

ภาคผนวกที่ 4

สำเนาเอกสารขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท เอ็นไวรอนเมนต์ รีเสิร์ช แอนด์ เทคโนโลยี จำกัด

ที่ อก ๐๓๑๐(๑)/ ๖๔๗๖



กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

๐๓ กรกฎาคม ๒๕๖๗

เรื่อง ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท เอ็นไวรอนเมนต์ รีเสิร์ช แอนด์ เทคโนโลยี จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๒๔ เมษายน ๒๕๖๗

สิ่งที่ส่งมาด้วย ๑. รายชื่อผู้ควบคุมห้องปฏิบัติการวิเคราะห์เอกชน จำนวน ๑ แผ่น
๒. รายชื่อเจ้าหน้าที่ห้องปฏิบัติการวิเคราะห์เอกชน จำนวน ๒ แผ่น
๓. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๑๔ แผ่น

ตามคำขอที่อ้างถึง บริษัท เอ็นไวรอนเมนต์ รีเสิร์ช แอนด์ เทคโนโลยี จำกัด ขอต่ออายุหนังสือ
รับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ว-๐๙๙ สถานที่ตั้งเลขที่ ๒๕/๑๑๔ หมู่ที่ ๖
ซอยชินเขต ๑ ถนนงามวงศ์วาน แขวงทุ่งสองห้อง เขตหลักสี่ กรุงเทพมหานคร ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท เอ็นไวรอนเมนต์ รีเสิร์ช แอนด์ เทคโนโลยี จำกัด
ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน โดยมีองค์ประกอบดังนี้

ก. ผู้ควบคุมห้องปฏิบัติการวิเคราะห์เอกชน จำนวน ๒๐ ราย ตามสิ่งที่ส่งมาด้วย ๑
ข. เจ้าหน้าที่ห้องปฏิบัติการวิเคราะห์เอกชน ๖๑ ราย ตามสิ่งที่ส่งมาด้วย ๒
ค. ขอบข่ายชนิดสารมลพิษที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำ/น้ำเสีย น้ำใต้ดิน อากาศเสีย
สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว และดิน ตามสิ่งที่ส่งมาด้วย ๓

หนังสือฉบับนี้จะหมดอายุในวันที่ ๑๘ พฤษภาคม ๒๕๗๑ หากประสงค์จะต่ออายุหนังสือรับขึ้น
ทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอต่อกรมโรงงานอุตสาหกรรม
ภายใน ๖๐ วัน ก่อนวันสิ้นอายุของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายพรยศ กลั่นกรอง)

รองอธิบดี ปฏิบัติราชการแทน
อธิบดีกรมโรงงานอุตสาหกรรม

กองวิจัยและเตือนภัยมลพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕

โทรสาร ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๙๙

ไปรษณีย์อิเล็กทรอนิกส์ saraban@diw.mail.go.th



“อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว”



เอกสารแนบท้ายหนังสือต่ออายุรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท เอ็นไวรอนเมนต์ รีเสิร์ช แอนด์ เทคโนโลยี จำกัด

เลขทะเบียน ว-๐๙๙

ที่ อก ๐๓๑๐(๑)/ ๖๔๗ ๖

ลงวันที่ ๐๓ กรกฎาคม ๒๕๖๗

ก. ผู้ควบคุมห้องปฏิบัติการวิเคราะห์เอกชน จำนวน ๒๐ ราย

- ๑) นางสาวสุดารัตน์ เขจรรักษ์
- ๒) นางสาวพิชิตา เขียววรภัย
- ๓) นางสาววลิตา โพธิ์เจริญ
- ๔) ว่าที่ร้อยตรีวันชนะ สีหามาตร
- ๕) นางสาวรัชนีวรรณ ภูประเสริฐ
- ๖) นางสาวปณิชา พรหมชัย
- ๗) นางณัฐรดา เลี้ยงรักษา
- ๘) นายมงคล บุรภักดิ์
- ๙) นางสาวธนิดา บุญรุ่งเรือง
- ๑๐) นางสาวมิตา แต่งไทย
- ๑๑) นางสาวไรวินทร์ โพธิ์สิทธิ์
- ๑๒) นางสาวณัฐนิชา เสริมมิตวงศ์
- ๑๓) นายณพลสิทธิ์ ทวีพรประดิษฐ์
- ๑๔) นางสาวธิดารัตน์ ปุกคะ
- ๑๕) นายอภิชาติ พูลพล
- ๑๖) นายนิทัศน์ ศิริชาติ
- ๑๗) นายสุทธิชาญ สังข์ทอง
- ๑๘) นางสาวยุวดี ณ ระนอง
- ๑๙) นางสาวสุภาวรรณ สุวรรณภา
- ๒๐) นางสาวนภาพรสิริ หมีนวงษ์

- ทะเบียนเลขที่ ว-๐๙๙-ค-๐๐๐๑
- ทะเบียนเลขที่ ว-๐๙๙-ค-๐๐๐๒
- ทะเบียนเลขที่ ว-๐๙๙-ค-๐๐๐๓
- ทะเบียนเลขที่ ว-๐๙๙-ค-๐๐๐๔
- ทะเบียนเลขที่ ว-๐๙๙-ค-๐๐๐๕
- ทะเบียนเลขที่ ว-๐๙๙-ค-๐๐๐๖
- ทะเบียนเลขที่ ว-๐๙๙-ค-๐๐๐๗
- ทะเบียนเลขที่ ว-๐๙๙-ค-๐๐๐๘
- ทะเบียนเลขที่ ว-๐๙๙-ค-๐๐๐๙
- ทะเบียนเลขที่ ว-๐๙๙-ค-๐๐๑๐
- ทะเบียนเลขที่ ว-๐๙๙-ค-๐๐๑๑
- ทะเบียนเลขที่ ว-๐๙๙-ค-๐๐๑๒
- ทะเบียนเลขที่ ว-๐๙๙-ค-๐๐๑๓
- ทะเบียนเลขที่ ว-๐๙๙-ค-๐๐๑๔
- ทะเบียนเลขที่ ว-๐๙๙-ค-๐๐๑๕
- ทะเบียนเลขที่ ว-๐๙๙-ค-๐๐๑๖
- ทะเบียนเลขที่ ว-๐๙๙-ค-๐๐๑๗
- ทะเบียนเลขที่ ว-๐๙๙-ค-๐๐๑๘
- ทะเบียนเลขที่ ว-๐๙๙-ค-๐๐๑๙
- ทะเบียนเลขที่ ว-๐๙๙-ค-๐๐๒๐

วิภา

เอกสารแนบท้ายหนังสือต่ออายุรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท เอ็นไวรอนเมนต์ รีเสิร์ช แอนด์ เทคโนโลยี จำกัด

เลขทะเบียน ว-๐๙๙

ที่ อก ๐๓๑๐(๑)/ ๖๔๗ ๖

ลงวันที่ ๐๓ กรกฎาคม ๒๕๖๗

ข. เจ้าหน้าที่ห้องปฏิบัติการวิเคราะห์เอกชน จำนวน ๖๑ ราย

๑) นางสาวณัฐธิดา ขาวสุทธิ	ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๐๒
๒) นางสาวสุธิดา ทองประภา	ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๐๕
๓) นายจิรยุทธ์ สามารถ	ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๐๗
๔) นายอัษฎา ไชยวงศ์	ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๐๘
๕) นางสาวณัฐริสา บุญหนัก	ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๐๙
๖) นายนฤตม์ โชติกาญจน์	ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๑๒
๗) นางสาวพรทิพย์ อัมภรัตน์	ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๑๓
๘) นายอัศววัฒน์ คชบก	ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๑๕
๙) นางสาวธัญพิชชา สุตเขียน	ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๑๖
๑๐) นางสาวพาขวัญ นนพละ	ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๑๗
๑๑) นางสาววิมลรัตน์ แปรทอง	ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๑๘
๑๒) นางสาวจรรยาวิทย์ ขำแบ่ง	ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๑๙
๑๓) นางสาวธาราภรณ์ สมัยใหม่	ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๒๐
๑๔) นางสาวรัตนชนก ชนะคำ	ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๒๑
๑๕) นางสาวกมลทิพย์ พุ่มตาก้อง	ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๒๒
๑๖) นางสาวสุพัตรา ผาสุขพัคตร์	ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๒๓
๑๗) นางสาวฉัตรยาลักษณ์ บรรดิษฐ์	ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๒๔
๑๘) นางสาวอาภัสรา หล้าสูงเนิน	ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๒๕
๑๙) นางสาวพิมพ์ิศา ทับพันธ์	ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๒๖
๒๐) นางสาวอัจฉรี แก้วเพชรวงศ์	ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๒๗
๒๑) นางสาวชลธิชา กันยานุช	ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๒๘
๒๒) นางสาวพิชามณูช ยังฝ่อง	ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๒๙
๒๓) นางสาวณิชารีย์ ปริญาณวัตร	ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๓๐
๒๔) นายวัชรพล บุตรดีขัน	ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๓๑
๒๕) นางสาวณัฐติมา ปัดชา	ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๓๒
๒๖) นายวัชรพงษ์ พูลเขตกิจ	ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๓๓
๒๗) นายศิวักร วงสุตาล	ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๓๔
๒๘) นางสาววิภา จาระณะ	ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๓๕
๒๙) นางสาวธัญญาภรณ์ คณะศรี	ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๓๖
๓๐) นางสาวพัชรพร อนุสร	ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๓๗
๓๑) นายธนากร อริยพงษ์โสภณ	ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๓๘
๓๒) นางสาวบุษกร สมรักษ์	ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๓๙
๓๓) นางสาววิลาวัลย์ แก้วยม	ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๔๐
๓๔) นางสาวธัญญาลักษณ์ แสงโยธา	ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๔๑
๓๕) นายสุชาพงศ์ รุ่งเรือง	ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๔๒

วิภา

๓๖) นายสิทธิพร...

- ๓๖) นายสิทธิพร วงษ์คำ
- ๓๗) นางเตชินี สืบเสระ
- ๓๘) นางสาวธัญพร คนแรง
- ๓๙) นายภาณุพล โพธิ์แดง
- ๔๐) นายวัชรานุกร กองแสง
- ๔๑) นางสาวสุธาทิพย์ อิ่มน้อย
- ๔๒) นางสาวชมพูนุท กสิชีวิน
- ๔๓) นางสาวรวีวรรณ สุขารมย์
- ๔๔) นางสาวกัญญาลักษณ์ กระทาง
- ๔๕) นางสาวปิยธิดา ประแดงโค
- ๔๖) นางสาวปวีตรา นาเหล็ก
- ๔๗) นางสาวทักษพร ไกรสิงห์
- ๔๘) นางสาวเบญจวรรณ คำหงษา
- ๔๙) นางสาวพัชชา แก้วย้อย
- ๕๐) นางสาวณัฐชา สัมฤทธิ์ดี
- ๕๑) นายรอมซี กาเต๊ะ
- ๕๒) นางสาวอังคณา อุ่นตา
- ๕๓) นายสุริยะ ชูทอง
- ๕๔) นายฉันทวิชญ์ เหลวกุล
- ๕๕) นายศิวาวุธ ธรรมนิทา
- ๕๖) นายอนุวัฒน์ เรืองอ่อน
- ๕๗) นายฉัตรชัย โยวะผุย
- ๕๘) นายกลยุทธ อินทร์คำ
- ๕๙) นางสาวนันทชา เนื่อนวล
- ๖๐) นางสาวจิตตวรรณ ลิ้มสมบูรณ์
- ๖๑) ว่าที่ร้อยตรีณัฐพล สุทธิมล

- ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๔๓
- ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๔๔
- ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๔๕
- ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๔๖
- ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๔๗
- ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๔๘
- ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๔๙
- ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๕๐
- ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๕๑
- ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๕๒
- ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๕๓
- ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๕๔
- ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๕๕
- ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๕๖
- ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๕๗
- ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๕๘
- ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๕๙
- ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๖๐
- ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๖๑
- ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๖๒
- ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๖๓
- ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๖๔
- ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๖๕
- ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๖๖
- ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๖๗
- ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๖๘

วิมล

เอกสารแนบท้ายหนังสือต่ออายุรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท เอ็นไวรอนเม้นท์ รีเสิร์ช แอนด์ เทคโนโลยี จำกัด

เลขทะเบียน ว-๐๙๙

ที่ อก ๐๓๑๐(๑)/ ๖๔๗๖

ลงวันที่ ๐๓ กรกฎาคม ๒๕๖๗

ขอขยายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๑๙๓ รายการ

น้ำ/น้ำเสีย จำนวน 27 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Arsenic	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[4]
2	Barium	2) Digestion, Inductively Coupled Plasma Method ^[4]
3	Biochemical Oxygen Demand	Digestion, Inductively Coupled Plasma Method ^[4] 1) 5-Day BOD Test, Azide Modification Method ^[4] 2) 5-Day BOD Test, Membrane Electrode Method ^[4]
4	Cadmium	Digestion, Inductively Coupled Plasma Method ^[4]
5	Chemical Oxygen Demand	Closed Reflux, Titrimetric Method ^[4]
6	Chromium	Digestion, Inductively Coupled Plasma Method ^[4]
7	Color	ADMI Weighted-Ordinate Spectrophotometric Method ^[4]
8	Copper	Digestion, Inductively Coupled Plasma Method ^[4]
9	Cyanide	Distillation, Colorimetric Method ^[4]
10	Formaldehyde	Distillation, Colorimetric Method ^[3]
11	Free Chlorine	1) Iodometric Method ^[4] 2) DPD Colorimetric Method ^[4]
12	Hexavalent Chromium	Colorimetric Method ^[4]
13	Lead	1) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^[4] 2) Digestion, Inductively Coupled Plasma Method ^[4]
14	Manganese	Digestion, Inductively Coupled Plasma Method ^[4]
15	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[4]
16	Nickel	Digestion, Inductively Coupled Plasma Method ^[4]
17	Oil & Grease	Liquid-Liquid, Partition-Gravimetric Method ^[4]
18	pH	Electrometric Method ^[4]
19	Phenols	Distillation, Direct Photometric Method ^[4]
20	Selenium	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[4] 2) Digestion, Inductively Coupled Plasma Method ^[4]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
21	Sulfide	Iodometric Method ^[4]
22	Temperature	Laboratory and Field Methods ^[4]
23	Total Dissolved Solids	Dried at 180 °C ^[4]
24	Total Kjeldahl Nitrogen	1) Macro-Kjeldahl Method ^[4] 2) Semi-Micro-Kjeldahl Method ^[4]
25	Total Suspended Solids	Dried from 103 to 105 °C ^[4]
26	Trivalent Chromium	Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation ^[4]
27	Zinc	Digestion, Inductively Coupled Plasma Method ^[4]

