241, 1242, 1243, 1244, 1245, 1246, 1247, 1248, 1249, 1250, 1251, 1252, 1253, 1254, 1255, 1256, 1257, 1258, 1259, 1260, 1261, 1262, 1263, 1264, 1265, 1266, 1267, 1268, 1269, 1270, 1271, 1272, 1273, 1274, 1275, 1276, 1277, 1278, 1279, 1280, 1281, 1282, 1283, 1284, 1285, 1286, 1287, 1288, 1289, 1290, 1291, 1292, 1293, 1294, 1295, 1296, 1297, 1298, 1299, 1300, 1301, 1302, 1303, 1304, 1305, 1306, 1307, 1308, 1309, 1310, 1311, 1312, 1313, 1314, 1315, 1316, 1317, 1318, 1319, 1320, 1321, 1322, 1323, 1324, 1325, 1326, 1327, 1328, 1329, 1330, 1331, 1332, 1333, 1334, 1335, 1336, 1337, 1338, 1339, 1340, 1341, 1342, 1343, 1344, 1345, 1346, 1347, 1348, 1349, 1350, 1351, 1352, 1353, 1354, 1355, 1356, 1357, 1358, 1359, 1360, 1361, 1362, 1363, 1364, 1365, 1366, 1367, 1368, 1369, 1370, 1371, 1372, 1373, 1374, 1375, 1376, 1377, 1378, 1379, 1380, 1381, 1382, 1383, 1384, 1385, 1386, 1387, 1388, 1389, 1390, 1391, 1392, 1393, 1394, 1395, 1396, 1397, 1398, 1399, 1400, 1401, 1402, 1403, 1404, 1405, 1406, 1407, 1408, 1409, 1410, 1411, 1412, 1413, 1414, 1415, 1416, 1417, 1418, 1419, 1420, 1421, 1422, 1423, 1424, 1425, 1426, 1427, 1428, 1429, 1430, 1431, 1432, 1433, 1434, 1435, 1436, 1437, 1438, 1439, 1440, 1441, 1442, 1443, 1444, 1445, 1446, 1447, 1448, 1449, 1450, 1451, 1452, 1453, 1454, 1455, 1456, 1457, 1458, 1459, 1460, 1461, 1462, 1463, 1464, 1465, 1466, 1467, 1468, 1469, 1470, 1471, 1472, 1473, 1474, 1475, 1476, 1477, 1478, 1479, 1480, 1481, 1482, 1483, 1484, 1485, 1486, 1487, 1488, 1489, 1490, 1491, 1492, 1493, 1494, 1495, 1496, 1497, 1498, 1499, 1500, 1501, 1502, 1503, 1504, 1505, 1506, 1507, 1508, 1509, 1510, 1511, 1512, 1513, 1514, 1515, 1516, 1517, 1518, 1519, 1520, 1521, 1522, 1523, 1524, 1525, 1526, 1527, 1528, 1529, 1530, 1531, 1532, 1533, 1534, 1535, 1536, 1537, 1538, 1539, 1540, 1541, 1542, 1543, 1544, 1545, 1546, 1547, 1548, 1549, 1550, 1551, 1552, 1553, 1554, 1555, 1556, 1557, 1558, 1559, 1560, 1561, 1562, 1563, 1564, 1565, 1566, 1567, 1568, 1569, 1570, 1571, 1572, 1573, 1574, 1575, 1576, 1577, 1578, 1579, 1580, 1581, 1582, 1583, 1584, 1585, 1586, 1587, 1588, 1589, 1590, 1591, 1592, 1593, 1594, 1595, 1596, 1597, 1598, 1599, 1600, 1601, 1602, 1603, 1604, 1605, 1606, 1607, 1608, 1609, 1610, 1611, 1612, 1613, 1614, 1615, 1616, 1617, 1618, 1619, 1620, 1621, 1622, 1623, 1624, 1625, 1626, 1627, 1628, 1629, 1630, 1631, 1632, 1633, 1634, 1635, 1636, 1637, 1638, 1639, 1640, 1641, 1642, 1643, 1644, 1645, 1646, 1647, 1648, 1649, 1650, 1651, 1652, 1653, 1654, 1655, 1656, 1657, 1658, 1659, 1660, 1661, 1662, 1663, 1664, 1665, 1666, 1667, 1668, 1669, 1670, 1671, 1672, 1673, 1674, 1675, 1676, 1677, 1678, 1679, 1680, 1681, 1682, 1683, 1684, 1685, 1686, 1687, 1688, 1689, 1690, 1691, 1692, 1693, 1694, 1695, 1696, 1697, 1698, 1699, 1700, 1701, 1702, 1703, 1704, 1705, 1706, 1707, 1708, 1709, 1710, 1711, 1712, 1713, 1714, 1715, 1716, 1717, 1718, 1719, 1720, 1721, 1722, 1723, 1724, 1725, 1726, 1727, 1728, 1729, 1730, 1731, 1732, 1733, 1734, 1735, 1736, 1737, 1738, 1739, 1740, 1741, 1742, 1743, 1744, 1745, 1746, 1747, 1748, 1749, 1750, 1751, 1752, 1753, 1754, 1755, 1756, 1757, 1758, 1759, 1760, 1761, 1762, 1763, 1764, 1765, 1766, 1767, 1768, 1769, 1770, 1771, 1772, 1773, 1774, 1775, 1776, 1777, 1778, 1779, 1780, 1781, 1782, 1783, 1784, 1785, 1786, 1787, 1788, 1789, 1790, 1791, 1792, 1793, 1794, 1795, 1796, 1797, 1798, 1799, 1800, 1801, 1802, 1803, 1804, 1805, 1806, 1807, 1808, 1809, 1810, 1811, 1812, 1813, 1814, 1815, 1816, 1817, 1818, 1819, 1820, 1821, 1822, 1823, 1824, 1825, 1826, 1827, 1828, 1829, 1830, 1831, 1832, 1833, 1834, 1835, 1836, 1837, 1838, 1839, 1840, 1841, 1842, 1843, 1844, 1845, 1846, 1847, 1848, 1849, 1850, 1851, 1852, 1853, 1854, 1855, 1856, 1857, 1858, 1859, 1860, 1861, 1862, 1863, 1864, 1865, 1866, 1867, 1868, 1869, 1870, 1871, 1872, 1873, 1874, 1875, 1876, 1877, 1878, 1879, 1880, 1881, 1882, 1883, 1884, 1885, 1886, 1887, 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1896, 1897, 1898, 1899, 1900, 1901, 1902, 1903, 1904, 1905, 1906, 1907, 1908, 1909, 1910, 1911, 1912, 1913, 1914, 1915, 1916, 1917, 1918, 1919, 1920, 1921, 1922, 1923, 1924, 1925, 1926, 1927, 1928, 1929, 1930, 1931, 1932, 1933, 1934, 1935, 1936, 1937, 1938, 1939, 1940, 1941, 1942, 1943, 1944, 1945, 1946, 1947, 1948, 1949, 1950, 1951, 1952, 1953, 1954, 1955, 1956, 1957, 1958, 1959, 1960, 1961, 1962, 1963, 1964, 1965, 1966, 1967, 1968, 1969, 1970, 1971, 1972, 1973, 1974, 1975, 1976, 1977, 1978, 1979, 1980, 1981, 1982, 1983, 1984, 1985, 1986, 1987, 1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 205



Certificate No.: CP20240324EA

Calibration Report

Equipment: Sound Level Meter
Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)
Model/Type: LX71 (Meter), 377802 (Microphone), PRLM-LT1 (Preamplifier)
Serial No.: 0007302 (Meter), 344896 (Microphone), 0776637 (Preamplifier)
ID No.: UAE.EFM.035/2566
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Pressure: (101.3 ± 1.5) kPa

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

Condition of this result of calibration

1. Reference standards instrument :-

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

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

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

Reference standards instrument for Acoustic function

- National Institute of Metrology (Thailand)

Reference standards instrument for Electrical function

- National Institute of Metrology (Thailand)

- Electrical and Electronics Institute; NSC Accredited Calibration No.0119

Result of Calibration:-

Function : 1. Indication at the calibration check frequency

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

เอกสารไม่ควบคุม



Certificate No.: CP20240324EA

Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone Installed

Measured value (dB)
26.8

2.2 Microphone replaced by the electrical input signal device

Frequency Weighting	Measured value (dB)
A-weighting	26.6
C-weighting	26.4
Z-weighting	34.3

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

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

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance Limits (dB)
125	0.1	0.1	0.1	±1.0
1000	0.0	0.0	0.0	±0.7
8000	-0.2	-0.2	-0.1	+1.5; -2.5

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
63	-0.1	0.0	0.0	±1.0
125	0.0	0.0	-0.1	±1.0
250	-0.1	0.0	-0.1	±1.0
500	0.0	0.0	-0.1	±1.0
1000	0.0	0.0	0.0	±0.7
2000	0.0	0.0	0.0	±1.0
4000	0.0	0.0	0.0	±1.0
8000	-0.1	0.0	0.0	+1.5; -2.5
16000	0.0	0.0	-0.1	+2.5; -16.0

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Certificate No.: CP20240324EA

Calibration Report

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

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

5.2 Time weighting at 1 kHz

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

Function : 6. Long-Term Stability

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

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
30	94.0	94.0	0.0	±0.1

Function : 7. Level Linearity on the reference level range

7.1 Level Linearity on the reference level range, Upper

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±0.8
99.0	99.0	0.0	±0.8
104.0	104.0	0.0	±0.8
109.0	109.0	0.0	±0.8
114.0	114.0	0.0	±0.8
119.0	119.0	0.0	±0.8
124.0	124.0	0.0	±0.8
129.0	129.0	0.0	±0.8
134.0	134.0	0.0	±0.8
139.0	139.0	0.0	±0.8

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Certificate No.: CP20240324EA

Calibration Report

7.2 Level Linearity on the reference level range, Lower

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	54.0	0.0	±0.8
49.0	49.0	0.0	±0.8
44.0	44.1	0.1	±0.8
39.0	39.4	0.4	±0.8

Function : 8. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	200	136.0	0.0	±0.5
	2	118.8	-0.2	+1.0; -1.5
	0.25	109.7	-0.3	+1.0; -3.0
Slow	200	129.5	-0.1	±0.5
	2	109.9	-0.1	+1.0; -3.0
	0.25	130.0	0.0	±0.5
LAE	200	110.0	0.0	+1.0; -1.5
	0.25	100.9	-0.1	+1.0; -3.0

Function : 9. Peak C sound level

Number of cycles in test signal	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Complete cycle	135.4	134.8	-0.6	±2.0
Positive half cycle	134.4	134.0	-0.4	±1.0
Negative half cycle	134.4	134.1	-0.3	±1.0

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CALIBRATION LABORATORY CO., LTD.

100/1 Sukhumvit Road, 11th Floor, Sukhumvit 11, Bangkok 10110, Thailand
Tel: 02-2717-3000-29 Fax: 02-2719-9484



CALIBRATION DATA

5. DISPLACEMENT RESULT

Item No.	Instrument	Model	Serial No.	Lot No.	Calibration Date	Due Date
1	Displacement Meter	Model 1	10000	10000	2024	2025
2	Displacement Meter	Model 1	10000	10000	2024	2025
3	Displacement Meter	Model 1	10000	10000	2024	2025
4	Displacement Meter	Model 1	10000	10000	2024	2025
5	Displacement Meter	Model 1	10000	10000	2024	2025
6	Displacement Meter	Model 1	10000	10000	2024	2025
7	Displacement Meter	Model 1	10000	10000	2024	2025
8	Displacement Meter	Model 1	10000	10000	2024	2025
9	Displacement Meter	Model 1	10000	10000	2024	2025
10	Displacement Meter	Model 1	10000	10000	2024	2025

1. This report is valid for the above stated instruments only.

2. This report is valid for the above stated instruments only.

This report is valid for the above stated instruments only.

*** End of Certificate ***

Certificate No. 24CH40

Page: 1 of 3



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
3344 PATTANAKARN ROAD SOI 18, SUANLIANG, SUANLIANG BANGKOK 10250
TEL: 0-2717-3000-29 FAX: 0-2719-9484



Cert.No.: 24CH40
Page: 1 of 3

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Horiba
Model : LAQUA-PH210
Serial No. : HA9M0046
ID No. : UAE.EFM.001/2563(EFM, pH.01/63)
Condition As-Received: Used Item
Received Date : 09 January 2024
Calibration Date : 10 January 2024
Reference : 2401-0219WSC-3
Submitted by : United Analyst and Engineering Consultant Co., Ltd.
3 Soli Udomak 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260

Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In-house method :
- CP-CH5 by direct measurement with standard voltage calibrator and direct measurement with certified reference material (CRM)
- CP-CH8 by comparison with standard thermometer

Calibrated by : Wansorn Lemgagrakul

Approved by :
Approved Signatory

(✓) Sathip Meangmal
() Wansorn Lemgagrakul
() Ponpan Palpin

Issue Date : 15 January 2024

The Uncertainties are for a confidence probability of approximately 95 %

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

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Cert.No.: 24CH40
Page: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030049	130RC115	23E2802	27 Aug 2024
2) Ref. Standard Thermometer	4982054	110RC044	23J908	26 July 2024

This certification is traceable to the International System of Units maintained through:-
- Technology Promotion Association (Thailand-Japan)

2. Certified Reference Materials : The measurement results are traceable to SI through CPA chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. AR-1935

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	940102	27 Nov 2025
pH 6.868	CPA chem	931969	01 Oct 2024
pH 9.997	CPA chem	940106	02 Nov 2024

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

Calibration Results

Function : mV Measurement

Performing standard curve by Fluke at pH (4,7)(7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement	Coverage factor
	pH	mV	mV	pH	(\pm mV)	k
pH Meter	4.00	177.48	177.5	4.01	0.058	2.00
S.N.: HA9M0046	7.00	0.00	0.2	7.00	0.058	2.00
	7.00	0.00	0.2	7.00	0.058	2.00
	10.00	-177.48	-177.0	10.01	0.058	2.00



Cert.No.: 24CH40
Page: 3 of 3

Calibration Results

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4,7)(7,10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement (±)	Coverage factor k
pH Electrode	4.008	4.01	171.9	0.0079	2.00
S/N.: -	6.868	6.99	-2.2	0.0093	2.00
	6.868	6.99	-3.6	0.0093	2.00
	9.997	10.01	-171.0	0.011	2.07

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model :
- Serial No. :
- Dimension of probe :
- Length : 103 mm
- Diameter : 16 mm
- Immersion Depth : 90 mm

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor k
25.0	25.002	25.0	-0.002	0.13	2.00
30.0	30.002	30.0	-0.002	0.13	2.00
35.0	35.003	35.0	-0.003	0.13	2.00

Remark : - UUC* = Unit Under Calibration

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

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Certificate of Calibration

Customer: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Certificate No.: 24H753
Request No.: Req. 2024-1594

Address: 81 Soi Udomsuk 41, Sukhumvit Road, Bangkok 10250, Thailand

Unit Under Calibration Details

Maximum Size: 100mm x 100mm x 100mm
Material: 304 Stainless Steel
Weight: 111.20g
Serial No.: 10000000000000000000
Model: 10000000000000000000
Reference: 10000000000000000000
Lot: 10000000000000000000

Calibration Environment and Details

Temperature: $(23 \pm 0.1)^\circ\text{C}$
Humidity: $(50 \pm 2)\%\text{RH}$
Barometric Pressure: $(1013.25 \pm 0.05)\text{hPa}$
Performed Date: 24 June 2024
Calibration Date: 24 June 2024
Limiting of Calibration: 1.50 % Absolute

Calibration Procedure: 1. Reference standard (NIST 402) used for the calibration.

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Sound Pressure Level	SV 25A	SV 25A	Yes	12 June 2025
100 Multiplier	1000	10000000000000000000	Yes	10 January 2025

Traceability: This certificate is a statement of conformity of measurement to recognized standards and is not a statement of the accuracy of the unit under calibration.

Note

The performance of the unit under calibration is not guaranteed for use outside the calibration environment and conditions.

Calibrated By: Mr. Chakrit Waeuwwanja
Approved By: Mr. Chakrit Waeuwwanja
Issue Date: 24 June 2024

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Certificate of Calibration

Certificate No.: 24H753

Request No.: Req. 2024-1594

Sound pressure level		Calibration Results: 100 Multiplier			
Calibration Range (dB)	Without Adjustment Measured	Adjusted Value	Uncertainty (dB)	Acceptance time	Result
114.00 - 114.02	114.00	114.00	0.01	0.01	Pass
114.02 - 114.04	114.02	114.02	0.01	0.01	Pass

Frequency of Sound pressure level		Calibration Results: 100 Multiplier			
Calibration Range (Hz)	Without Adjustment Measured (Hz)	Adjusted Value	Uncertainty (Hz)	Acceptance time	Result
94.00 - 100.00	94.00	94.00	0.01	0.01	Pass
100.00 - 110.00	100.00	100.00	0.01	0.01	Pass

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

Calibration Range (Hz)	Without Adjustment Measured (%)	Adjusted Value	Uncertainty (%)	Acceptance time	Result
94.00 - 100.00	0.04	0.04	0.01	0.01	Pass
100.00 - 110.00	0.04	0.04	0.01	0.01	Pass

Note

Function	Maximum permitted Uncertainty of measurement
Sound pressure level	0.15 dB
Frequency	0.2 Hz
Total Harmonic Distortion plus Noise	0.05 %

The performance of the unit under calibration is not guaranteed for use outside the calibration environment and conditions.

The performance of the unit under calibration is not guaranteed for use outside the calibration environment and conditions.

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Certificate of Calibration

Certificate No.: 24H753

Request No.: Req. 2024-1594

Revision Rule for Statements of Conformity

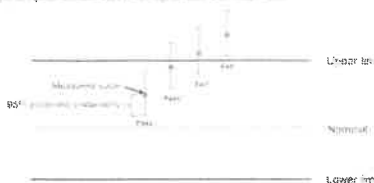
The revised statements of conformity shall be issued only if the unit under calibration is found to be in conformity with the requirements of the standard.

Pass: The unit under calibration is found to be in conformity with the requirements of the standard.

Fail: The unit under calibration is found to be not in conformity with the requirements of the standard.

Re-test: The unit under calibration is found to be not in conformity with the requirements of the standard, but it is found to be in conformity with the requirements of the standard after re-testing.

Retest: The unit under calibration is found to be not in conformity with the requirements of the standard, but it is found to be in conformity with the requirements of the standard after re-testing.



End of Calibration

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Certificate of Calibration

Certificate No.: 24H753

Page: 1 of 2

Equipment: Dial Thermo-Hygrometer

Manufacturer: Barigo

Model: -

Serial No.: -

ID No.: UAE.ANV.127/2550

Condition As-Received: Used item

Received Date: 05 April 2024

Calibration Date: 10 April 2024

Reference: 2404-0247WSC

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

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

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

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

81 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10250

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

Condition of this result of calibration

- Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Chilled Mirror Hygrometer	Dew Master	44730	21656	02 Aug 2024
2) Handheld Thermometer With Sensor	1521	ASA339	231238	16 Oct 2024
- The certificate is valid only to the item calibrated on date and place of calibration.
- This Certification is traceable to the International System of Unit maintained through:
 - Thunder Scientific Corporation, NVLAB Accreditation No. Calibration 200592-0
 - Technology Promotion Association (Thailand-Japan), NSQ-ONSC Accredited No. Calibration 0008

Calibrated by: Chakrit Waeuwwanja

Issue Date: 18 April 2024

Approved Signatory:

[] Chakrit Waeuwwanja

[x] Viporn Tanliyawatt

[] Unnopphol Harachai

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Cert. No.: 24H753
Page: 2 of 2

Result of Calibration:-

Without Adjustment
Function: Humidity Measurement.

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Error (%R.H.)	Uncertainty of Measurement (%R.H.)
25.0	40.1	43	2.9	1.6
25.0	60.0	60	0.0	1.7
25.0	80.0	78	-2.0	1.8

Result of Calibration:-

Without Adjustment
Function: Temperature Measurement.

Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (°C)
20.014	20.0	-0.014	0.72
25.033	25.0	-0.033	0.72
30.010	30.0	-0.010	0.72
35.027	34.5	-0.527	0.72
40.013	39.5	-0.513	0.72

UUC* : Unit Under Calibration

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

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

Certificate of Calibration

Certificate No.: 24P1251
Page: 1 of 2

Equipment : U Tube Manometer
Manufacturer: Dwyer
Model : 1221-36-W/M
Serial No.:
ID No.: UAE.EFM.077/2565
Condition As-Received: Used Item
Received Date: 03 April 2024
Calibration Date: 11 April 2024

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.

Reference: 2404-0118WSC Submitted by: United Analyst and Engineering Consultant Co., Ltd.
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Atmospheric Pressure: 1012 mbar
81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to calibration procedure CP-P04, using " DKD-R 6-1 : Calibration of Pressure Gauges " as a guidelines.