น้ำใต้ดิน จำนวน 61 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Acetone	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
2	Antimony	Digestion, Inductively Coupled Plasma Method ^[4]
3	Arsenic	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[4] 2) Digestion, Inductively Coupled Plasma Method ^[4]
4	Barium	Digestion, Inductively Coupled Plasma Method ^[4]
5	Benzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
6	Beryllium	Digestion, Inductively Coupled Plasma Method ^[4]
7	Bromodichloromethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
8	Bromoform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
9	Cadmium	Digestion, Inductively Coupled Plasma Method ^[4]
10	Carbon disulfide	Purge and Trap Gas Chromatographic/ Mass Spectrometric Method ^[4]
11	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
12	Chlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
13	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
14	Chloroform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
15	Chromium	Digestion, Inductively Coupled Plasma Method ^[4]
16	Chromium (III)	Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation ^[4]
17	Chromium (VI)	Colorimetric Method ^[4]
18	Cyanide	Distillation, Colorimetric Method ^[4]
19	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
20	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
21	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
22	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
23	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
24	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
25	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
26	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
27	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
28	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
29	1,3-Dichloropropene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
30	Ethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]

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ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
31	Hexachloro-1,3-butadiene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
32	Lead	1) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^[4] 2) Digestion, Inductively Coupled Plasma Method ^[4]
33	Manganese	Digestion, Inductively Coupled Plasma Method ^[4]
34	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[4]
35	Methyl bromide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
36	Methylene chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
37	Methyl tert-butyl ether	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
38	Naphthalene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
39	Nickel	Digestion, Inductively Coupled Plasma Method ^[4]
40	pH	Electrometric Method ^[4]
41	Selenium	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[4] 2) Digestion, Inductively Coupled Plasma Method ^[4]
42	Silver	Digestion, Inductively Coupled Plasma Method ^[4]
43	Styrene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
44	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
45	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
46	Toluene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[4]
47	TPH (C ₅ -C ₈)	Purge and Trap, Gas Chromatographic Method ^[11,19]
48	TPH (C _{>8} -C ₁₆)	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^[9,19]

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ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
49	TPH (C ₁₆ -C ₃₅)	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^[9,19]
50	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
51	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
52	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
53	Trichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
54	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
55	Vanadium	Digestion, Inductively Coupled Plasma Method ^[4]
56	Vinyl chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
57	m-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
59	o-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
59	p-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
60	Xylene (Total)	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
61	Zinc	Digestion, Inductively Coupled Plasma Method ^[4]

อากาศเสีย (ปล่อยระบาย) จำนวน 26 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Antimony	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
2	Arsenic	1) Isokinetic Sampling, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[5] 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
3	Beryllium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
4	Cadmium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
5	Carbon Monoxide	Instrumental Analyzer Method ^[5]
6	Chlorine	1) Absorption Sampling, Ion Chromatographic Method ^[5] 2) Isokinetic Sampling, Ion Chromatographic Method ^[5]
7	Chromium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
8	Cobalt	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
9	Copper	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
10	Dioxins/Furans	Isokinetic Sampling ^[5]
11	Hydrogen Chloride	1) Absorption Sampling, Ion Chromatographic Method ^[5] 2) Isokinetic Sampling, Ion Chromatographic Method ^[5]
12	Hydrogen Fluoride	1) Absorption Sampling, Ion Chromatographic Method ^[5] 2) Isokinetic Sampling, Ion Chromatographic Method ^[5]
13	Hydrogen Sulfide	Absorption Sampling, Iodometric Method ^[5]
14	Lead	1) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5] 2) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ^[5]
15	Manganese	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
16	Mercury	Isokinetic Sampling, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[5]
17	Nickel	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
18	Opacity	Ringelmann's Method ^[2]
19	Oxides of Nitrogen	1) Absorption Sampling, Alkaline Permanganate/Colorimetric Method ^[5] 2) Instrumental Analyzer Method ^[5]
20	Selenium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]

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ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
21	Sulfur Dioxide	1) Isokinetic Sampling, Barium-Thorin Titrimetric Method ^[5] 2) Absorption Sampling, Barium-Thorin Titrimetric Method ^[5] 3) Instrumental Analyzer Method ^[5]
22	Sulfuric Acid	Isokinetic Sampling, Barium-Thorin Titrimetric Method ^[5]
23	Tin	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
24	Total Suspended Particulate	Isokinetic Sampling, Gravimetric Method ^[5]
25	Vanadium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
26	Xylene	Adsorption Sampling, Gas Chromatographic Method ^[5]

สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน 20 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Antimony	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,13] 2) Digestion, Inductively Coupled Plasma Method ^[7,13]
2	Arsenic	1) Waste Extraction, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[1,6,14] 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,13] 3) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[7,14] 4) Digestion, Inductively Coupled Plasma Method ^[7,13]
3	Barium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,13] 2) Digestion, Inductively Coupled Plasma Method ^[7,13]
4	Beryllium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,13] 2) Digestion, Inductively Coupled Plasma Method ^[7,13]
5	Cadmium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,13] 2) Digestion, Inductively Coupled Plasma Method ^[7,13]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
6	Chromium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,13]
7	Chromium (III)	2) Digestion, Inductively Coupled Plasma Method ^[7,13] 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method; Waste Extraction, Colorimetric Method; Calculation ^[1,6,13,15]
8	Chromium (VI)	2) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation ^[7,8,13,15] 1) Waste Extraction, Colorimetric Method ^[1,15]
9	Cobalt	2) Alkaline Digestion, Colorimetric Method ^[8,15] 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,13]
10	Copper	2) Digestion, Inductively Coupled Plasma Method ^[7,13] 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,13]
11	Lead	2) Digestion, Inductively Coupled Plasma Method ^[7,13] 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,13]
12	Mercury	2) Digestion, Inductively Coupled Plasma Method ^[7,13] 1) Waste Extraction, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[1,6,16]
13	Molybdenum	2) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[17] 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,13]
14	Nickel	2) Digestion, Inductively Coupled Plasma Method ^[7,13] 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,13]
15	pH	2) Digestion, Inductively Coupled Plasma Method ^[7,13] Electrometric Method ^[21,22]
16	Selenium	1) Waste Extraction, Digestion, Hydride Generation/ Atomic Absorption Spectrometric Method ^[1,6,18] 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,13]

พิมพ์

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
17	Silver	3) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[7,18] 4) Digestion, Inductively Coupled Plasma Method ^[7,13] 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,13] 2) Digestion, Inductively Coupled Plasma Method ^[7,13]
18	Thallium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,13] 2) Digestion, Inductively Coupled Plasma Method ^[7,13]
19	Vanadium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,13] 2) Digestion, Inductively Coupled Plasma Method ^[7,13]
20	Zinc	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,13] 2) Digestion, Inductively Coupled Plasma Method ^[7,13]

ดิน จำนวน 59 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Acetone	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[12,20]
2	Antimony	Digestion, Inductively Coupled Plasma Method ^[7,13]
3	Arsenic	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[7,14] 2) Digestion, Inductively Coupled Plasma Method ^[7,13]
4	Barium	Digestion, Inductively Coupled Plasma Method ^[7,13]
5	Benzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[12,20]
6	Beryllium	Digestion, Inductively Coupled Plasma Method ^[7,13]
7	Bromodichloromethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[12,20]
8	Bromoform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[12,20]
9	Cadmium	Digestion, Inductively Coupled Plasma Method ^[7,13]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
10	Carbon disulfide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[12,20]
11	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[12,20]
12	Chlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[12,20]
13	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[12,20]
14	Chloroform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[12,20]
15	Chromium	Digestion, Inductively Coupled Plasma Method ^[7,13]
16	Chromium (III)	Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation ^[7,8,13,15]
17	Chromium (VI)	Alkaline Digestion, Colorimetric Method ^[8,15]
18	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[12,20]
19	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[12,20]
20	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[12,20]
21	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[12,20]
22	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[12,20]
23	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[12,20]
24	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[12,20]
25	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[12,20]
26	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[12,20]
27	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[12,20]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
28	1,3-Dichloropropene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[12,20]
29	Ethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[12,20]
30	Hexachloro-1,3-butadiene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[12,20]
31	Lead	Digestion, Inductively Coupled Plasma Method ^[7,13]
32	Manganese	Digestion, Inductively Coupled Plasma Method ^[7,13]
33	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[17]
34	Methyl bromide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[12,20]
35	Methylene chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[12,20]
36	Methyl tert-butyl ether	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[12,20]
37	Naphthalene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[12,20]
38	Nickel	Digestion, Inductively Coupled Plasma Method ^[7,13]
39	Selenium	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[7,18] 2) Digestion, Inductively Coupled Plasma Method ^[7,13]
40	Silver	Digestion, Inductively Coupled Plasma Method ^[7,13]
41	Styrene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[12,20]
42	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[12,20]
43	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[12,20]
44	Toluene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[12,20]
45	TPH (C ₅ -C ₈)	Purge and Trap, Gas Chromatographic Method ^[12,19]
46	TPH (C _{>8} -C ₁₆)	Ultrasonic Extraction, Gas Chromatographic Method ^[10,19]

อินท

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
47	TPH (C _{>16} -C ₃₅)	Ultrasonic Extraction, Gas Chromatographic Method ^[10,19]
48	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[12,20]
49	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[12,20]
50	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[12,20]
51	Trichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[12,20]
52	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[12,20]
53	Vanadium	Digestion, Inductively Coupled Plasma Method ^[7,13]
54	Vinyl chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[12,20]
55	m-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[12,20]
56	o-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[12,20]
57	p-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[12,20]
58	Xylene (Total)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[12,20]
59	Zinc	Digestion, Inductively Coupled Plasma Method ^[7,13]

เอกสารอ้างอิง

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3mgl

ที่ อก ๐๓๑๐(๑)/ ๑๑ ๕'๒ ๓



กรมโรงงานอุตสาหกรรม

ถนนพระรามที่ ๖ แขวงทุ่งพญาไท

เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

๒๑ พฤศจิกายน ๒๕๖๗

เรื่อง เปลี่ยนแปลงบุคลากรและสารมลพิษที่วิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท เอ็นไวรอนเมนต์ รีเสิร์ช แอนด์ เทคโนโลยี จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๒๓ กันยายน ๒๕๖๗

สิ่งที่ส่งมาด้วย เอกสารแนบท้ายหนังสือเปลี่ยนแปลงบุคลากรและสารมลพิษที่วิเคราะห์

บริษัท เอ็นไวรอนเมนต์ รีเสิร์ช แอนด์ เทคโนโลยี จำกัด จำนวน ๒ แผ่น

ตามคำขอที่อ้างถึง บริษัท เอ็นไวรอนเมนต์ รีเสิร์ช แอนด์ เทคโนโลยี จำกัด ห้องปฏิบัติการวิเคราะห์
เอกชน เลขทะเบียน ว-๐๙๙ สถานที่ตั้งเลขที่ ๒๕/๑๑๔ หมู่ที่ ๖ ซอยชินเขต ๑ ถนนงามวงศ์วาน แขวงทุ่งสองห้อง
เขตหลักสี่ กรุงเทพมหานคร ขอเปลี่ยนแปลงบุคลากรและสารมลพิษที่วิเคราะห์ ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว มีความเห็นดังนี้

๑. ให้ยกเลิกเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๒ ราย

๑) นางสาวกมลทิพย์ พุ่มตาก้อง ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๒๒

๒) นายศิวารุช ธรรมนิทา ทะเบียนเลขที่ ว-๐๙๙-จ-๐๐๖๒

๒. ให้เพิ่มขอบข่ายชนิดสารมลพิษที่วิเคราะห์ในน้ำ/น้ำเสีย น้ำใต้ดิน และดิน ตามสิ่งที่ส่งมาด้วย

อนึ่ง หนังสือฉบับนี้จะหมดอายุพร้อมหนังสือต่ออายุรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
ในวันที่ ๑๘ พฤษภาคม ๒๕๗๑

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายธีรทัศน์ อิศรางกูร ณ อยุธยา)

รองอธิบดี ปฏิบัติราชการแทน

อธิบดีกรมโรงงานอุตสาหกรรม

กองวิจัยและเตือนภัยมลพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕

โทรสาร ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๙๙

ไปรษณีย์อิเล็กทรอนิกส์ saraban@diw.mail.go.th



เอกสารแนบท้ายหนังสือเปลี่ยนแปลงบุคลากรและสารมลพิษที่วิเคราะห์

บริษัท เอ็นไวรอนเม้นท์ รีเสิร์ช แอนด์ เทคโนโลยี จำกัด

เลขทะเบียน ว-๐๙๙

ที่ อก ๐๓๑๐(๑)/ ๑๑ ๕๒ ๓

ลงวันที่ ๒๑ พฤศจิกายน ๒๕๖๗

ขอข่ายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๔๗ รายการ

น้ำ/น้ำเสีย จำนวน 19 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Aldrin	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]
2	α -BHC	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]
3	β -BHC	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]
4	δ -BHC	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]
5	γ -BHC	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]
6	Chlordane	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]
7	o,p'-DDT	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]
8	4,4'-DDD	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]
9	4,4'-DDE	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]
10	4,4'-DDT	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]
11	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]
12	Endosulfan I	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]
13	Endosulfan II	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]
14	Endosulfan sulfate	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]
15	Endrin	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]
16	Endrin aldehyde	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]
17	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]
18	Heptachlor epoxide	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]
19	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]

น้ำใต้ดิน จำนวน 14 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Aldrin	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]
2	Chlordane	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]
3	DDD	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]
4	DDE	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]
5	DDT	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]
6	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]

7 Endosulfan...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
7	Endosulfan	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]
8	Endrin	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]
9	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]
10	Heptachlor epoxide	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]
11	α -HCH	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]
12	β -HCH	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]
13	γ -HCH	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]
14	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]