Condition of this result of calibration

1. Reference standards Instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Pressure Calibrator	PC106P	1189	MP-0176-23	12 Sep 2024
2. This result of calibration was made on requested at the point specified by customer.				
3. Scale and conversion factor is 1 kPa = 4.0146329 inHg				
4. This instrument was used clean air as pressure media.				
5. This instrument was calibrated by applied pressure to high-port (+) side and low-port (-) side open to atmospheric pressure.				
6. This instrument was installed in vertical orientation and top of the pressure port was used as the reference level.				
7. The certificate is valid only to the item calibrated on date and place of calibration.				
8. This Certification is traceable to the International System of Unit maintained through:- - National Institute of Metrology (Thailand), NSG-ONS Accredited No. Calibration 0144				

Calibrated by : Sukkan Khankaew
Issue Date : 17 April 2024

Approved Signatory :

[] Phalinee Prabpai
[] Sura Suwannasri
[✓] Attapol Panurach

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Cert. No.: 24P1251
Page: 2 of 2

Result of calibration:- Without adjustment

Function:- Pressure Measurement
Increasing Pressure

Range: 0 inHg to 36 inHg

Scale Interval: 0.1 inHg (The Second Estimate)

Applied Pressure	High-port side	UUC Indication Low-port side	ΔP	Error
0.00	0.00	0.00	0.00	0.00
2.00	1.00	-1.00	2.00	0.00
4.00	2.00	-2.00	4.00	0.00
6.00	3.00	-3.00	6.00	0.00
8.00	4.00	-4.00	8.00	0.00
10.00	5.00	-5.00	10.00	0.00
12.00	6.00	-6.00	12.00	0.00
14.00	7.05	-7.05	14.10	0.10
16.00	8.05	-8.05	16.10	0.10
18.00	9.05	-9.05	18.10	0.10
20.00	10.05	-10.05	20.10	0.10
22.00	11.05	-11.05	22.10	0.10
24.00	12.05	-12.05	24.10	0.10
26.00	13.05	-13.05	26.10	0.10
28.00	14.05	-14.05	28.10	0.10
30.00	15.05	-15.05	30.10	0.10
32.00	16.05	-16.10	32.15	0.15
34.00	17.05	-17.10	34.15	0.15
36.00	18.00	-18.00	36.00	0.20

The uncertainty of measurement was ± 0.11 inHg

* ΔP = High-port side - Low-port side

* UUC = Unit Under Calibration

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

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

Certificate of Calibration

Certificate No.: 24P1367
Page: 1 of 2

Equipment : Aneroid Barometer
Manufacturer: Barigo
Model :
Serial No.:
ID No.: UAE.ANV.152/2550
Condition As-Received: Used Item
Received Date: 05 April 2024
Calibration Date: 22 April 2024

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.

Reference: 2404-0243WSC Submitted by: United Analyst and Engineering Consultant Co., Ltd.
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Atmospheric Pressure: 1007 mbar
81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260

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

Condition of this result of calibration

1. Reference standards Instruments

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard Barometer	DPI142	1422505048	MP-0094-23	03 May 2024
2. This instrument was installed in vertical orientation and center of the dial was used as the reference level.				
3. This result of calibration was made on requested at the point specified by customer.				
4. This result of calibration instrument was in absolute pressure.				
5. This instrument was used clean air as pressure media.				
6. The certificate is valid only to the item calibrated on date and place of calibration.				
7. This Certification is traceable to the International System of Unit maintained through:- - National Institute of Metrology Thailand (NIMT)				

Calibrated by : Sukkan Khankaew
Issue Date : 23 April 2024

Approved Signatory :

[] Phalinee Prabpai
[] Sura Suwannasri
[✓] Attapol Panurach

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Cert.No.: 24P1357
Page: 2 of 2

Result of calibration: Without adjustment
Function: Absolute Pressure Measurement

Range: 980 hPa to 1030 hPa
Scale Interval: 1 hPa (The Fifth Estimate)

Applied Pressure (hPa)	957.13	968.77	980.13	990.56	1001.20	1011.35	1022.10	1032.61
UUC* Indication (hPa)	960.0	970.0	980.0	990.0	1000.0	1010.0	1020.0	1030.0
Error (hPa)	2.87	1.23	-0.13	-0.56	-1.26	-1.35	-2.10	-2.61

Applied Pressure (hPa)	1032.51	1021.64	1010.88	1000.82	990.20	979.52	968.48	957.17
UUC* Indication (hPa)	1030.0	1020.0	1010.0	1000.0	990.0	980.0	970.0	960.0
Error (hPa)	-2.61	-1.64	-0.88	-0.82	-0.20	0.48	1.52	2.83

The uncertainty of measurement was ± 0.25 hPa

* UUC = Unit Under Calibration

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

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NAC - TISI - TIS 17025
CALIBRATION 0367

CERTIFICATE OF CALIBRATION

Certificate No.: 12CP-093-04

Page 2 of 2

REGISTRATION ITEM

NAME/TYPE

SERIAL NUMBER

ID NUMBER

CONDITION AS-RECEIVED

CUSTOMER

1 Tool Load Office

1 Addition measurement

1 C54

1 B31

1 34.444444444444

1 Used item

1 United Analyst and Engineering Consultant Co., Ltd.

1 61 Soi Udomsuk 41, Sukhumvit Road, Bangkok 10260

1 Borehole 10100

RECEIVED DATE

MEASUREMENT DATE

ISSUE DATE

ENVIRONMENTAL CONDITIONS

Ambient conditions in the laboratory are as follows:

Temperature

Relative humidity

Air pressure

23.0 ± 3.0 °C

55.0 ± 15.0 %RH

1010 ± 10 hPa

CALIBRATION CONDITION

Duration

Measurement

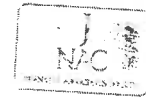
174 hours at ambient conditions

1 The coverage factor during measurement is a 95% level of confidence.

NOTES: The certificate is valid only for the item calibrated in the place of issue.

TABULATION OF RESULTS

The table in next page shall be measured values.



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Continuation of Certificate of Calibration number CDF-002-40

Page 2 of 2 pages

MEASUREMENT RESULTS

The Orion gas flow device was calibrated by direct comparison method with the Standard Primary Displacement Meter (Mass Flow Meter). The Standard flow meter is a medium in the system. The standard conditions are 25°C (77°F) and 1013.25 hPa (29.92 inHg) for standard temperature and standard pressure respectively.

Table 1: Results of (1) Standard calibration data

Flute	Flow rate m ³ /min	Pressure [Pa] mmHg	Temperature [T ₁] °C	Temperature [T ₂] °C	Ap ₁ meter mmHg	Ap ₂ Orifice mmHg	Y	Standard Flow [Q _s] m ³ /min
1	0.761	754.115	23.52	23.10	55.600	1.635	1.275	0.645
2	0.897	754.081	23.25	23.14	61.250	1.710	1.705	0.734
3	1.121	754.055	23.81	23.25	61.250	4.350	3.970	1.167
4	1.172	754.024	23.72	23.15	50.093	4.891	2.368	1.173
5	1.610	753.994	23.36	23.13	29.415	7.155	1.675	1.352

Slope (a): 1.98463

Intercept (b): -0.03618

Correlation coefficient (r): 0.99972

Uncertainty (k=2): 0.015 m³/min

Table 2: Results of (2) actual calibration data

Flute	Flow rate m ³ /min	Pressure [Pa] mmHg	Temperature [T ₁] °C	Temperature [T ₂] °C	Ap ₁ meter mmHg	Ap ₂ Orifice mmHg	Y	Standard Flow [Q _s] m ³ /min
1	0.761	754.115	23.52	23.10	55.600	1.635	0.895	0.653
2	0.897	754.081	23.25	23.14	61.250	1.710	1.123	0.731
3	1.121	754.055	23.81	23.25	61.250	4.350	5.197	1.166
4	1.172	754.024	23.72	23.15	50.093	4.891	2.368	1.176
5	1.610	753.994	23.36	23.13	29.415	7.155	1.675	1.357

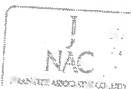
Slope (a): 1.28506

Intercept (b): -0.01809

Correlation coefficient (r): 0.99972

Uncertainty (k=2): 0.015 m³/min

End of Certificate of Calibration



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ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

975 Moo 4, Bangpoo Industrial Estate, Soi 8, Sukhumvit Road km 37,

Phraek Sa, Mueang Samut Prakan, Samut Prakan 10280

Tel: +66 2709 4860 Fax: +66 2324 0917



Certificate No.: CP20240324EA

Operation No.: CP2024080295

Certificate of Calibration

Equipment: Sound Level Meter

Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)

Model/Type: LxT1 (Meter), 377B02 (Microphone), PRLxT1 (Preamplifier)

Serial No.: 0007302 (Meter), 344896 (Microphone), 0776637 (Preamplifier)

ID No.: UAE.FM.035/2566

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

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

Received Date: 9 August 2024

Calibrated Date: 22 - 27 August 2024

Issued Date: 28 August 2024

Calibrated by: Ms. Juntaporn Kunhakorn

Approved by: (Mr. Sittichai Swaksuriyayong)
Group Manager

This report was prepared electronically using applicable electronic signature. Printing or copy of file are considered as a copy of the document.

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor (k) providing a level of confidence of approximately 95%. This certificate may not be reproduced other than in full except with the prior written approval of the Electrical and Electronics Institute, Foundation for Industrial Development.

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F-CAL-004 Ed.1



ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20240324EA

Calibration Report

Equipment: Sound Level Meter
Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)
Model/Type: LX1 (Meter), 377802 (Microphone), PM100T1 (Preamplifier)
Serial No.: 0007302 (Meter), 344896 (Microphone), 0776637 (Preamplifier)
ID No.: UAE.FIN.035/2566
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Pressure: (101.3 ± 1.5) kPa
Method of Calibration :-
IEC 61672-3:2013.
Condition of this result of calibration
1. Reference standards instrument :-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Standard microphone	4180	2787490	AA-1012-23	12 November 2024
2) Arbitrary Function Generator	AFG2021	C010063	CK20240048EA	23 June 2025
3) Programmable Attenuator	PA5	2755	EF-0040-23	1 October 2024
4) 6.5 Digit precision multimeter	8846A	9610014	CB20230200EA	15 November 2024
5) Pressure humidity and Temperature Transmitter	PTU301	L3950483	CL1-P240023	24 March 2025
6) Pressure humidity and Temperature Transmitter	PTU301	L3950484	CL1-P240030	11 April 2025
7) Performance Audio Analyzer	U89038	MY56510003	CB20240035EB	13 February 2025
			CK20230072EA	13 September 2024

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

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

Reference standards instrument for Acoustic function

- National Institute of Metrology (Thailand)

Reference standards instrument for Electrical function

- National Institute of Metrology (Thailand)

- Electrical and Electronics Institute; MSC Accredited Calibration No.0119

Result of Calibration:-

Function : 1. Indication at the calibration check frequency

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

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F-CAL-005 Ed.1



ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20240324EA

Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone Installed

Measured value (dB)
28.8

2.2 Microphone replaced by the electrical input signal device

Frequency Weighting	Measured value (dB)
A-weighting	28.6
C-weighting	28.4
Z-weighting	34.3

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

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

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve				Acceptance limits (dB)
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)		
125	0.1	0.1	0.1		±1.0
1000	0.0	0.0	0.0		±0.7
8000	-0.2	-0.2	-0.1		+1.5; -2.5

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve				Acceptance limits (dB)
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)		
63	-0.1	0.0	0.0		±1.0
125	0.0	0.0	-0.1		±1.0
250	-0.1	0.0	-0.1		±1.0
500	0.0	0.0	-0.1		±1.0
1000	0.0	0.0	0.0		±0.7
2000	0.0	0.0	0.0		±1.0
4000	0.0	0.0	0.0		±1.0
8000	-0.1	0.0	0.0		+1.5; -2.5
15000	0.0	0.0	-0.1		+2.5; -16.0

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F-CAL-005 Ed.1



ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20240324EA

Calibration Report

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

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

5.2 Time weighting at 1 kHz

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

Function : 6. Long-Term Stability

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

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
30	94.0	94.0	0.0	±0.1

Function : 7. Level Linearity on the reference level range

7.1 Level Linearity on the reference level range, Upper

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±0.8
99.0	99.0	0.0	±0.8
104.0	104.0	0.0	±0.8
109.0	109.0	0.0	±0.8
114.0	114.0	0.0	±0.8
119.0	119.0	0.0	±0.8
124.0	124.0	0.0	±0.8
129.0	129.0	0.0	±0.8
134.0	134.0	0.0	±0.8
139.0	139.0	0.0	±0.8

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F-CAL-005 Ed.1



ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20240324EA

Calibration Report

7.2 Level Linearity on the reference level range, Lower

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	54.0	0.0	±0.8
49.0	49.0	0.0	±0.8
44.0	44.1	0.1	±0.8
39.0	39.4	0.4	±0.8

Function : 8. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	200	136.0	0.0	±0.5
	2	118.8	-0.2	+1.0; -1.5
	0.25	109.7	-0.3	+1.0; -3.0
Slow	200	129.5	-0.1	±0.5
	2	109.9	-0.1	+1.0; -3.0
	0.25	100.9	-0.1	+1.0; -3.0

Function : 9. Peak C sound level

Number of cycles in test signal	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Complete cycle	135.4	134.8	-0.6	±2.0
Positive half cycle	134.4	134.0	-0.4	±1.0
Negative half cycle	134.4	134.1	-0.3	±1.0

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F-CAL-005 Ed.1



ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20240324EA

Calibration Report

Function : 10. Overload Indication

Measured value (dB)		Deviated value (dB)	Acceptance limits (dB)
Positive one-half cycle	Negative one-half cycle		
143.6	143.4	-0.2	±1.5

Function : 11. High-Level Stability

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

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
5	139.0	139.0	0.0	±0.1

Uncertainty of measurement

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

- Remarks:
1. Indication at the calibration check frequency can not measured because customer does not provide a sound calibrator.
 2. The acceptance limit is for the deviated value.
 3. Acceptance limits was EC61672-3:2013 Class 1.
 4. The coverage factor $k = 2.00$

-- End of Report --

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F-CAL-005 Ed.1



CALIBRATION LABORATORY CO., LTD.

117/111 หมู่ 10 ต.บ้านใหม่ อ.เมือง จ.นนทบุรี 11000
โทร : 02-010-1234 โทรสาร : 02-010-1234 E-mail : info@cll.co.th

ISO 9001



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A301
SERIAL NO. : UM11355/UM11355 (UAE CFM 002-2500)
C.I.B. NO. : 252006637
JOB CONTROL NO. : 240608059522
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
81 SOI LUDSUK 41, SUKHUMVIT ROAD,
BANGCHAK, PHRAKHAMONG, BANGKOK 10260

DATE OF RECEIVED : 08 June 2024

DATE OF ISSUED : 12 June 2024

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Suwit Phansubasing
Calibration Engineer



Approved By : Mongkol Yotsontorn
Authorized Signatory
12 June 2024

This Calibration Certificate conforms to the traceability to national standards, which is under the control of the company according to the International System of Units (SI).

Certificate No. Q24059622

03-011-05/12-23

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CALIBRATION LABORATORY CO., LTD.

117/111 หมู่ 10 ต.บ้านใหม่ อ.เมือง จ.นนทบุรี 11000
โทร : 02-010-1234 โทรสาร : 02-010-1234 E-mail : info@cll.co.th



REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A301
SERIAL NO. : UM11355/UM11355 (UAE CFM 002-2500)
DATE OF CALIBRATION : 11 June 2024

ENVIRONMENT CONDITIONS :

Temperature : $(23 \pm 2) ^\circ\text{C}$

Relative Humidity : $(65 \pm 15) \% \text{RH}$

PROCEDURE USED :

This instrument was calibrated under conditions No. CLC-CPE-08 based on ISO 10663-21 as calibration guideline.

The calibration was performed by using Digital Multimeter, Programmable Thermostat,

Accelerometer and Measurement Amplifier which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Digital Multimeter, Vector Model 1281 (N, 3 1/2).
2. Programmable Thermostat, Hologic Model 9516005 S1, SA160201.
3. Accelerometer with Measurement Amplifier, Brüel & Kjær Model 8345, 2725 S.N. 39791, 240498.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through Accredited Radiat of Thailand Ltd. Certificate No. 05-0210-23, Due Date 31 July 2025.
2. The measurements are traceable to International System of Units (SI), through Accredited Radiat of Thailand Ltd. Certificate No. 07-0900-24, Due Date 13 May 2025.
3. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV 6072-23, Due Date 29 September 2024.

UNCERTAINTY :

The reported amount of uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2.00$ which is a normal distribution corresponding to a coverage probability of approximately 95%. It has been evaluated according to the Evaluation of the Uncertainty of Measurement in Calibration (GUM:1992, 1995/2000).

Certificate No. Q24059622

03-011-05/12-23

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CALIBRATION LABORATORY CO., LTD.

117/111 หมู่ 10 ต.บ้านใหม่ อ.เมือง จ.นนทบุรี 11000
โทร : 02-010-1234 โทรสาร : 02-010-1234 E-mail : info@cll.co.th

ISO 9001



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

1. ACCELERATION RESULT

Frequency (Hz)	Unit	STD Reading (g)	DUC Reading (g)	Correction (g)	Uncertainty \pm (% of rdg.)
0.5	Peak	0.360	0.215	-0.000	1.0
0.7		0.400	0.207	-0.003	1.0
0.8		0.500	0.476	+0.003	1.0
0.9		0.600	0.584	-0.006	0.8
1.0		0.700	0.693	-0.007	2.4
1.2	Peak	0.700	0.261	+0.001	1.0
0.4		0.400	0.390	-0.001	3.6
0.5		0.500	0.497	-0.003	1.0
0.6		0.600	0.596	-0.004	2.5
0.7		0.700	0.699	-0.001	0.8

2. VELOCITY RESULT

Frequency (Hz)	Unit	STD Reading (mm/s)	DUC Reading (mm/s)	Correction (mm/s)	Uncertainty \pm (% of rdg.)
0.5	gms	3.060	2.012	-0.013	1.8
0.7		4.000	4.000	-0.000	1.8
0.8		5.000	5.000	-0.000	1.8
0.9		6.000	6.000	-0.000	1.8
1.0		7.000	7.000	-0.000	1.8
1.2	Peak	3.000	3.014	-0.014	1.6
0.4		4.000	4.021	-0.021	1.0
0.5		5.000	5.009	-0.009	1.6
0.6		6.000	6.002	-0.002	1.0
0.7		7.000	7.008	-0.008	1.0

Certificate No. Q24059622

03-011-05/12-23

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Cert. No.: 24H753
Page: 2 of 2

Result of Calibration:- Without Adjustment
Function: Humidity Measurement.

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Error (%R.H.)	Uncertainty of Measurement (±%R.H.)
25.0	40.1	43	2.9	1.8
25.0	60.0	60	0.0	1.7
25.0	80.0	78	-2.0	1.8

Result of Calibration:- Without Adjustment
Function: Temperature Measurement.

Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (±°C)
20.014	20.0	-0.014	0.72
25.033	25.0	-0.033	0.72
30.010	30.0	-0.010	0.72
35.027	34.5	-0.527	0.72
40.013	39.5	-0.513	0.72

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

-00-

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

Certificate of Calibration

Certificate No.: 24P1251
Page: 1 of 2

Equipment : U Tube Manometer

Manufacturer: Dwyer

Model : 1221-36-W/M

Serial No.:

ID No.: UAE.EFM.077/2566

Condition As-Received: Used Item

Received Date: 03 April 2024

Calibration Date: 11 April 2024

Reference: 2404-0118WSC

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

Ambient Temperature: (23 ± 2) °C

Relative Humidity: (60 ± 15) %

Atmospheric Pressure: 1012 mbar

81 Soi Udomsuk 41, Sukhumvit Road, Bangkok,

Phrakhanong, Bangkok 10260

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to calibration procedure CP-P04, using " DKD-R 6-1 ; Calibration of Pressure Gauges " as a guidelines.

Condition of this result of calibration

1.Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Pressure Calibrator	PC106P	1189	MP-0178-23	12 Sep 2024

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

3.Scale and conversion factor is 1 kPa = 4.0146283 inH₂O

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

5.This instrument was calibrated by applied pressure to high-port (+) side and low-port (-) side open to atmospheric pressure.

6.This instrument was installed in vertical orientation and top of the pressure port was used as the reference level.

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

8.This Certification is traceable to the International System of Unit maintained through:-

-National Institute of Metrology (Thailand), NCS-ONSAC Accredited No. Calibration 0144

Calibrated by : Suksan Khankaew

Issue Date : 17 April 2024

Approved Signatory :

[] Phalinee Prabpalai

[] Sura Suwanasri

[✓] Atapol Panurach

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Cert.No.: 24P1251
Page: 2 of 2

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

Range: 0 inH₂O to 36 inH₂O

Scale Interval: 0.1 inH₂O (The Second Estimate)

Applied Pressure	High-port side	UUC indication Low-port side	ΔP	Error
0.00	0.00	0.00	0.00	0.00
2.00	1.00	-1.00	2.00	0.00
4.00	2.00	-2.00	4.00	0.00
6.00	3.00	-3.00	6.00	0.00
8.00	4.00	-4.00	8.00	0.00
10.00	5.00	-5.00	10.00	0.00
12.00	6.00	-6.00	12.00	0.00
14.00	7.05	-7.05	14.10	0.10
16.00	8.05	-8.05	16.10	0.10
18.00	9.05	-9.05	18.10	0.10
20.00	10.05	-10.05	20.10	0.10
22.00	11.05	-11.05	22.10	0.10
24.00	12.05	-12.05	24.10	0.10
26.00	13.05	-13.05	26.10	0.10
28.00	14.05	-14.05	28.10	0.10
30.00	15.05	-15.05	30.10	0.10
32.00	16.05	-16.10	32.15	0.15
34.00	17.05	-17.10	34.15	0.15
35.80	18.00	-18.00	36.00	0.20

The uncertainty of measurement was ± 0.11 inH₂O

* ΔP = High-port side - Low-port side

* UUC = Unit Under Calibration

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

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

Certificate of Calibration

Certificate No.: 24P1367
Page: 1 of 2

Equipment : Aneroid Barometer

Manufacturer: Barigo

Model :

Serial No.:

ID No.: UAE.ANV.152/2550

Condition As-Received: Used Item

Received Date: 05 April 2024

Calibration Date: 22 April 2024

Reference: 2404-0243WSC

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

Ambient Temperature: (23 ± 2) °C

Relative Humidity: (60 ± 15) %

Atmospheric Pressure: 1007 mbar

81 Soi Udomsuk 41, Sukhumvit Road, Bangkok,

Phrakhanong, Bangkok 10260

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

Condition of this result of calibration

1.Reference standards instruments

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard Barometer	DP142	1422505046	MP-0094-23	03 May 2024

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

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

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

5.This instrument was used clean air as pressure media

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

7.This Certification is traceable to the International System of Unit maintained through:-

-National Institute of Metrology Thailand (NIMT)