ดิน จำนวน 14 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Aldrin	Ultrasonic Extraction, Gas Chromatographic Method ^[2,3]
2	Chlordane	Ultrasonic Extraction, Gas Chromatographic Method ^[2,3]
3	DDD	Ultrasonic Extraction, Gas Chromatographic Method ^[2,3]
4	DDE	Ultrasonic Extraction, Gas Chromatographic Method ^[2,3]
5	DDT	Ultrasonic Extraction, Gas Chromatographic Method ^[2,3]
6	Dieldrin	Ultrasonic Extraction, Gas Chromatographic Method ^[2,3]
7	Endosulfan	Ultrasonic Extraction, Gas Chromatographic Method ^[2,3]
8	Endrin	Ultrasonic Extraction, Gas Chromatographic Method ^[2,3]
9	Heptachlor	Ultrasonic Extraction, Gas Chromatographic Method ^[2,3]
10	Heptachlor epoxide	Ultrasonic Extraction, Gas Chromatographic Method ^[2,3]
11	α -HCH	Ultrasonic Extraction, Gas Chromatographic Method ^[2,3]
12	β -HCH	Ultrasonic Extraction, Gas Chromatographic Method ^[2,3]
13	γ -HCH	Ultrasonic Extraction, Gas Chromatographic Method ^[2,3]
14	Methoxychlor	Ultrasonic Extraction, Gas Chromatographic Method ^[2,3]

เอกสารอ้างอิง

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ที่ อก ๐๓๑๐(๑)/ ๑๖๐๘



กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

๒๘ กุมภาพันธ์ ๒๕๖๘

เรื่อง เปลี่ยนแปลงสารมลพิษที่วิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท เอ็นไวรอนเมนต์ รีเสิร์ช แอนด์ เทคโนโลยี จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๒๗ มกราคม ๒๕๖๘

สิ่งที่ส่งมาด้วย เอกสารแนบท้ายหนังสือเปลี่ยนแปลงสารมลพิษที่วิเคราะห์

บริษัท เอ็นไวรอนเมนต์ รีเสิร์ช แอนด์ เทคโนโลยี จำกัด จำนวน ๑ แผ่น

ตามคำขอที่อ้างถึง บริษัท เอ็นไวรอนเมนต์ รีเสิร์ช แอนด์ เทคโนโลยี จำกัด ห้องปฏิบัติการวิเคราะห์
เอกชน เลขทะเบียน ว-๐๙๙ สถานที่ตั้งเลขที่ ๒๕/๑๑๔ หมู่ที่ ๖ ซอยชินเขต ๑ ถนนงามวงศ์วาน แขวงทุ่งสองห้อง
เขตหลักสี่ กรุงเทพมหานคร ขอเปลี่ยนแปลงสารมลพิษที่วิเคราะห์ ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท เอ็นไวรอนเมนต์ รีเสิร์ช แอนด์ เทคโนโลยี จำกัด
เพิ่มขอบข่ายชนิดสารมลพิษที่วิเคราะห์ในน้ำ/น้ำเสีย น้ำใต้ดิน อากาศเสีย และดิน ตามสิ่งที่ส่งมาด้วย

อนึ่ง หนังสือฉบับนี้จะสิ้นอายุพร้อมหนังสือต่ออายุรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
ในวันที่ ๑๘ พฤษภาคม ๒๕๗๑

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ


(นายอิทธิศักดิ์ อัครางกูร ณ อยุธยา)
รองอธิบดี ปฏิบัติราชการแทน
อธิบดีกรมโรงงานอุตสาหกรรม

กองวิจัยและเตือนภัยมลพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕

โทรสาร ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๙๙

ไปรษณีย์อิเล็กทรอนิกส์ saraban@diw.mail.go.th



เอกสารแนบท้ายหนังสือเปลี่ยนแปลงสารมลพิษที่วิเคราะห์

บริษัท เอ็นไวรอนเม้นท์ รีเสิร์ช แอนด์ เทคโนโลยี จำกัด

เลขทะเบียน ว-๐๙๙

ที่ อก ๐๓๑๐(๑)/ ๑๖๐๘

ลงวันที่ ๒๘ กุมภาพันธ์ ๒๕๖๘

ขอขย้ายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๔ รายการ

น้ำ/น้ำเสีย จำนวน 1 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Toxaphene	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]

น้ำใต้ดิน จำนวน 1 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Toxaphene	Liquid-Liquid Extraction, Gas Chromatographic Method ^[1]

อากาศเสีย (ปล่องระบาย) จำนวน 1 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Cresol	Adsorption Sampling, Gas Chromatographic Method ^[2]

ดิน จำนวน 1 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Toxaphene	Ultrasonic Extraction, Gas Chromatographic Method ^[3,4]

เอกสารอ้างอิง

1. APHA, AWWA, WEF. **Standard Methods for the Examination of Water and Wastewater.** 24th ed. Washington, DC: APHA, 2017.
2. United States Environmental Protection Agency. **Standards of Performance for New Stationary Sources.** 40 CFR 60. Appendix A, 2023.
3. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. **Ultrasonic Extraction. SW-846 Method 3550C,** 2007.
4. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. **Organochlorine Pesticides by Gas Chromatography. SW-846 Method 8081B,** 2007.

ภาคผนวกที่ 5

เอกสารสอบเทียบเครื่องมือตรวจวัด

Calibration Report

Customer Name : บริษัท ไฟฟ้าสุรินทร์ จำกัด
Address : เลขที่ 264 หมู่ที่ 13 ตำบลปรีอ อำเภอปราสาท จังหวัดสุรินทร์ 32140
Project Name : โครงการโรงไฟฟ้าในโรงงานน้ำตาล ขนาดกำลังการผลิตเท่ากับ 30 เมกะวัตต์
Sampling Date : January – June, 2025

Stack

Item	Equipment	Manufacturer	Model	Serial Number	Calibration Date
1	Console Meter	APEX 1	MC-572	0306016	September 25, 2024
2	Console Meter	APEX 4	XC-572-V	1602011	September 24, 2024
3	Flue Gas Analyzer	Testo	TESTO 350	03599831	January 21, 2025
4	Flue Gas Analyzer	Testo	TESTO 350	62227989	March 11, 2025
5	Electronic Balance	Mettler Toledo	MS204S/01	B445239164	January 15, 2025

Calibration Report

Customer Name : บริษัท ไฟฟ้าสุรินทร์ จำกัด
Address : เลขที่ 264 หมู่ที่ 13 ตำบลปรี้อ อำเภอปราสาท จังหวัดสุรินทร์ 32140
Project Name : โครงการโรงไฟฟ้าในโรงงานน้ำตาล ขนาดกำลังการผลิตเท่ากับ 30 เมกะวัตต์
Sampling Date : January – June, 2025

Ambient

Item	Equipment	Manufacturer	Model	Serial Number	Calibration Date
1	TSP High-volume No. A2	Thermo Andersen	HIVOL-BBCBE	6215-462	February 24, 2025
2	TSP High-volume No. A31	Thermo Electron Corporation	HIVOL-BBCBE	57-507	February 26, 2025
3	TSP High-volume No. A21	Thermo Scientific	HIVOL-BBCBE	2216	February 24, 2025
4	TSP High-volume No. A20	Thermo Scientific	HIVOL-BBCBE	2142	February 25, 2025
5	TSP High-volume No. A24	Thermo Scientific	HIVOL-BBCBE	2149	May 27, 2025
6	TSP High-volume No. A11	Thermo Andersen	HIVOL-BBCBE	2141	May 27, 2025
7	TSP High-volume No. A22	Thermo Scientific	HIVOL-BBCBE	2054	May 27, 2025
8	TSP High-volume No. A10	Thermo Andersen	HIVOL-BBCBE	2012-04	May 27, 2025
9	High volume PM-10 No. 31	Thermo Electron Corporation	HIVOL-BMBBE	31	February 24, 2025
10	High-volume PM-10 No. 5	Thermo Andersen	HIVOL-BMBBE	2015-5	February 24, 2025
11	High volume PM-10 No. 28	Thermo Scientific	HIVOL-BMBBE	2206	February 24, 2025
12	High volume PM-10 No. 29	Thermo Scientific	HIVOL-BMBBE	2210	February 25, 2025
13	High-volume PM-10 No. 1	Thermo Andersen	HIVOL-BMBBE	1	May 27, 2025
14	High volume PM-10 No. 21	Thermo Scientific	HIVOL-BMBBE	2132	May 27, 2025
15	High-volume PM-10 No. 11	Thermo Scientific	HIVOL-BMBBE	610-643	May 27, 2025
16	High-volume PM-10 No. 6	Thermo Scientific	HIVOL-BMBBE	B-PM-10 No. 6	May 27, 2025

Calibration Report

Customer Name : บริษัท ไฟฟ้าสุรินทร์ จำกัด
Address : เลขที่ 264 หมู่ที่ 13 ตำบลปรี้อ อำเภอปราสาท จังหวัดสุรินทร์ 32140
Project Name : โครงการโรงไฟฟ้าในโรงงานน้ำตาล ขนาดกำลังการผลิตเท่ากับ 30 เมกะวัตต์
Sampling Date : January – June, 2025

Ambient

Item	Equipment	Manufacturer	Model	Serial Number	Calibration Date
17	Orifice	TISCH Environmental	TE-5025A	3883	June 26, 2024
18	Orifice	TISCH Environmental	TE-5025A	2913	February 14, 2025
19	Electronic Balance	Mettler Toledo	AB204-S	1123103723	January 16, 2025
20	Electronic Balance	AND	BM-5	T1004302	January 6, 2025
21	NOx Analyzer	HORIBA	APNA-370	FC2E28YU	February 9, 2025
22	NOx Analyzer	HORIBA	APNA-370	KCDVY226	February 9, 2025
23	NOx Analyzer	HORIBA	APNA-370	TNTLC359	February 9, 2025
24	NOx Analyzer	API	200A	1464	February 8, 2025
25	NOx Analyzer	HORIBA	APNA-370	KPACV8NA	May 9, 2025
26	NOx Analyzer	HORIBA	APNA-370	4VWFEBUK	May 9, 2025
27	NOx Analyzer	HORIBA	APNA-360CE	EYC70000	May 9, 2025
28	NOx Analyzer	HORIBA	APNA-370	NGABK8F2	May 9, 2025

Calibration Report

Customer Name : บริษัท ไฟฟ้าสุรินทร์ จำกัด
Address : เลขที่ 264 หมู่ที่ 13 ตำบลปรีอ อำเภอบราสาท จังหวัดสุรินทร์ 32140
Project Name : โครงการโรงไฟฟ้าในโรงงานน้ำตาล ขนาดกำลังการผลิตเท่ากับ 30 เมกะวัตต์
Sampling Date : January – June, 2025

Ambient

Item	Equipment	Manufacturer	Model	Serial Number	Calibration Date
29	WS/WD	Davis Instruments	Vantage Pro2	AX161108018	August 28, 2024
30	WS/WD	Davis Instruments	Vantage Pro2	AS160105011	January 15, 2025
31	WS/WD	Davis Instruments	Vantage Pro2	A80409D18N	December 12, 2024
32	WS/WD	Davis Instruments	Vantage Pro2	AS160105017	January 15, 2025
33	WS/WD	Davis Instruments	Wizard III	WC40922A02	January 15, 2025
34	WS/WD	Davis Instruments	Wizard III	WC30506A54A	January 15, 2025
35	WS/WD	Davis Instruments	Wizard III	WC40801A97	December 12, 2024
36	WS/WD	Davis Instruments	Wizard III	WE91016A19	August 28, 2024

Calibration Report

Customer Name : บริษัท ไฟฟ้าสุรินทร์ จำกัด
Address : เลขที่ 264 หมู่ที่ 13 ตำบลปรี้อ อำเภอปราสาท จังหวัดสุรินทร์ 32140
Project Name : โครงการโรงไฟฟ้าในโรงงานน้ำตาล ขนาดกำลังการผลิตเท่ากับ 30 เมกะวัตต์
Sampling Date : January – June, 2025

Water

Item	Equipment	Manufacturer	Model	Serial Number	Calibration Date
1	pH Meter	Waterproof	pHTestr30	3195381	January 15, 2025
2	Hot Air Oven	Memmert	UF 110	B414.0652	January 6, 2025
3	Hot Air Oven	Binder	FED 115 E2	11-22823	January 6, 2025
4	Electronic Balance	Mettler Toledo	MS204TS/01	B334691537	January 15, 2025
5	Incubator	Hotpack	352601	78633	November 29, 2024
6	DO Meter	YSI	5000-115V	03C1280 AC	September 6, 2024
7	Heating Block	Hanna	HI 8398000-02	G0059491	November 30, 2024
8	Electronic Balance	Mettler Toledo	MS204TS/00	B547728937	January 15, 2025

Calibration Report

Customer Name : บริษัท ไฟฟ้าสุรินทร์ จำกัด
Address : เลขที่ 264 หมู่ที่ 13 ตำบลปรี้อ อำเภอลำทะเมนชัย จังหวัดสุรินทร์ 32140
Project Name : โครงการโรงไฟฟ้าในโรงงานน้ำตาล ขนาดกำลังการผลิตเท่ากับ 30 เมกะวัตต์
Sampling Date : January – June, 2025

Noise

Item	Equipment	Manufacturer	Model	Serial Number	Calibration Date
1	Sound Level Meter	RION	NL-31	00803922	February 24, 2025
2	Sound Level Meter	Scarlet Tech	ST-11D	820801	February 24, 2025
3	Sound Level Meter	Scarlet Tech	ST-11D	820933	February 24, 2025
4	Sound Level Meter	RION	NL-31	00803925	February 24, 2025
5	Sound Level Meter	Scarlet Tech	ST-21D	820453	May 28, 2025
6	Sound Level Meter	Scarlet Tech	ST-21D	820449	May 28, 2025
7	Sound Level Meter	Scarlet Tech	ST-21D	820466	May 28, 2025
8	Sound Level Meter	Scarlet Tech	ST-21D	820467	May 28, 2025
9	Acoustic Calibrator	BSWA	CA114	590048	September 12, 2024
10	Acoustic Calibrator	BSWA	CA114	590043	January 17, 2025