Calibrated by : Suksan Khankaew

Issue Date : 23 April 2024

Approved Signatory :

[] Phalinee Prabpalai

[] Sura Suwanasri

[✓] Atapol Panurach

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Cert.No.: 24P1387
Page: 2 of 2

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

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

Increasing Pressure

Applied Pressure (hPa)	957.13	968.77	980.13	990.56	1001.28	1011.35	1022.10	1032.61
UUC* Indication (hPa)	960.0	970.0	980.0	990.0	1000.0	1010.0	1020.0	1030.0
Error (hPa)	2.87	1.23	-0.13	-0.56	-1.26	-1.35	-2.10	-2.61

Decreasing Pressure

Applied Pressure (hPa)	1032.61	1021.84	1010.88	1000.82	990.20	979.52	968.48	957.17
UUC* Indication (hPa)	1030.0	1020.0	1010.0	1000.0	990.0	980.0	970.0	960.0
Error (hPa)	-2.61	-1.84	-0.88	-0.82	-0.20	0.48	1.52	2.83

The uncertainty of measurement was ± 0.25 hPa

* UUC = Unit Under Calibration

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

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Electronics Institute
Foundation for Industrial Development
975 Moo 4, Bangpoo Industrial Estate, Soi 8, Sukhumvit Road km 37,
Phraek Sa, Mueang Samut Prakan, Samut Prakan 10280
Tel: +66 2709 4860 Fax: +66 2324 0917



NAC - TISI - TIS 17025
CALIBRATION 0367

CERTIFICATE OF CALIBRATION

Certificate No.: CP-002-04

Page 1 of 2 Page

MEASUREMENT ITEM

MANUFACTURER

MODEL/TYPE

SERIAL NUMBER

RO NUMBER

CONDITION AS RECEIVED

CUSTOMER

RECEIVED DATE

MEASUREMENT DATE

ISSUE DATE

ENVIRONMENTAL CONDITIONS:

Atmospheric conditions in the laboratory are as follows:

Temperature: 23.0 ± 0.5 °C

Relative Humidity: 55.0 ± 15.0 %RH

Atmospheric Pressure: 1010 ± 10 hPa

CALIBRATION CONDITION:

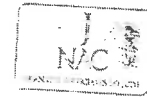
Reference condition

Measurement condition

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

TABULATION OF RESULTS:

The table in next page gives the measured values.



Approved by: _____
Signature of the person responsible for the calibration

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



THANATIP ANANACHAI CO., LTD.

Continuation of Certificate of Calibration number COF-002-04

Page 2 of 2 Page

MEASUREMENT RESULTS:

Y1 = Orifice gas flow device was calibrated by direct comparison method with the Standard Rotary Differential Meter (Blaas Meter). The flow rate was measured in the system. The standard conditions are 25 °C, 1013.25 hPa and 760 mmHg for standard temperature and standard pressure respectively.

Table 1: The results of Q standard calibration data

Plate	Flow rate m ³ /min	Pressure [Pa] mmHg	Temperature [°C]	Temperature [°C]	Ap_meter mmHg	Ap_orifice mmHg	γ	Standard Flow [Qs] m ³ /min
1	0.761	754.115	23.87	23.10	55.600	1.625	1.275	0.645
2	0.997	754.083	23.30	23.21	51.160	1.758	1.705	0.614
3	1.131	754.005	23.11	23.36	41.760	1.878	1.977	0.577
4	1.172	754.004	23.72	23.15	30.833	1.891	2.008	0.517
5	1.410	753.964	23.76	23.18	25.415	2.110	2.671	0.352

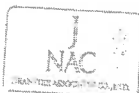
Slope (a): 1.50463
Intercept (b): -0.93658
Correlation coefficient (r): 0.99972
Uncertainty (k=2): 0.015 m³/min

Table 2: The results of Q actual calibration data

Plate	Flow rate m ³ /min	Pressure [Pa] mmHg	Temperature [°C]	Temperature [°C]	Ap_meter mmHg	Ap_orifice mmHg	γ	Standard Flow [Qs] m ³ /min
1	0.761	754.115	23.87	23.10	55.600	1.610	0.806	0.651
2	0.997	754.083	23.30	23.21	51.160	1.750	1.129	0.617
3	1.131	754.005	23.11	23.36	41.760	1.882	1.197	0.565
4	1.172	754.004	23.72	23.15	30.833	1.891	1.368	0.516
5	1.410	753.964	23.76	23.18	25.415	2.110	1.674	0.357

Slope (a): 1.36506
Intercept (b): -0.09009
Correlation coefficient (r): 0.99972
Uncertainty (k=2): 0.015 m³/min

End of Certificate of Calibration



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ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

975 Moo 4, Bangpoo Industrial Estate, Soi 8, Sukhumvit Road km 37,
Phraek Sa, Mueang Samut Prakan, Samut Prakan 10280

Tel: +66 2709 4860 Fax: +66 2324 0917



Certificate No.: CP20240324EA

Operation No.: CP2024080295

Certificate of Calibration

Equipment: Sound Level Meter

Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)

Model/Type: LxT1 (Meter), 377B02 (Microphone), PRMLxT1 (Preamplifier)

Serial No.: 0007302 (Meter), 344896 (Microphone), 0776637 (Preamplifier)

ID No.: UAE.EFM.035/2566

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

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

Received Date: 9 August 2024

Calibrated Date: 22 - 27 August 2024

Issued Date: 28 August 2024

Calibrated by: Ms. Juntaporn Kunhakom

Approved by: _____
(Mr. Sittichai Swaksuriyayong)
Group Manager

This report was prepared electronically using applicable electronic signature. Printing or copy of file are considered as a copy of the document.

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor (k) providing a level of confidence of approximately 95%. This certificate may not be reproduced other than in full except with the prior written approval of the Electrical and Electronics Institute, Foundation for Industrial Development.

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F-CAL-004 Ed.1



ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20240324EA

Calibration Report

Equipment: Sound Level Meter
Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)
Model/Type: LX71 (Meter), 377B02 (Microphone), PRLXL1 (Preamplifier)
Serial No.: 0007302 (Meter), 344896 (Microphone), 0776637 (Preamplifier)
ID No.: UAE EFM.035/2566
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Pressure: (101.3 ± 1.5) kPa

Method of Calibration :-
IEC 61672-3:2015.

Condition of this result of calibration

1. Reference standards instrument :-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Standard microphone	4180	2787490	AA-1012-23	12 November 2024
2) Arbitrary Function Generator	AFG2021	C010063	CK20240048EA	23 June 2025
3) Programmable Attenuator	PA5	2755	EF-0040-23	1 October 2024
4) 6.5 Digit precision multimeter	8846A	9610014	CB20230200EA	15 November 2024
5) Pressure humidity and Temperature Transmitter	PTU301	L3950485	CL1-P240023	24 March 2025
6) Pressure humidity and Temperature Transmitter	PTU301	L3950484	CL1-P240030	11 April 2025
7) Performance Audio Analyzer	U89038	MY56510003	CB20240035EB CK20230072EA	13 February 2025 13 September 2024

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

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

Reference standards instrument for Acoustic function

- National Institute of Metrology (Thailand)

Reference standards instrument for Electrical function

- National Institute of Metrology (Thailand)

- Electrical and Electronics Institute: NSC Accredited Calibration No.0119

Result of Calibration:-

Function : 1. Indication at the calibration check frequency

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

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F-CAL-005 Ed.1



ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20240324EA

Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone installed

Measured value (dB)
28.8

2.2 Microphone replaced by the electrical input signal device

Frequency Weighting	Measured value (dB)
A-weighting	28.6
C-weighting	28.4
Z-weighting	34.3

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

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

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
125	0.1	0.1	0.1	±1.0
1000	0.0	0.0	0.0	±0.7
8000	-0.2	-0.2	-0.1	+1.5; -2.5

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
63	-0.1	0.0	0.0	±1.0
125	0.0	0.0	-0.1	±1.0
250	-0.1	0.0	-0.1	±1.0
500	0.0	0.0	-0.1	±1.0
1000	0.0	0.0	0.0	±0.7
2000	0.0	0.0	0.0	±1.0
4000	0.0	0.0	0.0	±1.0
8000	-0.1	0.0	0.0	+1.5; -2.5
16000	0.0	0.0	-0.1	+2.5; -16.0

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F-CAL-005 Ed.1



ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20240324EA

Calibration Report

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

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

5.2 Time weighting at 1 kHz

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

Function : 6. Long-Term Stability

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

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
30	94.0	94.0	0.0	±0.1

Function : 7. Level Linearity on the reference level range

7.1 Level Linearity on the reference level range, Upper

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±0.8
99.0	99.0	0.0	±0.8
104.0	104.0	0.0	±0.8
109.0	109.0	0.0	±0.8
114.0	114.0	0.0	±0.8
119.0	119.0	0.0	±0.8
124.0	124.0	0.0	±0.8
129.0	129.0	0.0	±0.8
134.0	134.0	0.0	±0.8
139.0	139.0	0.0	±0.8

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F-CAL-005 Ed.1



ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20240324EA

Calibration Report

7.2 Level Linearity on the reference level range, Lower

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	54.0	0.0	±0.8
49.0	49.0	0.0	±0.8
44.0	44.1	0.1	±0.8
39.0	39.4	0.4	±0.8

Function : 8. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	200	136.0	0.0	±0.5
	2	118.8	-0.2	+1.0; -1.5
	0.25	109.7	-0.3	+1.0; -3.0
Slow	200	129.5	-0.1	±0.5
	2	109.9	-0.1	+1.0; -3.0
	200	130.0	0.0	±0.5
LAE	2	110.0	0.0	+1.0; -1.5
	0.25	100.9	-0.1	+1.0; -3.0

Function : 9. Peak C sound level

Number of cycles in test signal	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Complete cycle	135.4	134.8	-0.6	±2.0
Positive half cycle	134.4	134.0	-0.4	±1.0
Negative half cycle	134.4	134.1	-0.3	±1.0

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F-CAL-005 Ed.1

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Cert. No.: 24H753
Page: 2 of 2

Result of Calibration:- Without Adjustment
Function: Humidity Measurement.

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Error (%R.H.)	Uncertainty of Measurement (±%R.H.)
25.0	40.1	43	2.9	1.6
25.0	60.0	60	0.0	1.7
25.0	60.0	78	-2.0	1.8

Result of Calibration:- Without Adjustment
Function: Temperature Measurement.

Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (±°C)
20.014	20.0	-0.014	0.72
25.033	25.0	-0.033	0.72
30.010	30.0	-0.010	0.72
35.027	34.5	-0.527	0.72
40.013	39.5	-0.513	0.72

UUC* : Unit Under Calibration

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

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
53/44 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL. 0-2717-3000-24 FAX. 0-2719-9484

Certificate of Calibration

Certificate No.: 24P1251
Page: 1 of 2

Equipment : U Tube Manometer

Manufacturer: Dwyer

Model : 1221-36-W/M

Serial No. : -

ID No. : UAE.EFM.077/2566

Condition As-Received: Used Item

Received Date: 03 April 2024

Calibration Date: 11 April 2024

Reference: 2404-0118WSC

Ambient Temperature: (23 ± 2) °C

Relative Humidity: (50 ± 15) %

Atmospheric Pressure: 1012 mbar

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

81 Soi Udomsak 41, Sukhumvit Road, Bangchak,

Phrakhanong, Bangkok 10260

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to calibration procedure CP-P04, using " DKD-R 6-1 ; Calibration of Pressure Gauges " as a guidelines.