Calibration Report

Customer Name : บริษัท ไฟฟ้าสุรินทร์ จำกัด
Address : เลขที่ 264 หมู่ที่ 13 ตำบลปรี้อ อำเภอปราสาท จังหวัดสุรินทร์ 32140
Project Name : โครงการโรงไฟฟ้าในโรงงานน้ำตาล ขนาดกำลังการผลิตเท่ากับ 30 เมกะวัตต์
Sampling Date : January – June, 2025

Workplace


Item	Equipment	Manufacturer	Model	Serial Number	Calibration Date
1	Sound Level Meter	ACO	6236	222110	February 25, 2025
2	Sound Level Meter	ACO	6236	222112	February 25, 2025
3	Sound Level Meter	ACO	6236	222114	February 25, 2025
4	Sound Level Meter	ACO	6236	222123	February 25, 2025
5	Sound Level Meter	RION	NL-21	01009847	February 25, 2025
6	Sound Level Meter	RION	NL-53	00251813	June 5, 2025
7	Sound Level Meter	RION	NL-53	00251852	June 5, 2025
8	Sound Level Meter	RION	NL-53	00251827	June 5, 2025
9	Sound Level Meter	RION	NL-53	00251856	June 5, 2025
10	Sound Level Meter	RION	NL-53	00251829	June 5, 2025
11	Acoustic Calibrator	LARSON DAVIS	CAL200	5652	August 27, 2024
12	Acoustic Calibrator	LARSON DAVIS	CAL250	2528	November 20, 2024
13	Personal Pump	Gilian	GiAir-5	ERTC118: 12160	February 25, 2025
14	Personal Pump	Gilian	GiAir-5	ERTC119: 12161	February 25, 2025

Calibration Report

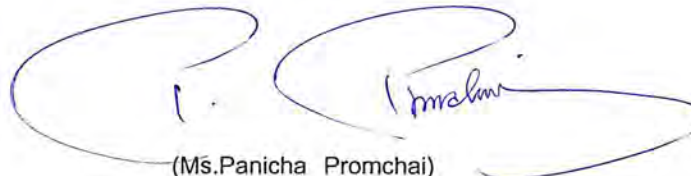
Customer Name : บริษัท ไฟฟ้าสุรินทร์ จำกัด
Address : เลขที่ 264 หมู่ที่ 13 ตำบลปรี้อ อำเภอปราสาท จังหวัดสุรินทร์ 32140
Project Name : โครงการโรงไฟฟ้าในโรงงานน้ำตาล ขนาดกำลังการผลิตเท่ากับ 30 เมกะวัตต์
Sampling Date : January – June, 2025

Workplace

Item	Equipment	Manufacturer	Model	Serial Number	Calibration Date
15	Personal Pump	Gilian	GilAir-5	ERTC58: 13788	June 3, 2025
16	Personal Pump	Gilian	GILAIR-3/GilAir	ERTC61: 20051103010	June 3, 2025
17	Personal Pump	Gilian	BDX II	ERTC65: ERTC#65	June 3, 2025
18	Personal Pump	Gilian	GilAir-5/clock	ERTC135: 13276	June 3, 2025
19	Dry Cal	Bios International	DCL-ML	4492	September 7, 2024
20	Heat Stress Monitor	Metrosonics	Hs – 32	MCD070019	October 22, 2024
21	Heat Stress Monitor	Metrosonics	Hs – 32	MCH110038	October 22, 2024
22	Heat Stress Monitor	Metrosonics	Hs – 32	MCF010006	January 14, 2025


(Ms. Supawan Suwannapa)
Environmental Scientist




(Ms. Panicha Promchai)
Laboratory Supervisor



Certificate of Calibration

Method 5 Pre-Test Calibration - Liters (L)

UUT Meter Console Information

Model #: 572
Serial #: 0306016
DGM Model #: SK25EX
DGM Serial #: 00005305

Calibration Conditions

Bar. Pressure (mm Hg): 756.4
Ambient Temperature (°C): 24.9
Relative Humidity (%): 84
Altitude (m): 1.83
Bar. Pressure Corr. (mm Hg): 756.3

Factors/Conversions

Std. Temp. (K): 293.15
Std. Press. (mm Hg): 760
K₁ (K/mm Hg): 0.3857

Reference Equipment

Calibration Meter Model: DGMR-200H
Cal. Due Date: 20-Aug-25
Serial No.: 0000026
Gamma: 1.0000

UUT Meter (DGM)

Run Time (seconds)	Orifice, ΔH (mm H ₂ O)	Volume			Meter Temperature (°C)		Meter Pressure (in H ₂ O)	Volume (L)			Outlet Temperature (°C)	
		Initial (L)	Final (L)	Total (L)	Initial	Final		Initial	Final	Total	Initial	Final
Θ	P _{m(g)}	V _{mi}	V _{mf}	V _m	t _{mi}	t _{mf}	P _w	V _{wi}	V _{wf}	V _w	t _{wi}	t _{wf}
840.00	13.00	1103598.0	1103738.0	140.0	25.0	25.0	0.3	0.00	152.23	152.23	25.0	25.0
630.00	25.00	1103738.0	1103887.0	149.0	25.0	26.0	0.5	0.00	160.29	160.29	25.0	25.0
450.00	50.00	1103887.0	1104042.0	155.0	26.0	26.0	0.6	0.00	165.34	165.34	25.0	25.0
360.00	80.00	1104042.0	1104200.4	158.4	26.0	27.0	2.0	0.00	169.87	169.87	25.0	25.0
300.00	120.00	1104200.4	1104365.0	164.6	28.0	29.0	2.4	0.00	179.87	179.87	25.0	25.0

Reference Meter (WTM)

Standardized Data

Reference Meter (L)		UUT Meter (L)		Correction Factor		ΔH @ (mm H ₂ O)	
Std. Vol.	Std. Flow	Std. Vol.	Std. Flow	Value	Variance	0.0212 SCMM	Variance
V _{w(std)}	Q _{w(std)}	V _{m(std)}	V _{w(std)}	Y	ΔY	ΔH@	ΔΔH@
149.06	10.65	137.15	10.6	1.0868	0.0060	50.8	3.426
157.03	14.95	145.89	15.0	1.0763	-0.0045	49.5	2.169
162.02	21.60	151.88	21.6	1.0667	-0.0141	47.5	0.174
167.03	27.84	155.41	27.8	1.0748	-0.0060	46.1	-1.189
177.03	35.41	161.04	35.4	1.0993	0.0185	42.8	-4.580
				1.0808	= Y Avg.	47.3	= ΔH@ Avg. Metric

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is ±0.02.

Note: For ΔH_g, orifice pressure differential that equates to 0.0212m³/min at standard temperature and pressure, acceptable tolerance of individual values from the average is ±0.2inches (5.1mm) H₂O.

Pass/Fail Judgment :

Pass

Calibrate By :

Pattanasan P.

Approved By :

[Signature]

Date:

10 Sep 24

The instruments listed and described on this certificate have been calibrated against standards traceable to the National Institute of Standards and Technology (N.I.S.T.) and in reference to EPA Method 5, Section 10.3.1.

Nomenclature

Equations

Calibration Train

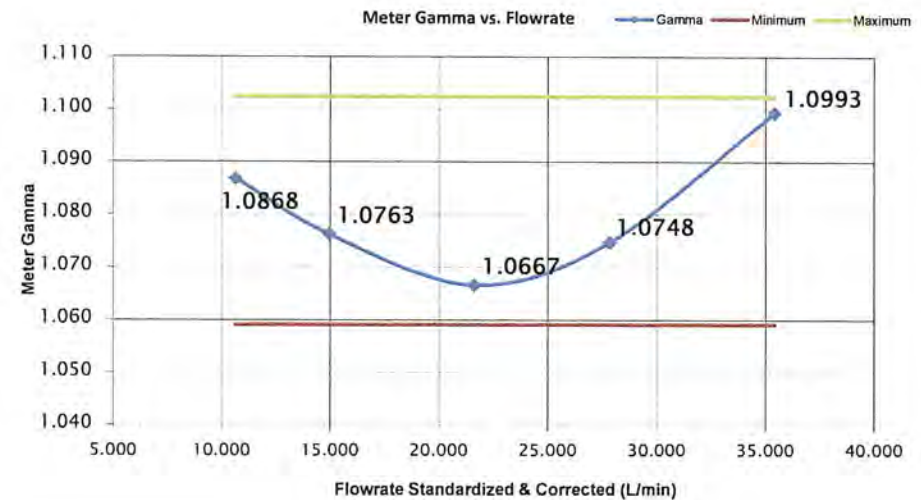
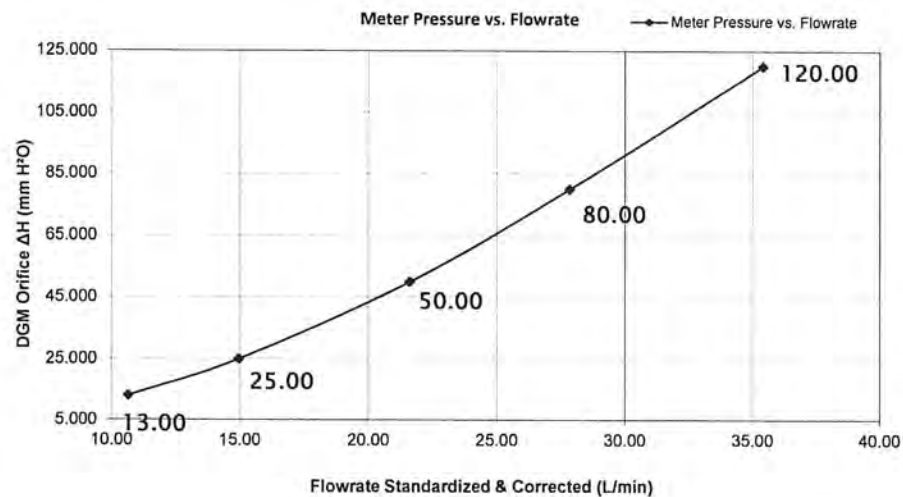
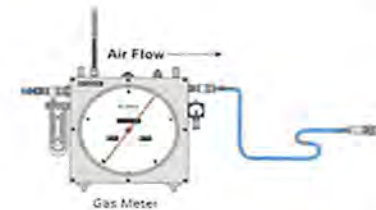
P_b - Barometric Pressure
 DGM - Dry Gas Meter
 K_1 - Constant based on standard temp and press
 Θ - Run time, in minutes
 P_m - ΔH (Meter Pressure, gauge)
 V_m - Volume collected by test meter, corrected for STP
 $Q_{m(std)}$ - Calculated flow rate of test meter
 K' - Critical orifice coefficient
 P_w - Measured pressure of reference meter
 t_w - Temperature measured in reference meter

$$V_{w(std)} = Y * K_1 \frac{V_w * (P_{bar} + \frac{P_{m(g)}}{13.6})}{T_w}$$

$$V_{m(std)} = \frac{K_1 V_m (P_{bar} + \frac{\Delta H}{13.6})}{T_m}$$

$$K_1 = \frac{T_{std}}{P_{std}} \quad Y = \frac{V_{cr(std)}}{V_{m(std)}} \quad Q_{w(std)} = \frac{V_{w(std)}}{\Theta}$$

$$Metric \Delta H_o = \frac{P_{m(g)} * 0.0011696 * (P_{bar} + \frac{P_{m(g)}}{13.6})}{T_m} * \left(\frac{T_w * \Theta}{V_w * P_{bar}} \right)^2$$





Certificate of Calibration

Method 5 Console Sensor Calibration - Metric Units

Console Information

Model #: 572
Serial #: 0306016
Units: Metric

Calibration Conditions

Pbar (mm. Hg): 756.4
Humidity (%): 84
Tamb (°C): 24.9
Elevation (m): 1.8
Corr. Pbar (mm. Hg): 756.3

Reference Devices

TC Calibrator Model: CC-VTR-SH
Reference #: 091109269
Barometer Model: 736930
Reference #: EBARODIALSPE01
Pressure Model: 718 30G
Reference #: 9543013

Temperature Display Calibration Data

Reference Point ¹	Reference Temp.	Test Thermocouple Calibrations					Reference Point Status ²
		Probe	Stack	Filter	Exit	Aux	
#	°C	°C	°C	°C	°C	°C	Pass/Fail
1	-18	-18	-17	-18	-17	-17	PASS
2	38	38	38	37	36	37	PASS
3	93	93	93	93	92	93	PASS
4	149	150	149	151	149	149	PASS
5	260	259	259	260	259	259	PASS
6	371	372	372	373	371	372	PASS
7	482	482	482	483	482	482	PASS
8	593	595	594	594	594	594	PASS
9	816	818	816	816	816	816	PASS
10	1038	1039	1039	1039	1038	1038	PASS
							PASS

Overall Audit Status

NIST Reference Thermocouple ID:

12702001

Ref Point	Theoretical Temp.	DGM Thermocouple Sensor Reading	ΔT_{abs} ⁴
#	°C	°C	°C
Ice Water	1	1.1	2
Ambient ³	2	24.9	25
			Maximum ²
			Status

Internal temperature thermocouple is not audited to EPA standards, and should not be used as an official reference for ambient temperature.

Calibrate By :

Dattanyan P.

Approved By:

K.

Date:

10 Sep 24

Notes

¹ Suggested, minimum reference points are 10 (0, 100, 200, 300, 500, 700, 900, 1100, 1500, 1900 °F), can test for more.

² For valid test results, the maximum difference between temperature and reference readings should be less than ± 5.4 °F (± 3 °C), for all thermocouples except for the stack thermocouple which should be less than $\pm 1.5\%$ absolute temperature from the reference reading and the exit thermocouple which should be less than ± 2 °F (± 1 °C) from the reference reading (EPA Method 2, Section 6.3 and EPA Method 5, Sections 6.1.1.7-6.1.1.8)

³ Do not change this cell value, it is instead based on input from Cell H8 at the top of this sheet under "Calibration Conditions"

⁴ Absolute temperature difference and other formulas are calculated based on unit input from cell C8 at the top of this sheet under "Meter Console Information"

⁵ For valid test results, the maximum difference between console and reference barometric pressure readings should be less than ± 0.1 in. Hg (± 2.5 mm Hg), (EPA Method 5, Section 6.1.2)

⁶ For valid test results, the maximum difference between console and reference vacuum readings should be less than ± 0.5 in. Hg (± 12.5 mm Hg)

⁶ For valid test results, the maximum difference between console and reference vacuum readings should be less than ± 0.05 in. H₂O (± 1.25 mm H₂O), or 5% of full scale



Console Sensor Calibration Data Sheet

Console Information

Model #: 572
Serial #: 0306016
Units: Metric
Type:
"English"

Calibration Conditions

Pbar (mm. Hg): 756.4
Humidity (%): 84.0
Tamb (°C): 24.9
Corr. Pbar (mm. Hg): 756.3

Reference Devices

TC Simulator Model: CC-VTR-SH
Reference #: 091109269
Barometer Model: 736930
Reference #: EBARODIALSPE01
Digital Pressure Calibrator Model: 718 30G
Reference #: 3891001

Pressure Gauge / Manometer Calibration Data

Console Vacuum Calibration			
Reference Point	Reference Vacuum	Console Vacuum	Reference Point Status ⁶
#	in. Hg	in. Hg	Pass/Fail
1	-5.0	-5.5	PASS
2	-15.0	-15.5	PASS
3	-20.0	-20.5	PASS

Reference Point ¹	ΔH_Manometer Calibration			Reference Point Status ²
	Reference	Positive (+) Pitot	Negative (-) Pitot	
#	mm H ₂ O	mm H ₂ O	mm H ₂ O	Pass/Fail
1	-200.0	0.0	-200.0	PASS
2	-150.0	0.0	-150.0	PASS
3	-100.0	0.0	-100.0	PASS
4	-80.0	0.0	-80.0	PASS
5	-50.0	0.0	-50.0	PASS
6	0.0	0.0	0.0	PASS
7	50.0	50.0	0.0	PASS
8	80.0	80.0	0.0	PASS
9	100.0	100.0	0.0	PASS
10	150.0	150.0	0.0	PASS
11	200.0	200.0	0.0	PASS
ΔH Overall Audit Status				PASS

Reference Point ¹	ΔP_Manometer Calibration			Reference Point Status ²
	Reference	Positive (+) Pitot	Negative (-) Pitot	
#	mm H ₂ O	mm H ₂ O	mm H ₂ O	Pass/Fail
1	-200.0	0.0	-200.0	PASS
2	-150.0	0.0	-150.0	PASS
3	-100.0	0.0	-100.0	PASS
4	-80.0	0.0	-80.0	PASS
5	-50.0	0.0	-50.0	PASS
6	0.0	0.0	0.0	PASS
7	50.0	50.0	0.0	PASS
8	80.0	80.0	0.0	PASS
9	100.0	100.0	0.0	PASS
10	150.0	150.0	0.0	PASS
11	200.0	200.0	0.0	PASS
ΔP Overall Audit Status				PASS

Calibrate By: Pattarapan P. Approved By: [Signature] Date: 10 Sep 24

Notes

- ¹ Suggested, minimum reference points are 10 (0, 100, 200, 300, 500, 700, 900, 1100, 1500, 1900 °F), can test for more.
- ² For valid test results, the maximum difference between temperature and reference readings should be less than ±5.4 °F (±3 °C), for all thermocouples except for the stack thermocouple which should be less than ±1.5% absolute temperature from the reference reading and the exit thermocouple which should be less than ±2°F (±1 °C) from the reference
- ³ Do not change this cell value, it is instead based on input from Cell H8 at the top of this sheet under "Calibration Conditions"
- ⁴ Absolute temperature difference and other formulas are calculated based on unit input from cell C8 at the top of this sheet under "Meter Console Information"
- ⁵ For valid test results, the maximum difference between console and reference barometric pressure readings should be less than ±0.1 in. Hg (±2.5 mm Hg), (EPA Method 5, Section 6.1.2)
- ⁶ For valid test results, the maximum difference between console and reference vacuum readings should be less than ±0.5 in. Hg (±12.5 mm Hg)
- ⁷ For valid test results, the maximum difference between console and reference vacuum readings should be less than ±0.05 in. H₂O (±1.25 mm H₂O), or 5% of full scale
- I certify that the above Thermocouple Sensors were calibrated in accordance with US EPA Methods 2 and 5, CFR 40 Part 60.



neediss Console Sensor Audit QA Sheet

Meter Console Information (UUT)

Model #: 572
 Serial #: 0306016
 Units: Metric

Calibration Conditions

Pbar (mm. Hg): 756.4
 Humidity (%): 84
 Amb. Temp. (°C): 24.9
 Altitude (m): 1.8
 Corrected Pbar (mm. Hg): 756.3

Reference Devices

TC Simulator Model: CC-VTR-SH
 Reference #: 91109269
 Barometer Model: 369307
 Reference #: EBARODIALSPE01
 DP Calibrator Model: 718 30G
 Reference #: 9543013

Audit Data

Reference Point	Reference Temp.	Thermocouple Probe Audit					Reference Point Status ¹
		Probe	Stack	Filter	Exit	Aux	
	°C	°C	°C	°C	°C	°C	Pass/Fail
Room	24.9	25	25	24	23	24	PASS
Ice Water	1.8	2	2	2	1	2	PASS

Console Vacuum Audit			
Reference Point	Reference Vacuum	Console Vacuum	Reference Point Status ³
#	in. Hg	in. Hg	Pass/Fail
1	17.0	17.5	PASS

Calibrate By: Dattapan P. Approved By: [Signature] Date: 10 Sep 24

Notes

¹For valid test results, the maximum difference between test and reference readings should be less than 5.4 °F (3 °C), for all thermocouples except for the stack thermocouple which should be less than 1.5% absolute temperature from the reference reading and the exit thermocouple which should be less than 2°F (1 °C) from the reference reading (EPA Method 2, Section 6.3 and EPA Method 5, Sections 6.1.1.7-6.1.1.8)

²For valid test results, the maximum difference between console and reference barometric pressure readings should be less than 0.1 in. Hg (2.5 mm Hg), (EPA Method 5, Section 6.1.2)

³For valid test results, the maximum difference between console and reference vacuum readings should be less than 0.5 in. Hg (12.5 mm Hg)

I certify that the above Thermocouple, Barometric, and Vacuum Sensors were calibrated and audited in accordance with US EPA Methods, CFR 40 Part 60.



Needless Supply Instrument Co., Ltd.



Certificate of Calibration

Method 5 Pre-Test Calibration - Liters (L)

UUT Meter Console Information

Model #: XC-572-V
Serial #: 1602011
DGM Model #: SK25EX
DGM Serial #: 00006265

Calibration Conditions

Bar. Pressure (mm Hg): 760.3
Ambient Temperature (°C): 24.9
Relative Humidity (%): 66.0
Altitude (m): 1.83
Bar. Pressure Corr. (mm Hg): 760.2

Factors/Conversions

Std. Temp. (K): 293.15
Std. Press. (mm Hg): 760
K₁ (K/mm Hg): 0.3857

Reference Equipment

Calibration Meter Model: DGMR-200H
Cal. Due Date: 20-Aug-25
Serial No.: 0000026
Gamma: 1.0000

UUT Meter (DGM)

Reference Meter (WTM)

Run Time (seconds)	Orifice, ΔH (mm H ₂ O)	Volume			Meter Temperature (°C)		Meter Pressure (in H ₂ O)	Volume (L)			Outlet Temperature (°C)	
		Initial (L)	Final (L)	Total (L)	Initial	Final		Initial	Final	Total	Initial	0.00
Θ	P _{m(g)}	V _{mi}	V _{mf}	V _m	t _{mi}	t _{mf}	P _w	V _{wi}	V _{wf}	V _w	t _{wi}	t _{wf}
840.00	13.00	1372611.0	1372782.4	171.4	24.0	25.0	0.3	0.00	173.69	173.69	25.0	25.0
630.00	25.00	1372782.4	1372959.4	177.0	25.0	25.0	0.5	0.00	178.20	178.20	25.0	25.0
452.00	50.00	1372959.4	1373139.6	180.2	26.0	27.0	0.6	0.00	181.31	181.31	25.0	25.0
360.00	80.00	1373139.6	1373323.6	184.0	27.0	27.0	2.0	0.00	185.01	185.01	25.0	25.0
300.00	120.00	1373323.6	1373512.4	188.8	27.0	28.0	2.4	0.00	188.85	188.85	25.0	25.0

Standardized Data

Reference Meter (L)		UUT Meter (L)		Correction Factor		ΔH @ (mm H ₂ O)	
Std. Vol.	Std. Flow	Std. Vol.	Std. Flow	Value	Variance	0.0212 SCMM	Variance
V _{w(std)}	Q _{w(std)}	V _{m(std)}	V _{w(std)}	Y	ΔY	ΔH@	ΔΔH@
170.94	12.21	169.06	12.2	1.0111	0.0038	38.9	-0.284
175.47	16.71	174.50	16.7	1.0056	-0.0018	39.9	0.771
178.58	23.70	177.19	23.7	1.0078	0.0005	39.6	0.447
182.84	30.47	181.14	30.5	1.0094	0.0020	38.6	-0.503
186.83	37.37	186.27	37.4	1.0030	-0.0044	38.7	-0.432
				1.0074	= Y Avg.	39.1	= ΔH@ Avg. Metric

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is ±0.02.

Note: For ΔH_g, orifice pressure differential that equates to 0.0212m³/min at standard temperature and pressure, acceptable tolerance of individual values from the average is ±0.2inches (5.1mm) H₂O.

Pass/Fail Judgment : **Pass**

Calibrate By :

Dattaraj P.

Approved By :

K.

Date:

24 Sep 24

The instruments listed and described on this certificate have been calibrated against standards traceable to the National Institute of Standards and Technology (N.I.S.T.) and in reference to EPA Method 5, Section 10.3.1.

Nomenclature

Equations

Calibration Train

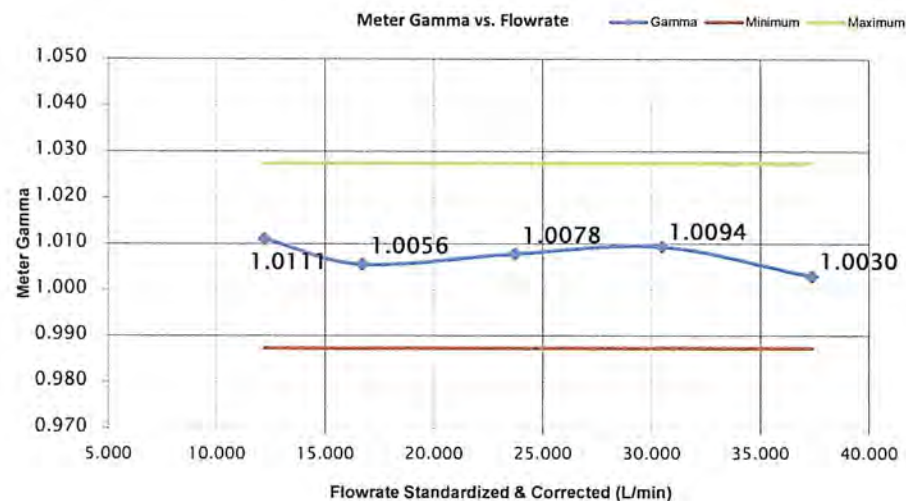
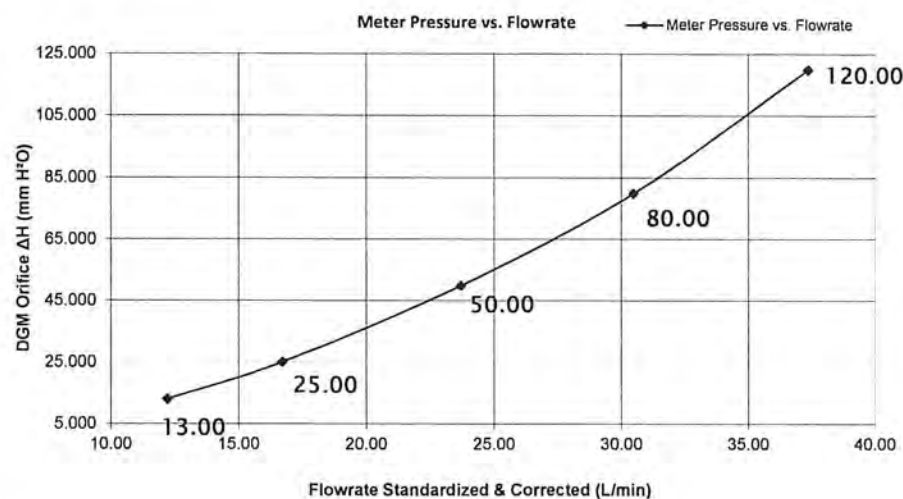
P_b - Barometric Pressure
 DGM - Dry Gas Meter
 K_1 - Constant based on standard temp and press
 Θ - Run time, in minutes
 P_m - ΔH (Meter Pressure, gauge)
 V_m - Volume collected by test meter, corrected for STP
 $Q_{m(std)}$ - Calculated flow rate of test meter
 K' - Critical orifice coefficient
 P_w - Measured pressure of reference meter
 t_w - Temperature measured in reference meter

$$V_{w(std)} = Y * K_1 \frac{V_w * (P_{bar} + \frac{P_{m(g)}}{13.6})}{T_w}$$

$$V_{m(std)} = \frac{K_1 V_m (P_{bar} + \frac{\Delta H}{13.6})}{T_m}$$

$$K_1 = \frac{T_{std}}{P_{std}} \quad Y = \frac{V_{cr(std)}}{V_{m(std)}} \quad Q_{w(std)} = \frac{V_{w(std)}}{\Theta}$$

$$Metric \Delta H_u = \frac{P_{m(g)} + 0.0011696 * (P_{bar} + \frac{P_{m(g)}}{13.6})}{T_m} * \left(\frac{T_w * \Theta}{V_w * P_{bar}} \right)^2$$





Certificate of Calibration

Method 5 Console Sensor Calibration - Metric Units

Console Information

Model #: XC-572-V
Serial #: 1602011
Units: Metric

Calibration Conditions

Pbar (mm. Hg): 760.3
Humidity (%): 66
Tamb (°C): 24.9
Elevation (m): 1.8
Corr. Pbar (mm. Hg): 760.2

Reference Devices

TC Calibrator Model: CC-VTR-SH
Reference #: 091109269
Barometer Model: 736930
Reference #: EBARODIALSPE01
Pressure Model: 718 30G
Reference #: 9543013

Temperature Display Calibration Data

Reference Point ¹	Reference Temp.	Test Thermocouple Calibrations						Reference Point Status ²
		Aux	Stack	Probe	Oven	Filter	Exit	
#	°C	°C	°C	°C	°C	°C	°C	Pass/Fail
1	-18	-17	-17	-17	-17	-17	-17	PASS
2	38	37	38	38	38	38	38	PASS
3	93	93	93	93	93	93	93	PASS
4	149	149	149	150	149	149	149	PASS
5	260	258	259	259	259	258	259	PASS
6	371	371	371	371	371	371	371	PASS
7	482	481	481	481	481	481	481	PASS
8	593	592	592	592	592	592	592	PASS
9	816	814	815	815	814	814	815	PASS
10	1038	1037	1036	1036	1037	1037	1037	PASS
								PASS
								Overall Audit Status

NIST Reference Thermocouple ID:

12702001

	Ref Point	Theoretical Temp.	DGM Thermocouple Sensor Reading	ΔT_{abs} ⁴
	#	°C	°C	°C
Ice Water	1	1.4	1	0.15%
Ambient ³	2	24.9	24	0.19%
Maximum ²				0.19%
Status				PASS

Internal temperature thermocouple is not audited to EPA standards, and should not be used as an official reference for ambient temperature.