Condition of this result of calibration

1. Reference standards Instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Pressure Calibrator	PC106P	1189	MP-0176-23	12 Sep 2024

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

3. Scale and conversion factor is 1 kPa = 4.01463293 inH₂O

4. This instrument was used clean air as pressure media

5. This instrument was calibrated by applied pressure to high-port (+) side and low-port (-) side open to atmospheric pressure.

6. This instrument was installed in vertical orientation and top of the pressure port was used as the reference level.

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

8. This Certification is traceable to the International System of Unit maintained through:-

-National Institute of Metrology (Thailand), NSC-ONSC Accredited No. Calibration 0144

Calibrated by : Suksan Khankaew

Issue Date : 17 April 2024

Approved Signatory :

[] Phalinee Prabpalai

[] Sura Suwannasri

[✓] Atapol Panurach

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Cert.No.: 24P1251
Page: 2 of 2

Result of calibration:- Without adjustment

Function:- Pressure Measurement

Increasing Pressure

Range: 0 inH₂O to 36 inH₂O

Scale Interval: 0.1 inH₂O (The Second Estimate)

Applied Pressure	High-port side	UUC Indication Low-port side	ΔP	Error
0.00	0.00	0.00	0.00	0.00
2.00	1.00	-1.00	2.00	0.00
4.00	2.00	-2.00	4.00	0.00
6.00	3.00	-3.00	6.00	0.00
8.00	4.00	-4.00	8.00	0.00
10.00	5.00	-5.00	10.00	0.00
12.00	6.00	-6.00	12.00	0.00
14.00	7.00	-7.00	14.00	0.10
16.00	8.00	-8.00	16.00	0.10
18.00	9.00	-9.00	18.00	0.10
20.00	10.00	-10.00	20.00	0.10
22.00	11.00	-11.00	22.00	0.10
24.00	12.00	-12.00	24.00	0.10
26.00	13.00	-13.00	26.00	0.10
28.00	14.00	-14.00	28.00	0.10
30.00	15.00	-15.00	30.00	0.10
32.00	16.00	-16.00	32.00	0.15
34.00	17.00	-17.00	34.00	0.15
36.00	18.00	-18.00	36.00	0.20

The uncertainty of measurement was ± 0.11 inH₂O

* ΔP = High-port side - Low-port side

* UUC = Unit Under Calibration

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

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
53/44 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL. 0-2717-3000-24 FAX. 0-2719-9484

Certificate of Calibration

Certificate No.: 24P1267
Page: 1 of 2

Equipment : Aneroid Barometer

Manufacturer: Barigo

Model : -

Serial No. : -

ID No. : UAE.ANV.152/2550

Condition As-Received: Used Item

Received Date: 05 April 2024

Calibration Date: 22 April 2024

Reference: 2404-0243WSC

Ambient Temperature: (23 ± 2) °C

Relative Humidity: (50 ± 15) %

Atmospheric Pressure: 1007 mbar

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

81 Soi Udomsak 41, Sukhumvit Road, Bangchak,

Phrakhanong, Bangkok 10260

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

Condition of this result of calibration

1. Reference standards Instruments :

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

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

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

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

5. This instrument was used clean air as pressure media

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

7. This Certification is traceable to the International System of Unit maintained through:-

-National Institute of Metrology Thailand (NIMT)

Calibrated by : Suksan Khankaew

Issue Date : 23 April 2024

Approved Signatory :

[] Phalinee Prabpalai

[] Sura Suwannasri

[✓] Atapol Panurach

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ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20240324EA

Calibration Report

Equipment: Sound Level Meter
Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)
Model/Type: LX11 (Meter), 37702 (Microphone), PRLxT1 (Preamplifier)
Serial No.: 0007302 (Meter), 344896 (Microphone), 0776637 (Preamplifier)
ID No.: UAE.FM.035/2566
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Pressure: (101.3 ± 1.5) kPa

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

Condition of this result of calibration

1. Reference standards instrument :-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Standard microphone	4180	2787490	AA-1012-23	12 November 2024
2) Arbitrary Function Generator	AFG2021	C010063	CK20240048EA	23 June 2025
3) Programmable Attenuator	PA5	2755	EF-0040-23	1 October 2024
4) 6.5 Digit precision multimeter	B846A	9610014	CB20230200EA	15 November 2024
5) Pressure humidity and Temperature Transmitter	PTU301	L3950483	CL1-P240023	24 March 2025
			CD20240142EA	12 June 2025
6) Pressure humidity and Temperature Transmitter	PTU301	L3950484	CL1-P240030	11 April 2025
			CD20240143EA	12 June 2025
7) Performance Audio Analyzer	U8903B	MY56510003	CB20240035EB	13 February 2025
			CK20230072EA	13 September 2024

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

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

Reference standards instrument for Acoustic function

- National Institute of Metrology (Thailand)

Reference standards instrument for Electrical function

- National Institute of Metrology (Thailand)

- Electrical and Electronics Institute; NSC Accredited Calibration No.0119

Result of Calibration:-

Function : 1. Indication at the calibration check frequency

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

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F-CAL-005 Ed.1



ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20240324EA

Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone installed

Measured value (dB)
28.8

2.2 Microphone replaced by the electrical input signal device

Frequency Weighting	Measured value (dB)
A-weighting	28.6
C-weighting	28.4
Z-weighting	34.3

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

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

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
125	0.1	0.1	0.1	±1.0
1000	0.0	0.0	0.0	±0.7
8000	-0.2	-0.2	-0.1	+1.5; -2.5

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
63	-0.1	0.0	0.0	±1.0
125	0.0	0.0	-0.1	±1.0
250	-0.1	0.0	-0.1	±1.0
500	0.0	0.0	-0.1	±1.0
1000	0.0	0.0	0.0	±0.7
2000	0.0	0.0	0.0	±1.0
4000	0.0	0.0	0.0	±1.0
8000	-0.1	0.0	0.0	+1.5; -2.5
16000	0.0	0.0	-0.1	+2.5; -16.0

เอกสารไม่ควบคุม

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ELECTRICAL AND ELECTRONICS INSTITUTE
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Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

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

5.2 Time weighting at 1 kHz

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

Function : 6. Long-Term Stability

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

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
30	94.0	94.0	0.0	±0.1

Function : 7. Level Linearity on the reference level range

7.1 Level Linearity on the reference level range, Upper

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±0.8
99.0	99.0	0.0	±0.8
104.0	104.0	0.0	±0.8
109.0	109.0	0.0	±0.8
114.0	114.0	0.0	±0.8
119.0	119.0	0.0	±0.8
124.0	124.0	0.0	±0.8
129.0	129.0	0.0	±0.8
134.0	134.0	0.0	±0.8
139.0	139.0	0.0	±0.8

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ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20240324EA

Calibration Report

7.2 Level Linearity on the reference level range, Lower

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	54.0	0.0	±0.8
49.0	49.0	0.0	±0.8
44.0	44.1	0.1	±0.8
39.0	39.4	0.4	±0.8

Function : 8. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance Limits (dB)
Fast	200	136.0	0.0	±0.5
	2	118.8	-0.2	+1.0; -1.5
	0.25	109.7	-0.3	+1.0; -3.0
Slow	200	129.5	-0.1	±0.5
	2	109.9	-0.1	+1.0; -3.0
	0.25	100.9	-0.1	+1.0; -3.0

Function : 9. Peak C sound level

Number of cycles in test signal	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Complete cycle	135.4	134.6	-0.6	±2.0
Positive half cycle	134.4	134.0	-0.4	±1.0
Negative half cycle	134.4	134.1	-0.3	±1.0

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ELECTRICAL AND ELECTRONICS INSTITUTE
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Calibration Report

Function : 10. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limits (dB)
Positive one-half cycle	Negative one-half cycle		
143.6	143.4	-0.2	±1.5

Function : 11. High-Level Stability

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

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
5	139.0	139.0	0.0	±0.1

Uncertainty of measurement

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

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

-- End of Report --

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CALIBRATION LABORATORY CO., LTD.



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3801
SERIAL NO. : UM11355/UM11355 (UAE.EFM.002/2560)
CLID. NO. : 28299627
JOB CONTROL NO. : 24053859622
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
81 SOI LUDOMSK 41, SUKHUMVIT ROAD,
BANGCHAK, PHRAKHANONG, BANGKOK 10710

DATE OF RECEIVED : 08 June 2024

DATE OF ISSUED : 12 June 2024

The report of Calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Suwit Phunbusabang
Calibration Engineer



Approved By : Mongkol Yonsuechom
Authorized Signatory
12 June 2024

This Calibration Certificate conforms to the laboratory's internal standards, which include the national accreditation according to the International System of Units (SI).

Certificate No. Q24059622

FC-011-0512-23

เอกสารไม่ควบคุม



CALIBRATION LABORATORY CO., LTD.

121/11, 44/11 Moo 11, Thungyai Yodhachin Road, Thungyai Yodhachin Sub-township, Thungyai Yodhachin District, Chiang Mai 50100, Thailand
Tel: 053-2511111 Fax: 053-2511112 Email: info@cll.co.th



REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3801
SERIAL NO. : UM11355/UM11355 (UAE.EFM.002/2560)
DATE OF CALIBRATION : 11 June 2024

ENVIRONMENT CONDITIONS :

Temperature : $(23 \pm 2) ^\circ\text{C}$ Relative Humidity : $(65 \pm 15) \% \text{RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CAL-08 based on ISO 10663-21 as calibration standard.
The calibration was performed by using Digital Multimeter, Programmable Ticker Counter,
Accelerometer and Moving Coil Amplifier which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Digital Multimeter, Wavetek Model 1281 / N, 2023
2. Programmable Ticker Counter, Fluke Model 7M600/5824, 8M600/591
3. Accelerometer with Mounting Assembly, Brüel & Kjær Model 8365, 2020 S/N: 3973915, 7474988

TRACEABILITY :

1. This measurement is traceable to International System of Units (SI), through Aeronaustical Research Thailand Ltd., Certificate No. 64-0014073, Due Date 31 July 2023.
2. The measurement and realization is traceable to System of Units (SI), through Aeronaustical Research Thailand Ltd., Certificate No. 64-0014073, Due Date 31 July 2023.
3. This measurement is traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AY 0052-21, Due Date 29 September 2024

UNCERTAINTY :

The reported measurement uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2.00$ which has a normal distribution and associated coverage probability of approximately 95%. It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration" (GUM:2008).

Certificate No. Q24059622

FC-011-0512-23

เอกสารไม่ควบคุม



CALIBRATION LABORATORY CO., LTD.