Calibrate By :

Pattananon P.

Approved By:

K

Date:

24 Sep 24

Notes

¹ Suggested, minimum reference points are 10 (0, 100, 200, 300, 500, 700, 900, 1100, 1500, 1900 °F), can test for more.

² For valid test results, the maximum difference between temperature and reference readings should be less than ± 5.4 °F (± 3 °C), for all thermocouples except for the stack thermocouple which should be less than $\pm 1.5\%$ absolute temperature from the reference reading and the exit thermocouple which should be less than ± 2 °F (± 1 °C) from the reference reading (EPA Method 2, Section 6.3 and EPA Method 5, Sections 6.1.1.7-6.1.1.8)

³ Do not change this cell value, it is instead based on input from Cell H8 at the top of this sheet under "Calibration Conditions"

⁴ Absolute temperature difference and other formulas are calculated based on unit input from cell C8 at the top of this sheet under "Meter Console Information"

⁵ For valid test results, the maximum difference between console and reference barometric pressure readings should be less than ± 0.1 in. Hg (± 2.5 mm Hg), (EPA Method 5, Section 6.1.2)

⁶ For valid test results, the maximum difference between console and reference vacuum readings should be less than ± 0.5 in. Hg (± 12.5 mm Hg)

⁷ For valid test results, the maximum difference between console and reference vacuum readings should be less than ± 0.05 in. H₂O (± 1.25 mm H₂O), or 5% of full scale



neediss Console Sensor Calibration Data Sheet

Console Information

Model #: XC-572-V
Serial #: 1602011
Units: Metric
Type:
"English"

Calibration Conditions

Pbar (mm. Hg): 760.3
Humidity (%): 66.0
Tamb (°C): 24.9
Corr. Pbar (mm. Hg): 760.2

Reference Devices

TC Simulator Model: CC-VTR-SH
Reference #: 091109269
Barometer Model: 736930
Reference #: EBARODIALSPE01
Digital Pressure Calibrator Model: 718 30G
Reference #: 3891001

Pressure Gauge / Manometer Calibration Data

Console Vacuum Calibration			
Reference Point	Reference Vacuum	Console Vacuum	Reference Point Status ⁶
#	in. Hg	in. Hg	Pass/Fail
1	-5.0	-4.5	PASS
2	-15.0	-14.5	PASS
3	-20.0	-19.5	PASS

Reference Point ¹	ΔH_Manometer Calibration			Reference Point Status ²
	Reference	Positive (+) Pitot	Negative (-) Pitot	
#	mm H2O	mm H2O	mm H2O	Pass/Fail
1	-200.00	0.0	-200.0	PASS
2	-150.00	0.0	-150.0	PASS
3	-100.00	0.0	-100.0	PASS
4	-80.00	0.0	-80.0	PASS
5	-50.00	0.0	-50.0	PASS
6	0.00	0.0	0.0	PASS
7	50.00	50.0	0.0	PASS
8	80.00	80.0	0.0	PASS
9	100.00	100.0	0.0	PASS
10	150.00	150.0	0.0	PASS
11	200.00	200.0	0.0	PASS
ΔH Overall Audit Status				PASS

Reference Point ¹	ΔP_Manometer Calibration			Reference Point Status ²
	Reference	Positive (+) Pitot	Negative (-) Pitot	
#	mm H2O	mm H2O	mm H2O	Pass/Fail
1	-200.00	0.0	-200.0	PASS
2	-150.00	0.0	-150.0	PASS
3	-100.00	0.0	-100.0	PASS
4	-80.00	0.0	-80.0	PASS
5	-50.00	0.0	-50.0	PASS
6	0.00	0.0	0.0	PASS
7	50.00	50.0	0.0	PASS
8	80.00	80.0	0.0	PASS
9	100.00	100.0	0.0	PASS
10	150.00	150.0	0.0	PASS
11	200.00	200.0	0.0	PASS
ΔP Overall Audit Status				PASS

Calibrate By :

D. Thompson

Approved By:

M.

Date:

24 Sep 24

Notes

¹ Suggested, minimum reference points are 10 (0, 100, 200, 300, 500, 700, 900, 1100, 1500, 1900 °F), can test for more.

² For valid test results, the maximum difference between temperature and reference readings should be less than ±5.4 °F (±3 °C), for all thermocouples except for the stack thermocouple which should be less than ±1.5% absolute temperature from the reference reading and the exit thermocouple which should be less than ±2 °F (±1 °C) from the reference reading (EPA Method 2, Section 6.3 and EPA Method 5, Section 6.1.7 & 6.1.9)

³ Do not change this cell value, it is instead based on input from Cell H8 at the top of this sheet under "Calibration Conditions"

⁴ Absolute temperature difference and other formulas are calculated based on unit input from cell C8 at the top of this sheet under "Meter Console Information"

⁵ For valid test results, the maximum difference between console and reference barometric pressure readings should be less than ±0.1 in. Hg (±2.5 mm Hg), (EPA Method 5, Section 6.1.2)

⁶ For valid test results, the maximum difference between console and reference vacuum readings should be less than ±0.5 in. Hg (±12.5 mm Hg)

⁷ For valid test results, the maximum difference between console and reference vacuum readings should be less than ±0.05 in. H2O (±1.25 mm H2O), or 5% of full scale
I certify that the above Thermocouple Sensors were calibrated in accordance with US EPA Methods 2 and 5, CFR 40 Part 60.



Console Sensor Audit QA Sheet

Meter Console Information (UUT)

Model #: XC-572-V
Serial #: 1602011
Units: Metric

Calibration Conditions

Pbar (mm. Hg): 760.3
Humidity (%): 66.0
Amb. Temp. (°C): 24.9
Altitude (m): 1.8
Corrected Pbar (mm. Hg): 760.2

Reference Devices

TC Simulator Model: CC-VTR-SH
Reference #: 91109269
Barometer Model: 369307
Reference #: EBARODIALSPE01
Digital Pressure Calibrator Model: 718 30G
Reference #: 9543013

Audit Data

Reference Point	Reference Temp.	Thermocouple Probe Audit						Reference Point Status ¹
		Aux	Stack	Probe	Oven	Filter	Exit	
	°C	°C	°C	°C	°C	°C	°C	Pass/Fail
Ambient	24.9	23	24	24	24	24	24	PASS
Ice Water	1.4	0	1	1	1	1	1	PASS

Audit Data

Console Vacuum Audit			
Reference Point	Reference Vacuum	Console Vacuum	Reference Point Status ³
#	in. Hg	in. Hg	Pass/Fail
1	-17.0	-16.5	PASS

Calibrate By: Dattapam P.

Approved By: K.

Date: 24 Sep 24

Notes

¹For valid test results, the maximum difference between test and reference readings should be less than 5.4 °F (3 °C), for all thermocouples except for the stack thermocouple which should be less than 1.5% absolute temperature from the reference reading and the exit thermocouple which should be less than 2°F (1 °C) from the reference reading (EPA Method 2, Section 6.3 and EPA Method 5, Sections 6.1.1.7-6.1.1.8)

²For valid test results, the maximum difference between console and reference barometric pressure readings should be less than 0.1 in. Hg (2.5 mm Hg), (EPA Method 5, Section 6.1.2)

³For valid test results, the maximum difference between console and reference vacuum readings should be less than 0.5 in. Hg (12.5 mm Hg)

I certify that the above Thermocouple, Barometric, and Vacuum Sensors were calibrated and audited in accordance with US EPA Methods, CFR 40 Part 60.


Neediss Supply Instrument Co.,Ltd.

Certificate No: G 680041

Date of issue : 22-Jan-25

Instrument description : Flue Gas Analyzer
Instrument model : Testo 350 New
Instrument serial no. : 63455602/0822
Control unit serial no. : 03599831/0822
ID no. or control no. : -
Manufacturer : Testo SE & Co. KGaA
Probe description : -
Probe model : -
Probe serial no. : -
Customer name : Environment Research & Technology Co., Ltd.
Customer address : 25/114 Moo 6, Soi Chinnakhet 1, Ngamwongwan Rd., Toongsonghong, Laksi, Bangkok 10210 Thailand
Total pages of certificate : 3 Pages
Receiving no. : L-250124
Receiving date. : 20-Jan-25
Parameter of calibration : Gas Calibration (Oxygen 2.50, 9.984, 21.02 %vol, Carbon Monoxide 80.45, 302, 1007 ppm, Nitrogen Dioxide 30.68, 81.8, 201.9 ppm, Nitric Oxide 30.0, 151.5, 322.5 ppm, Sulphur Dioxide 50.36, 100.7, 600.8 ppm)
Condition of UUC. : Used
Ambient condition : All of the Measurement were carried out the stabilized laboratory
Temperature : 23 ± 5 °C
Humidity : 55 ± 15 %RH
Calibration place : 17/121 Soi Ngamwongwan 47 Yaek 48, Toongsonghong, Laksi, Bangkok 10210
Calibration procedure no : This instrument was calibrated by comparison with Standard gas mixture according to calibration Work Instruction no. WI-CL-28-C

The calibration certificate expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%.

This certificate is applied only to item under test Environmental condition.

This Calibration Certificate may not be reproduced other than in full except with the permission of the issuing laboratory. Calibration certificates without signature and seal not valid and The results relate only to the items tested/calibrated.

This calibration certificate documents are traceability to national standards, which realize measurement according to the International System of Units (SI).

Date of calibration : 21-Jan-25



Mr. Kwanchai Khamdoun

Calibration Technician



Mrs. Nongluck Wongsettee

Technical Manager

Certificate No.: G 680041

Standard References (Table 1)

Standard	Certificate No.	Vendor	Due date
Oxygen (O ₂) 2.50 % Vol	2412/23	Linde	27-Aug-27
Oxygen (O ₂) 9.984 % Vol	CG-0113-24	Nimt	01-Aug-29
Oxygen (O ₂) 21.02 % Vol	CG-0041-22	Nimt	10-Feb-27
Carbon monoxide (CO) 80.45 ppm	CG-0132-24	Nimt	10-Sep-29
Carbon monoxide (CO) 302 ppm	1915/23	Linde	16-Jun-25
Carbon monoxide (CO) 1007 ppm	1870/24	Linde	17-Jun-26
Nitrogen Dioxide (NO ₂) 30.68 ppm	2832/24	Linde	08-Sep-26
Nitrogen Dioxide (NO ₂) 81.8 ppm	2330/24	Linde	01-Aug-26
Nitrogen Dioxide (NO ₂) 201.9 ppm	1975/23	Linde	17-Jul-25
Nitric Oxide (NO) 30.0 ppm	CG-0065-24	Nimt	06-May-26
Nitric Oxide (NO) 151.5 ppm	0161/23	Linde	22-Jan-25
Nitric Oxide (NO) 322.5 ppm	1974/23	Linde	17-Jul-25
Sulphur Dioxide (SO ₂) 50.36 ppm	2004/23	Linde	17-Jul-25
Sulphur Dioxide (SO ₂) 100.7 ppm	2662/24	Linde	25-Aug-26
Sulphur Dioxide (SO ₂) 600.8 ppm	2003/23	Linde	17-Jul-25

Measured room conditions

Temperature : 22.6 °C Humidity : 63.7 %RH Pressure : 1012.9 mbar

Calibration conditions

Gas Temperature : 23 °C Flow rate : 1,300 ml/min Gas pressure : 1015.8 mbar

Calibration Results (Before adjustment) (Table 2)

Parameter of Standard	Standard Values	Mean of UUC	Error	Uncertainty (±)
O ₂ (%Vol)	2.50	2.46	-0.04	0.15
O ₂ (%Vol)	9.984	9.92	-0.064	0.20
O ₂ (%Vol)	21.02	21.11	0.09	0.30
CO (ppm)	80.45	80	-0.45	3.0
CO (ppm)	302	302	0	6.0
CO (ppm)	1007	1005	-2	12
NO ₂ (ppm)	30.68	24.9	-5.78	8.0
NO ₂ (ppm)	81.8	72.5	-9.3	8.0
NO ₂ (ppm)	201.9	181.1	-20.8	12
NO (ppm)	30.0	30	0.0	8.0
NO (ppm)	151.5	154	2.5	8.0
NO (ppm)	322.5	325	2.5	12
SO ₂ (ppm)	50.36	49	-1.36	6.0
SO ₂ (ppm)	100.7	97	-3.7	6.0
SO ₂ (ppm)	600.8	584	-16.8	13

Certificate No.: G 680041

Calibration Results (After adjustment) (Table 3)

Parameter of Standard	Standard Values	Mean of UUC	Error	Uncertainty (±)
O2 (%Vol)	2.50	2.46	-0.04	0.15
O2 (%Vol)	9.984	9.92	-0.064	0.20
O2 (%Vol)	21.02	21.11	0.09	0.30
CO (ppm)	80.45	80	-0.45	3.0
CO (ppm)	302	302	0	6.0
CO (ppm)	1007	1005	-2	12
NO2 (ppm)	30.68	30.8	0.12	8.0
NO2 (ppm)	81.8	79.4	-2.4	8.0
NO2 (ppm)	201.9	198.3	-3.6	12
NO (ppm)	30.0	30	0.0	8.0
NO (ppm)	151.5	154	2.5	8.0
NO (ppm)	322.5	325	2.5	12
SO2 (ppm)	50.36	51	0.64	6.0
SO2 (ppm)	100.7	101	0.3	6.0
SO2 (ppm)	600.8	603	2.2	13

Remark : 1 cmol/mol = 1 %vol. 1 μmol/mol = 1 ppm.

End of Report

Certificate No: G 680172

Date of issue : 11-Mar-25

Instrument description : Flue Gas Analyzer
Instrument model : Testo 350 New
Instrument serial no. : 62227989/0320
Control unit serial no. : 03498219/0320
ID no. or control no. : -
Manufacturer : Testo SE & Co. KGaA
Probe description : -
Probe model : -
Probe serial no. : -
Customer name : Environment Research & Technology Co., Ltd.
Customer address : 25/114 Moo 6, Soi Chinnakhet 1, Ngamwongwan Rd., Toongsonghong, Laksi, Bangkok 10210 Thailand
Total pages of certificate : 3 Pages
Receiving no. : L-250771
Receiving date. : 06-Mar-25
Parameter of calibration : Gas Calibration(Oxygen 2.50,9.984,21.02 %vol, Carbon Monoxide 80.45,302,1007 ppm, Nitrogen Dioxide 30.68,81.8,202.6 ppm, Nitric Oxide 30.0,151.8,322.5 ppm, Sulphur Dioxide 50.36,100.7,600.8 ppm)
Condition of UUC. : Used
Ambient condition : All of the Measurment ware caried out the stabilized labotary
 Temperature : 23 \pm 5 $^{\circ}$ C
 Humidity : 55 \pm 15 %RH
Calibration place : 17/121 Soi Ngamwongwan 47 Yaek 48, Toongsonghong, Laksi, Bangkok 10210 THAILAND
Calibration procedure no : This instrument was calibrated by comparison with Standard gas mixture according to calibration Work Instruction no. WI-CL-28-C

The calibration certificate expanded uncertainty of measurement is stated as the standard uncertainty of measurent Multiplied by coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%.

This certificate is applied only to item under test Environmental condition.

This Calibration Certificate may not be reporduced other than in full except with the permission of the issuing laboratory. Calibration certificates without signature and seal not valid and The results relate only to the items tested/calibrated.

This calibration certificate documents are tracebility to national standards, which realize measurement according to the International System of Units (SI).

Date of calibration : 11-Mar-25



Mr. Kwanchai Khamdoun

Calibration Technician



Mrs. Nongluck Wongsettee

Technical Manager

Certificate No.: G 680172

Standard References (Table 1)

Standard	Certificate No.	Vendor	Due date
Oxygen (O ₂) 2.50 % Vol	2412/23	Linde	27-Aug-27
Oxygen (O ₂) 9.984 % Vol	CG-0113-24	Nimt	01-Aug-29
Oxygen (O ₂) 21.02 % Vol	CG-0041-22	Nimt	10-Feb-27
Carbon monoxide (CO) 80.45 ppm	CG-0132-24	Nimt	10-Sep-29
Carbon monoxide (CO) 302 ppm	1915/23	Linde	16-Jun-25
Carbon monoxide (CO) 1007 ppm	1870/24	Linde	17-Jun-26
Nitrogen Dioxide (NO ₂) 30.68 ppm	2832/24	Linde	08-Sep-26
Nitrogen Dioxide (NO ₂) 81.8 ppm	2330/24	Linde	01-Aug-26
Nitrogen Dioxide (NO ₂) 202.6 ppm	3794/24	Linde	23-Dec-26
Nitric Oxide (NO) 30.0 ppm	CG-0065-24	Nimt	06-May-26
Nitric Oxide (NO) 151.8 ppm	0404/25	Linde	09-Feb-27
Nitric Oxide (NO) 322.5 ppm	1974/23	Linde	17-Jul-25
Sulphur Dioxide (SO ₂) 50.36 ppm	2004/23	Linde	17-Jul-25
Sulphur Dioxide (SO ₂) 100.7 ppm	2662/24	Linde	25-Aug-26
Sulphur Dioxide (SO ₂) 600.8 ppm	2003/23	Linde	17-Jul-25

Measured room conditions

Temperature : 22.3 °C Humidity : 61.4 %RH Pressure : 1010.6 mbar

Calibration conditions

Gas Temperature : 23 °C Flow rate : 1,300 ml/min Gas pressure : 1015.7 mbar

Calibration Results (Befor adjustment) (Table 2)

Parameter of Standard	Standard Values	Mean of UUC	Error	Uncertainty (±)
O ₂ (%Vol)	2.50	2.47	-0.03	0.15
O ₂ (%Vol)	9.984	9.92	-0.064	0.20
O ₂ (%Vol)	21.02	21.09	0.07	0.30
CO (ppm)	80.45	81	0.55	3.0
CO (ppm)	302	303	1	6.0
CO (ppm)	1007	1008	1	12
NO ₂ (ppm)	30.68	21.7	-8.98	8.0
NO ₂ (ppm)	81.8	72.6	-9.2	8.0
NO ₂ (ppm)	202.6	182.7	-19.9	12
NO (ppm)	30.0	27	-3.0	8.0
NO (ppm)	151.8	141	-10.8	8.0
NO (ppm)	322.5	297	-25.5	12
SO ₂ (ppm)	50.36	55	4.64	6.0
SO ₂ (ppm)	100.7	111	10.3	6.0
SO ₂ (ppm)	600.8	651	50.2	13

Calibration Results (After adjustment) (Table 3)

Parameter of Standard	Standard Values	Mean of UUC	Error	Uncertainty (±)
O2 (%Vol)	2.50	2.47	-0.03	0.15
O2 (%Vol)	9.984	9.92	-0.064	0.20
O2 (%Vol)	21.02	21.09	0.07	0.30
CO (ppm)	80.45	81	0.55	3.0
CO (ppm)	302	303	1	6.0
CO (ppm)	1007	1009	1	12
NO2 (ppm)	30.68	30.9	0.22	8.0
NO2 (ppm)	81.8	83.4	1.6	8.0
NO2 (ppm)	202.6	204.8	2.2	12
NO (ppm)	30.0	30	0.0	8.0
NO (ppm)	151.8	153	1.2	8.0
NO (ppm)	322.5	321	-1.5	12
SO2 (ppm)	50.36	52	1.64	6.0
SO2 (ppm)	100.7	101	1.3	6.0
SO2 (ppm)	600.8	600	-0.8	13

Remark : 1 cmol/mol = 1 %vol. 1 µmol/mol = 1 ppm., Sensor CO New.

End of Report

Mettler-Toledo (Thailand) Ltd.

846/4 - 846/5 Lasalle Rd., Bangna Tai Sub-District

Bangna District, Bangkok 10260

+662 723 0382


MT-TH.ServiceSupport@mt.com



NSC-TISI-TIS 17025
CALIBRATION 0062

Accuracy Calibration Certificate

Customer

Company: Environment Research & Technology
Address: 25/114 Moo 6, Soi Chinaket 1, Ngamwongwan Rd., Toongsonghong
City: Laksi **Contact:** Ramita Taengthai
Zip / Postal: 10210
State / Province: Bangkok
Order Number: 
0 3 3 3 6 1 0 1 9

Weighing Device

Manufacturer: Mettler Toledo **Instrument Type:** Weighing Instrument
Model: MS204S/01 **Asset Number:** ERTC-L-IN-107
Serial No.: B445239164 **Terminal Model:** N/A
Building: N/A **Terminal Serial No.:** N/A
Floor: 4 **Terminal Asset No.:** N/A
Room: 411

Range	Max. Capacity	Readability (d)
1	220 g	0.0001 g

Procedure



Calibration Guideline: EURAMET cg-18 v. 4.0/CENAM-ema:2015
METTLER TOLEDO Work Instruction: CP/W002/20

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

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

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

	Temperature		Humidity	
As Found	Start: 19.3 °C	End: 18.2 °C	Start: 50.2 %	End: 39.7 %

As Found Calibration Date: 15-Jan-2025 **Calibrator:** 
As Left Calibration Date: N/A
Issue Date: 17-Jan-2025
Approved Signatory: 
Supapit Kruapoo
Technical Manager / Head of Calibration Center

Measurement Results

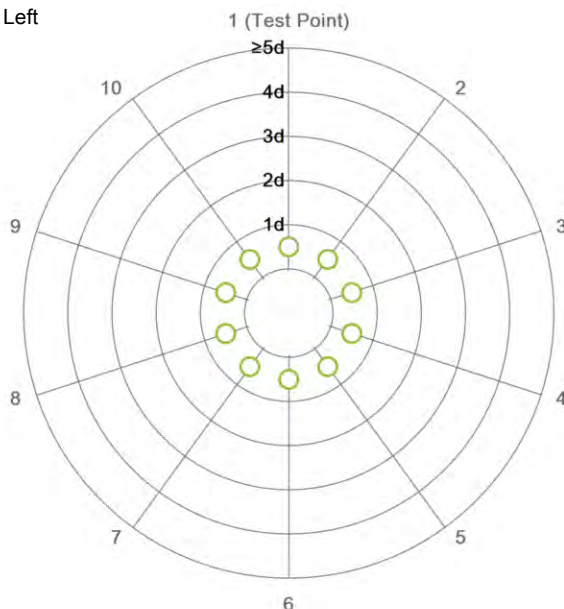
Repeatability

Test Load: 100 g

	As Found	As Left
1	99.9999 g	N/A
2	99.9998 g	N/A
3	99.9998 g	N/A
4	99.9998 g	N/A
5	99.9999 g	N/A
6	99.9999 g	N/A
7	99.9998 g	N/A
8	99.9998 g	N/A
9	99.9999 g	N/A
10	99.9999 g	N/A

Standard Deviation	0.00005 g	N/A
--------------------	-----------	-----

○ As Found
◆ As Left



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

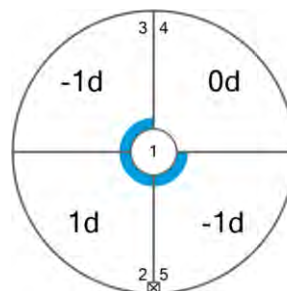
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

Test Load: 100 g

Position	As Found	As Left
1	99.9999 g	N/A
2	100.0000 g	N/A
3	99.9998 g	N/A
4	99.9999 g	N/A
5	99.9998 g	N/A

Maximum Deviation	0.0001 g	N/A
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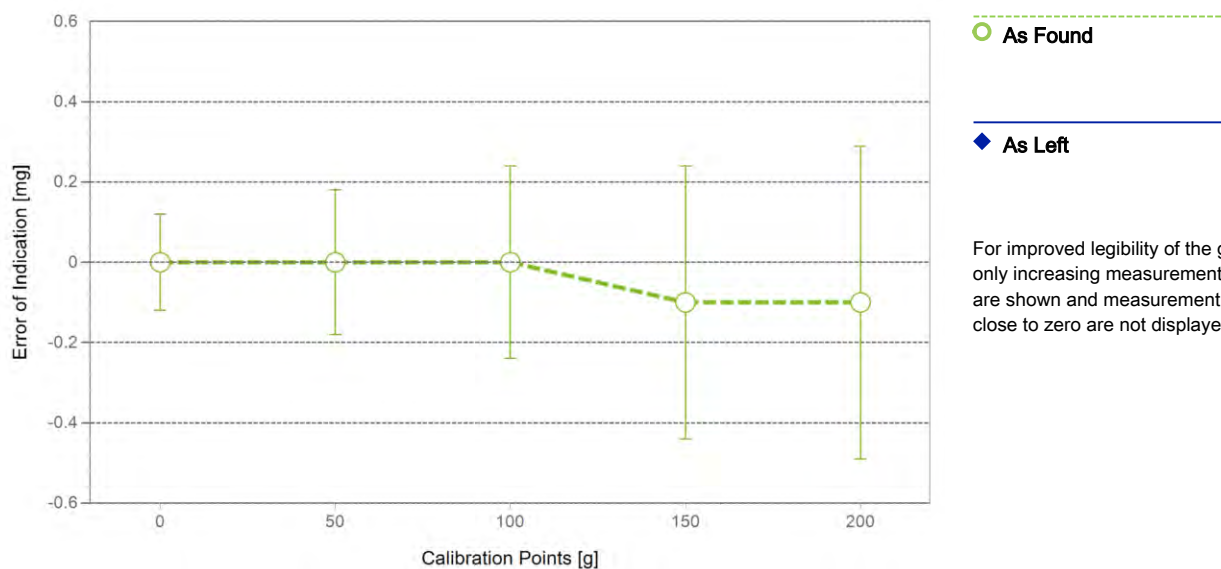
As Found

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

Error of Indication

As Found

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.0000 g	0.0000 g	0.0000 g	0.12 mg	2
2	0.0500 g	0.0500 g	0.0000 g	0.13 mg	2
3	0.1000 g	0.1000 g	0.0000 g	0.13 mg	2
4	0.5000 g	0.5000 g	0.0000 g	0.14 mg	2
5	1.0000 g	1.0000 g	0.0000 g	0.14 mg	2
6	5.0000 g	5.0001 g	0.0001 g	0.14 mg	2
7	10.0000 g	10.0000 g	0.0000 g	0.15 mg	2
8	50.0000 g	50.0000 g	0.0000 g	0.18 mg	2
9	99.9999 g	99.9999 g	0.0000 g	0.24 mg	2
10	149.9999 g	149.9998 g	-0.0001 g	0.34 mg	2
11	200.0001 g	200.0000 g	-0.0001 g	0.39 mg	2



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

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

Test Equipment

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

Weight Set 1: OIML E2

Weight Set No.:	WS38	Date of Issue:	15-Dec-2023
Certificate Number:	189517	Calibration Due Date:	15-Jun-2025

Weight Set 2: OIML E2

Weight Set No.:	WS38-1	Date of Issue:	22-Feb-2024
Certificate Number:	C411772496	Calibration Due Date:	22-Aug-2025

Weight Set 3: OIML E2

Weight Set No.:	WS38-3	Date of Issue:	27-Feb-2024
Certificate Number:	C411772498	Calibration Due Date:	27-Aug-2025