121/11, 44/11 Moo 11, Thungyai Yodhachin Road, Thungyai Yodhachin Sub-township, Thungyai Yodhachin District, Chiang Mai 50100, Thailand
Tel: 053-2511111 Fax: 053-2511112 Email: info@cll.co.th



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : () without adjustment () adjustment

CALIBRATION DATA

1. ACCELERATION RESULT

Time point		Value	STD Reading (mm/s ²)	DUT Reading (mm/s ²)	Correction (mm/s ²)	Uncertainty ± (% of ref. val.)
Time (s)	Frequency (Hz)					
0.0	50 Hz	Peak	0.100	0.100	-0.000	1.0
0.4	20 Hz		0.100	0.100	-0.000	1.0
0.5	50 Hz		0.500	0.495	-0.005	1.0
0.6	20 Hz		0.100	0.104	+0.004	2.5
0.7	50 Hz		0.100	0.095	-0.005	2.5
0.8	100 Hz	Peak	0.100	0.101	+0.001	1.0
0.9	100 Hz		0.400	0.399	-0.001	1.0
1.0	100 Hz		0.500	0.497	-0.003	1.0
1.1	100 Hz		0.000	0.006	+0.006	2.5
1.2	100 Hz		0.000	0.000	-0.000	2.5

2. VELOCITY RESULT

Time point		Value	STD Reading (mm/s)	DUT Reading (mm/s)	Correction (mm/s)	Uncertainty ± (% of ref. val.)
Time (s)	Frequency (Hz)					
0	50 Hz	Peak	3.000	2.995	-0.005	1.0
4	20 Hz		4.000	4.000	-0.000	1.0
5	50 Hz		5.000	4.995	-0.005	1.0
6	50 Hz		5.000	4.999	-0.001	1.0
7	50 Hz		5.000	5.000	-0.000	1.0
12	100 Hz	Peak	3.000	3.014	+0.014	1.0
14	100 Hz		4.000	4.021	+0.021	1.0
15	100 Hz		5.000	4.978	-0.022	1.0
16	100 Hz		6.000	6.032	+0.032	1.0
17	100 Hz		7.000	7.008	+0.008	1.0

Certificate No. Q24059622

FC-011-0512-23

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CALIBRATION DATA

A DISPLACEMENT RESULT

CONTRACT		Sample	STD. Deviation		Acceptance	Displacement
Contract No.	Contract Name		Range	Factor	Factor	Factor
0015	50110	P.01	0.001	0.001	0.001	0.001
0016	71110		0.001	0.001	0.001	0.001
0017	21110		0.001	0.001	0.001	0.001
0018	31110		0.001	0.001	0.001	0.001
0019	41110		0.001	0.001	0.001	0.001
0020	51110	P.02	0.001	0.001	0.001	0.001
0021	61110		0.001	0.001	0.001	0.001
0022	71110		0.001	0.001	0.001	0.001
0023	81110		0.001	0.001	0.001	0.001
0024	91110		0.001	0.001	0.001	0.001

Note: The Standard Deviation (STD) is calculated as $\sqrt{\frac{1}{n-1} \sum (x_i - \bar{x})^2}$ where n is the number of data points.

The acceptance factor is calculated as $\frac{1}{\sqrt{n-1}} \sum (x_i - \bar{x})^2$ where n is the number of data points.

This report is valid for the above stated instrument only.

*** End of Certificate ***

Certificate No. 0220000022

01-01-05-02-21



ภาคผนวก ฉ
หนังสือขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน



เอกสารแนบท้ายหนังสือคําสั่งรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท ยูนิเทค แอนาไลติกส์ แอนด์ เอ็นจิเนียริ่ง คอมพิวเตอร์ จำกัด เลขทะเบียน ๗-๑๕๕
ที่ จก ๐๓๑๐(๑)๗ ๑๐๘๖ ลงวันที่ ๐๗ กุมภาพันธ์ ๒๕๖๒

ขอขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์จากโรงงานอุตสาหกรรม จำนวน ๒๕๗ รายการ

น้ำ/แก๊ส จำนวน ๔๖ รายการ

ลำดับ	สารเคมี	วิธีการตรวจ
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 ⁽²⁾
3	Barium	Digestion, Inductively Coupled Plasma Method ⁽²⁾
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 ⁽²⁾
9	Cadmium	1) Digestion, Direct Air-Acetylene Flame Method ⁽¹⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽²⁾
10	Chemical Oxygen Demand	1) Closed Reflux, Titrimetric Method ⁽¹⁾ 2) Closed Reflux, Colorimetric Method ⁽²⁾ 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, Inductively Coupled Plasma Method ⁽²⁾
13	Color	ADMI Weighted-Ordinate Spectrophotometric Method ⁽¹⁾
14	Copper	1) Digestion, Direct Air-Acetylene Flame Method ⁽¹⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽²⁾
15	Cyanide	1) Distillation, Colorimetric Method ⁽¹⁾ 2) Total Cyanide after Distillation, by Flow Injection Analysis Method ⁽²⁾
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	Dieldrin	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...

ลำดับ	สารเคมี	วิธีการตรวจ
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 Thiocyanate Method ⁽²⁾
28	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾
29	Heptachlor Epoxide	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾
30	Hexavalent Chromium	Colorimetric Method ⁽¹⁾
31	Lead	1) Digestion, Direct Air-Acetylene Flame Method ⁽¹⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽²⁾
32	Manganese	1) Digestion, Direct Air-Acetylene Flame Method ⁽¹⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽²⁾
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, Inductively Coupled Plasma Method ⁽²⁾
36	Oil & Grease	1) Liquid-Liquid, Petrolon-Gravimetric Method ⁽¹⁾ 2) Soxhlet Extraction Method ⁽²⁾
37	pH	Electrometric Method ⁽¹⁾
38	Phenol	1) Distillation, Chloroform Extraction Method ⁽¹⁾ 2) Distillation, Direct Photometric Method ⁽²⁾
39	Selenium	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ⁽¹⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽²⁾
40	Sulfide	1) Iodometric Method ⁽¹⁾ 2) Methylene Blue Method ⁽²⁾
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 from 103 to 105 °C ⁽¹⁾
45	Trivalent Chromium	1) Digestion, Direct Air-Acetylene Flame Method ⁽¹⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽²⁾
46	Zinc	1) Digestion, Direct Air-Acetylene Flame Method ⁽¹⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽²⁾

31 Ethanol...

น้ำ/แก๊ส จำนวน 126 รายการ

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

14 Benzo(a)pyrene...

ลำดับ	สารเคมี	วิธีการตรวจ
14	Benzo(a)pyrene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽²⁾
15	Benzo(g,h,i)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 ⁽²⁾
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⁾
24	Carbazole	1) Digestion, Inductively Coupled Plasma Method ⁽²⁾ 2) 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...

ลำดับ	สารเคมี	วิธีวิเคราะห์
29	Chlorobenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
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, Inductively Coupled Plasma Method ⁽¹⁾
34	Chromium (III)	1) Digestion, Direct Air-Acetylene Flame Method; Colorimetric Method; Calculation ⁽¹⁾ 2) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation ⁽¹⁾
35	Chromium (VI)	Colorimetric Method ⁽¹⁾
36	Chrysene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
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 ⁽¹⁾
40	ODE	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
41	DDT	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
42	Dibenz(a,h)anthracene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾

43 Di-n-butyl phthalate

ลำดับ	สารเคมี	วิธีวิเคราะห์
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	3,4-Dichlorodibenzodioxin	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
48	1,1-Dichloroethene	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-Dichloropropenal	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 ⁽¹⁾
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

ลำดับ	สารเคมี	วิธีวิเคราะห์
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 ⁽¹⁾
65	Enoarin	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
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 ⁽¹⁾
68	Fluorene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
69	Heptachlor	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
70	Heptachlor epoxide	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
71	Hexachlorobenzene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
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 O-HCH

ลำดับ	สารเคมี	วิธีวิเคราะห์
74	O-HCH	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
75	P-HCH	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
76	Y-HCH	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
77	Hexachlorocyclopentadiene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
78	Hexachloroethane	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
79	Indeno(1,2,3-cd)pyrene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
80	Isophorone	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 ⁽¹⁾ 3) Digestion, Inductively Coupled Plasma Method ⁽¹⁾
82	Manganese	1) Digestion, Direct Air-Acetylene Flame Method ⁽¹⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽¹⁾
83	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽¹⁾
84	Methanol	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
85	Methoxychlor	1) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
86	Methyl bromide	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾

87 Methylene chloride

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
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 ⁽¹⁾
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 ⁽¹⁾
92	Nickel	1) Digestion, Direct Air-Acetylene Flame Method ⁽¹⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽¹⁾
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 - 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 ⁽¹⁾
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 ⁽¹⁾

100 Phenol...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
100	Phenol	1) Distillation, Chloroform Extraction Method ⁽¹⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
101	Pyrene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
102	Selenium	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ⁽¹⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽¹⁾
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	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
109	TPH (C ₁₃ - 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 ₁₀ - C ₁₁)	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(1,2)
111	TPH (C ₁₀ - C ₁₂)	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...

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

จากดัชนี (ปดอรรถวน) จำนวน 25 รายการ

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

Chromium (VI)...

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

23 Total Suspended Particulate...

ลำดับ	สารเคมี	วิธีการตรวจ
23	Total Suspended Particulate Variadium	Isokinetic Sampling, Gravimetric Method ^(3.2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^(3.2)
25	Xylene	1) Bag Sampling, Gas Chromatographic Method ^(3.2) 2) Adsorption Sampling, Gas Chromatographic Method ^(3.2)

เพิ่มอีกชนิดวัตถุที่ไม่ใช่ตัว จำนวน 35 รายการ

ลำดับ	สารเคมี	วิธีการตรวจ
1	Alcirin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(3.2) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(3.2)
2	Antimony	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(3.2) 2) Digestion, Inductively Coupled Plasma Method ^(3.2)
3	Arsenic	1) Waste Extraction, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(3.2) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(3.2) 3) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(3.2) 4) Digestion, Inductively Coupled Plasma Method ^(3.2)
4	Barium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(3.2) 2) Digestion, Inductively Coupled Plasma Method ^(3.2)
5	Beryllium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(3.2) 2) Digestion, Inductively Coupled Plasma Method ^(3.2)
6	Cadmium	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(3.2) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(3.2) 3) Digestion, Flame Atomic Absorption Spectrometric Method ^(3.2) 4) Digestion, Inductively Coupled Plasma Method ^(3.2)
7	Chlordane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(3.2) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(3.2)

8 Chromium ..

ลำดับ	สารเคมี	วิธีการตรวจ
8	Chromium	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(3.2) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(3.2) 3) Digestion, Flame Atomic Absorption Spectrometric Method ^(3.2) 4) Digestion, Inductively Coupled Plasma Method ^(3.2)
9	Chromium (VI)	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method, Waste Extraction, Colorimetric Method, Calculation ^(3.2) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method, Waste Extraction, Colorimetric Method, Calculation ^(3.2) 3) Digestion, Flame Atomic Absorption Spectrometric Method, Alkaline Digestion, Colorimetric Method, Calculation ^(3.2) 4) Digestion, Inductively Coupled Plasma Method, Alkaline Digestion, Colorimetric Method, Calculation ^(3.2)
10	Chromium (VI)	1) Waste Extraction, Colorimetric Method ^(3.2) 2) Alkaline Digestion, Colorimetric Method ^(3.2)
11	Cobalt	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(3.2) 2) Digestion, Inductively Coupled Plasma Method ^(3.2)
12	Copper	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(3.2) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(3.2) 3) Digestion, Flame Atomic Absorption Spectrometric Method ^(3.2) 4) Digestion, Inductively Coupled Plasma Method ^(3.2)
13	2,4-D	1) Waste Extraction, Gas Chromatographic Method ^(3.2) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(3.2)
14	DDE	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(3.2) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(3.2)

15 DDE ..

ลำดับ	สารเคมี	วิธีการตรวจ
15	DDE	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(3.2) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(3.2)
16	DDT	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(3.2) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(3.2)
17	Dieldrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(3.2) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(3.2)
18	Endrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(3.2) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(3.2)
19	Hepachlor	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(3.2) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(3.2)
20	Lead	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(3.2) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(3.2) 3) Digestion, Flame Atomic Absorption Spectrometric Method ^(3.2) 4) Digestion, Inductively Coupled Plasma Method ^(3.2)
21	Lindane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(3.2) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(3.2)
22	Mercury	1) Waste Extraction, Digestion, Cold Vapor Atomic Absorption Spectrometric Method ^(3.2) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(3.2) 3) Digestion, Cold Vapor Atomic Absorption Spectrometric Method ^(3.2) 4) Digestion, Inductively Coupled Plasma Method ^(3.2)

Mercury (Hg)...

ลำดับ	สารเคมี	วิธีการตรวจ
22	Mercury (Hg)	5) Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method ^(3.2)
23	Methoxychlor	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(3.2) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(3.2)
24	Molybdenum	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(3.2) 2) Digestion, Inductively Coupled Plasma Method ^(3.2)
25	Nickel	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(3.2) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(3.2) 3) Digestion, Flame Atomic Absorption Spectrometric Method ^(3.2) 4) Digestion, Inductively Coupled Plasma Method ^(3.2)
26	Polychlorinated Biphenyls - Aroclor 1016 - Aroclor 1221 - Aroclor 1232 - Aroclor 1242 - Aroclor 1243 - Aroclor 1254 - Aroclor 1269 - 2-Chlorobiphenyl - 2,3-Dichlorobiphenyl - 2,3,5-Trichlorobiphenyl - 2,4,5-Trichlorobiphenyl - 2,2',3,5'-Tetrachlorobiphenyl - 2,2',3,5'-Tetrachlorobiphenyl - 2,3',4,4'-Tetrachlorobiphenyl - 2,2',3,4,5'-Pentachlorobiphenyl - 2,2',4,5,5'-Pentachlorobiphenyl - 2,3,3',4,6-Pentachlorobiphenyl	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(3.2) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(3.2)

Polychlorinated Biphenyls (PCB) ..

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
27	Polychlorinated Biphenyls(พีซี) - 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',3,5,5',4,4',5'- Heptachlorobiphenyl - 2,2',3,4,4',5,5'- Heptachlorobiphenyl - 2,2',3,4',5,5',6'- Heptachlorobiphenyl - 2,2',3,3',4,4',5,5',6'- Nonachlorobiphenyl Pentachlorophenol	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(3.5.28) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(3.5.29) Electrometric Method ^(3.5.30)
28	pH	
29	Selenium	1) Waste Extraction, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(3.4.23) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(3.4.14) 3) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(7.22) 4) Digestion, Inductively Coupled Plasma Method ^(3.4.14)
30	Silver	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(3.4.14) 2) Digestion, Inductively Coupled Plasma Method ^(3.4.14)
31	Thallium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(3.4.14) 2) Digestion, Inductively Coupled Plasma Method ^(3.4.14)

32 Toraphene...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
33	Toxaphene	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(3.4.1) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(3.4.1)
34	Trichloroethylene	1) Waste Extraction, Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(3.5.29) 2) Waste Extraction, Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(3.5.31) 3) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(3.5.29) 4) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(3.5.31)
35	Vanadium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(3.4.14) 2) Digestion, Inductively Coupled Plasma Method ^(3.4.14)
36	Zinc	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(3.4.18) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(3.4.14) 3) Digestion, Flame Atomic Absorption Spectrometric Method ^(3.4.18) 4) Digestion, Inductively Coupled Plasma Method ^(3.4.14)

บัญชีแนบมา 125 รายชื่อสาร

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(3.4.1) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(3.5.28)
2	Acetone	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(3.5.29)
3	Aldrin	1) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(3.5.29) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(3.5.29)
4	Anthracene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(3.4.1)

Anthracene (พีซี)...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
4	Anthracene (พีซี)	2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(3.5.28)
5	Antimony	Digestion, Inductively Coupled Plasma Method ^(7.14)
6	Arsenic	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(7.14) 2) Digestion, Inductively Coupled Plasma Method ^(3.4.14)
7	Atrazine	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(3.5.28)
8	Barium	Digestion, Inductively Coupled Plasma Method ^(3.4.14)
9	Benzo(a)anthracene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(3.4.1) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(3.5.28)
10	Benzene	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(3.5.29) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(3.5.31)
11	Benzo(b)fluoranthene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(3.4.1) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(3.5.28)
12	Benzo(k)fluoranthene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(3.4.1) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(3.5.28)
13	Benzoic acid	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(3.5.28)
14	Benzo(a)pyrene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(3.4.1) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(3.5.28)
15	Benzo(g,h,i)perylene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(3.4.1) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(3.5.28)
16	Beryllium	Digestion, Inductively Coupled Plasma Method ^(3.4.14)

17 Bis(2-chloroethyl)ether...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
17	Bis(2-chloroethyl)ether	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(3.5.28)
18	Bis(2-ethylhexyl)phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(3.5.28)
19	Bromodichloromethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(3.5.29)
20	Bromoform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(3.5.29)
21	Butanol	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(3.5.29)
22	Butyl benzyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(3.5.28)
23	Cadmium	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(3.4.18) 2) Digestion, Inductively Coupled Plasma Method ^(7.14)
24	Carbazole	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(3.5.28)
25	Carbon disulfide	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(3.5.29)
26	Carbon tetrachloride	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(3.5.29) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(3.5.31)
27	Chlordane	1) Ultrasonic Extraction, Gas Chromatographic Method ^(3.4.1) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(3.5.28)
28	p-Chloroaniline	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(3.5.28)
29	Chlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(3.5.29)
30	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(3.5.29)
31	Chloroform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(3.5.29)
32	2-Chlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(3.5.28)

33 Chromium...

ลำดับ	สารเคมี	วิธีการตรวจ
33	Chromium	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,19) 2) Digestion, Inductively Coupled Plasma Method ^(2,14)
34	Chromium (III)	1) Digestion, Flame Atomic Absorption Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation ^(7,14,17) 2) Digestion, Inductively Coupled Plasma Method, Alkaline Digestion, Colorimetric Method; Calculation ^(7,14,11)
35	Chromium (VI)	Alkaline Digestion, Colorimetric Method ^(8,17)
36	Chrysene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(16,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(19,28)
37	Cyanide	Extraction, Distillation, Colorimetric Method ^(9,30)
38	2,4-D	Ultrasonic Extraction, Gas Chromatographic Method ⁽¹⁶⁾
39	DDD	1) Ultrasonic Extraction, Gas Chromatographic Method ^(16,23) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(19,28)
40	DDE	1) Ultrasonic Extraction, Gas Chromatographic Method ^(16,23) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(19,28)
41	DDT	1) Ultrasonic Extraction, Gas Chromatographic Method ^(16,23) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(19,28)
42	Dibenz(a,h)anthracene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(16,23) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(19,28)
43	Di-n-butyl phthalate	Ultrasonic Extraction, Gas Chromatographic Method ^(16,23)
44	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(11,12)

45 1,3-Dichlorobenzene..

ลำดับ	สารเคมี	วิธีการตรวจ
45	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(11,12)
46	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(11,12)
47	3,3'-Dichlorobenzidine	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(16,24)
48	1,1-Dichloroethane	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(11,12) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,27)
49	1,2-Dichloroethane	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(11,12) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,27)
50	1,1-Dichloroethylene	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(11,12) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,27)
51	cis-1,2-Dichloroethylene	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(11,12) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,27)
52	trans-1,2-Dichloroethylene	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(11,12) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,27)
53	2,4-Dichlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(16,25)
54	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(11,12)
55	1,3-Dichloropropene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(11,12)
56	1,3-Dichloropropene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(11,12)
57	Dieldrin	1) Ultrasonic Extraction, Gas Chromatographic Method ^(16,26) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(19,28)

58 Diethyl phthalate..

ลำดับ	สารเคมี	วิธีการตรวจ
58	Diethyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(16,26)
59	2,4-Dimethylphenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(16,26)
60	2,4-Dinitrophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(16,26)
61	2,4-Dinitrotoluene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(16,26)
62	2,6-Dinitrotoluene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(16,26)
63	Di-n-Octyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(16,26)
64	Endosulfan	1) Ultrasonic Extraction, Gas Chromatographic Method ^(16,27) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(19,29)
65	Endrin	1) Ultrasonic Extraction, Gas Chromatographic Method ^(16,27) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(19,29)
66	Ethylbenzene	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(11,27) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,27)
67	Fluoranthene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(16,28) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(19,30)
68	Fluorene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(16,28) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(19,30)
69	Heptachlor	1) Ultrasonic Extraction, Gas Chromatographic Method ^(16,29) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(19,31)
70	Heptachlor epoxide	1) Ultrasonic Extraction, Gas Chromatographic Method ^(16,29) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(19,31)

Heptachlor epoxide (๒๖) ..

ลำดับ	สารเคมี	วิธีการตรวจ
70	Heptachlor epoxide (๒๖)	2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(19,31)
71	Hexachlorobenzene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(16,32) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(19,32)
72	Hexachloro-1,3-butadiene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(11,27)
73	n-Hexane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(11,27)
74	α-HCH	1) Ultrasonic Extraction, Gas Chromatographic Method ^(16,33) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(19,34)
75	β-HCH	1) Ultrasonic Extraction, Gas Chromatographic Method ^(16,33) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(19,34)
76	γ-HCH	1) Ultrasonic Extraction, Gas Chromatographic Method ^(16,33) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(19,34)
77	Hexachlorocyclopentadiene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(16,35)
78	Hexachloroethane	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(16,35)
79	Indeno(1,2,3-cd)pyrene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(16,36) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(19,37)
80	Isophorone	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(16,38)
81	Lead	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,19) 2) Digestion, Inductively Coupled Plasma Method ^(2,14)
82	Manganes	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,19) 2) Digestion, Inductively Coupled Plasma Method ^(2,14)

83 Mercury..

Polychlorinated Biphenyls(多氯)

\$7 Parach's other...

111 1,2,4-Trichlorobenzene...

125 Zinc...

ลำดับ	สารเคมี	วิธีการตรวจ
125	Zinc	1) Digestion, Flame Atomic Absorption Spectrometric Method ^{1,11} 2) Digestion, inductively Coupled Plasma Method ^{7,10}

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