Thermo Hygrometer

Equipment No.:	IN256	Date of Issue:	19-Jul-2024
Certificate Number:	SG-H-00636/67	Calibration Due Date:	18-Jul-2025

Remarks

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

End of Accredited Section

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

Measurement Uncertainty of the Weighing Instrument in Use

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

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

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

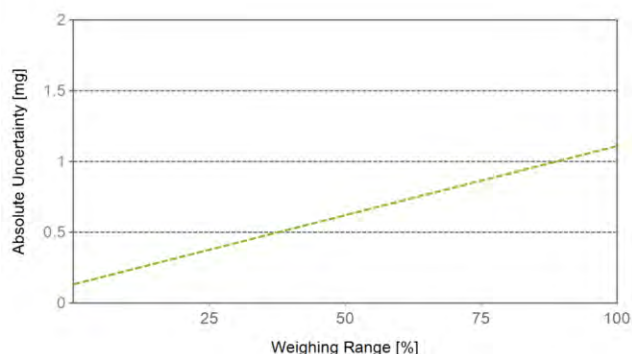
Linearization of Uncertainty Equation

Range			As Found	As Left
	d	Max		
1	0.0001 g	220 g	$U_1 = 0.13 \text{ mg} + 0.00444 \text{ mg/g} \cdot R$	N/A

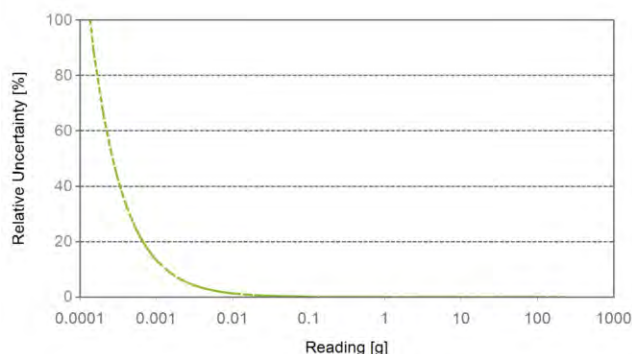
To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

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

Net Indication	As Found		As Left	
0.0220 g	0.13 mg	0.59%	N/A	N/A
0.2200 g	0.13 mg	0.060%	N/A	N/A
2.2000 g	0.14 mg	0.0064%	N/A	N/A
22.0000 g	0.23 mg	0.0010%	N/A	N/A
220.0000 g	1.1 mg	0.00050%	N/A	N/A



As Found



As Left

GWP® Certificate



**As
Found**



**As
Left**



The weighing device meets the given process requirements.

The weighing device meets the given process requirements.

Tests Performed:



As Found



As Left



No adjustments/modifications made. As Left results correspond to As Found.

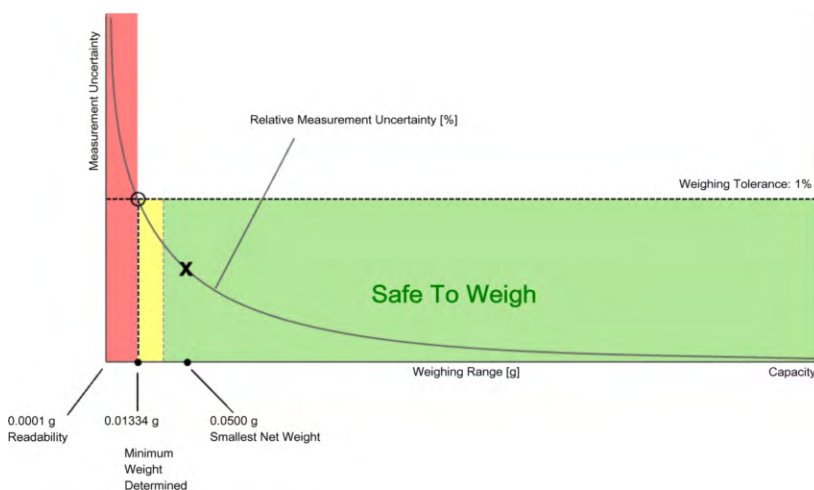
Process Requirements

Weighing Tolerance: 1%

Smallest Net Weight: 0.0500 g

Safety Factor: 2

Safe Weighing Range



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

Minimum Weight

As Found Minimum Weight Table

Minimum weights for different weighing tolerances and safety factors					
	Safety Factor				
Tolerance	1	2	3	5	10
0.1%	0.13393 g	0.26906 g	0.40540 g	0.68180 g	1.39528 g
0.2%	0.06681 g	0.13393 g	0.20134 g	0.33707 g	0.68180 g
0.5%	0.02669 g	0.05343 g	0.08021 g	0.13393 g	0.26906 g
1%	0.01334 g	0.02669 g	0.04005 g	0.06681 g	0.13393 g
2%	0.00667 g	0.01334 g	0.02001 g	0.03337 g	0.06681 g
5%	0.00267 g	0.00533 g	0.00800 g	0.01334 g	0.02669 g



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

As Left Minimum Weight Table

Minimum weights for different weighing tolerances and safety factors					
	Safety Factor				
Tolerance	1	2	3	5	10
0.1%	0.13393 g	0.26906 g	0.40540 g	0.68180 g	1.39528 g
0.2%	0.06681 g	0.13393 g	0.20134 g	0.33707 g	0.68180 g
0.5%	0.02669 g	0.05343 g	0.08021 g	0.13393 g	0.26906 g
1%	0.01334 g	0.02669 g	0.04005 g	0.06681 g	0.13393 g
2%	0.00667 g	0.01334 g	0.02001 g	0.03337 g	0.06681 g
5%	0.00267 g	0.00533 g	0.00800 g	0.01334 g	0.02669 g



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

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

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

Notes on minimum weight values in above table:

1. If "N/A" is shown above, no appropriate value could be calculated.
2. METTLER TOLEDO is not responsible for the definition of the process requirements.

Measurement Results

Results Summary

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

✓ = Passed

✗ = Failed

⚠ = Safety Factor not met

Repeatability

Test Load: 100 g

Tolerance	Control Limit	As Found		As Left	
		Std. Deviation	Result	Std. Deviation	Result
0.1%	N/A	0.00005 g*	N/A	0.00005 g*	N/A
0.2%	0.00005 g		✓		⚠
0.5%	0.00013 g		✓		✓
1%	0.00025 g		✓		✓
2%	0.00050 g		✓		✓
5%	0.00125 g		✓		✓

*The calculated standard deviation value is below the rounding error of the balance. The $0.41 \cdot d$ rule is used for the assessment of this repeatability test and the calculation of the minimum weight.

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

Eccentricity

Test Load: 100 g

Tolerance	Control Limit	As Found		As Left	
		Deviation	Result	Deviation	Result
0.1%	0.0500 g	0.0001 g	✓	0.0001 g	✓
0.2%	0.1000 g		✓		✓
0.5%	0.2500 g		✓		✓
1%	0.5000 g		✓		✓
2%	1.0000 g		✓		✓
5%	2.5000 g		✓		✓

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

Error of Indication**As Found**

		Control limits for various weighing tolerances					
Reference Value	Error	0.1%	0.2%	0.5%	1%	2%	5%
0.0000 g	0.0000 g	N/A	N/A	N/A	N/A	N/A	N/A
50.0000 g	0.0000 g	0.0250 g	0.0500 g	0.1250 g	0.2500 g	0.5000 g	1.2500 g
99.9999 g	0.0000 g	0.0500 g	0.1000 g	0.2500 g	0.5000 g	1.0000 g	2.5000 g
149.9999 g	-0.0001 g	0.0750 g	0.1500 g	0.3750 g	0.7500 g	1.5000 g	3.7500 g
200.0001 g	-0.0001 g	0.1000 g	0.2000 g	0.5000 g	1.0000 g	2.0000 g	5.0000 g
Result		✓	✓	✓	✓	✓	✓

As Left

		Control limits for various weighing tolerances					
Reference Value	Error	0.1%	0.2%	0.5%	1%	2%	5%
0.0000 g	0.0000 g	N/A	N/A	N/A	N/A	N/A	N/A
50.0000 g	0.0000 g	0.0250 g	0.0500 g	0.1250 g	0.2500 g	0.5000 g	1.2500 g
99.9999 g	0.0000 g	0.0500 g	0.1000 g	0.2500 g	0.5000 g	1.0000 g	2.5000 g
149.9999 g	-0.0001 g	0.0750 g	0.1500 g	0.3750 g	0.7500 g	1.5000 g	3.7500 g
200.0001 g	-0.0001 g	0.1000 g	0.2000 g	0.5000 g	1.0000 g	2.0000 g	5.0000 g
Result		✓	✓	✓	✓	✓	✓

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

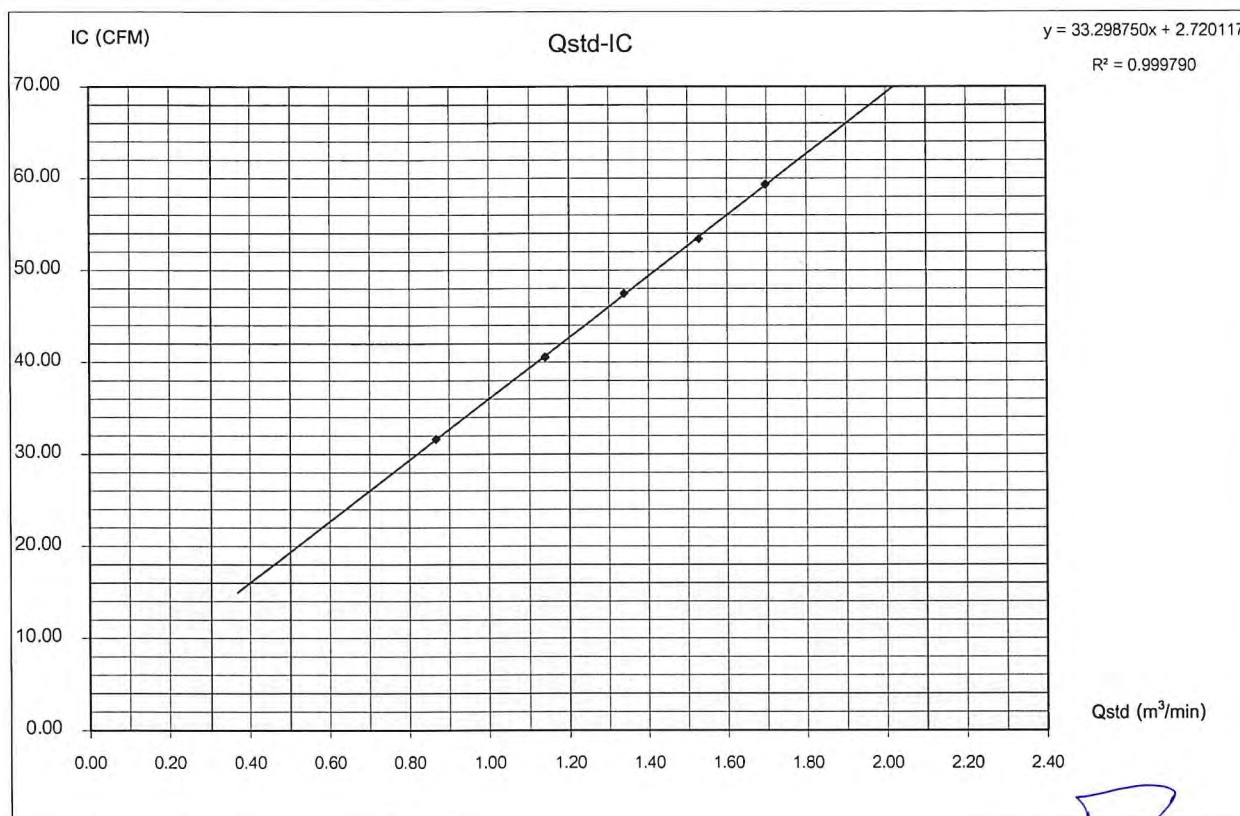
TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Quotation	2024-02184			Date	February 24, 2025
Sampler Location	บ้านละมั่งไร่			Start Time	5:12 PM
Sampler Number	TSP No.A2	Transfer Standard Type	Orifice	Stop Time	5:22 PM
Instrument Model	HIVOL-BBCBE	Calibrator Model	TE-5025A	Calibrated By	Mr.Nikul Phokamla
Motor Serial Number	6215-462	Calibrator Serial Number	3883		
Recorder Serial Number	4642				

Plate No.	(Delta H)			(A)	(X)	(I)	(Y)	Temperature	Barometric Pressure	Start Meter	Stop Meter
	Pressure Drop Across Orifice (inH ₂ O)			$[\Delta H_2O(Pa/P_{std})(T_{std}/Ta)]^{1/2}$	$Q_{std} = (1/m)[(A-b)]$ (m ³ /min)	Sample Flow Rate Indication (ft ³ /min)	$IC = I[(Pa/P_{std})(T_{std}/Ta)]^{1/2}$	(°K = °C+273)	(mmHg)		
	Positive	Negative	ΔH ₂ O								
5	1.5	1.5	3.0	1.71317	0.86757	32.0	31.65	303.0	756.0		
7	2.6	2.6	5.2	2.25550	1.13935	41.0	40.55	303.0	756.0		
10	3.6	3.6	7.2	2.65404	1.33907	48.0	47.48	303.0	756.0		
13	4.7	4.7	9.4	3.03253	1.52874	54.0	53.41	303.0	756.0		
18	5.8	5.8	11.6	3.36876	1.69724	60.0	59.35	303.0	756.0		
Linear Regression Y ON X : Y= mX + b							Average	303.0	756.0		
1	Slope (m)			1.99546	Linear Equation			r ²	0.99979	Pstd(mmHg)	760.0
2	Intercept (b)			-0.01802	Set Point Flow Rate (X) (m ³ /min)		1.133	r	0.999895	T _{NTP}	298.0
3	Correlation Coefficient (r)			0.99983	Final Set Flow Rate = (I)		0	(Pa/Pstd)*(Tstd/Ta)		0.978322043	
Result								C=(Pa/Pstd)*(Tstd/Ta)^0.5		0.989101634	

COMMENT

Andersen Instruments, Inc.



Checked By

(Mr. Prayun Detkla)

Technician



Approved By

(Mr. Panupon Podang)

Environmental Scientist

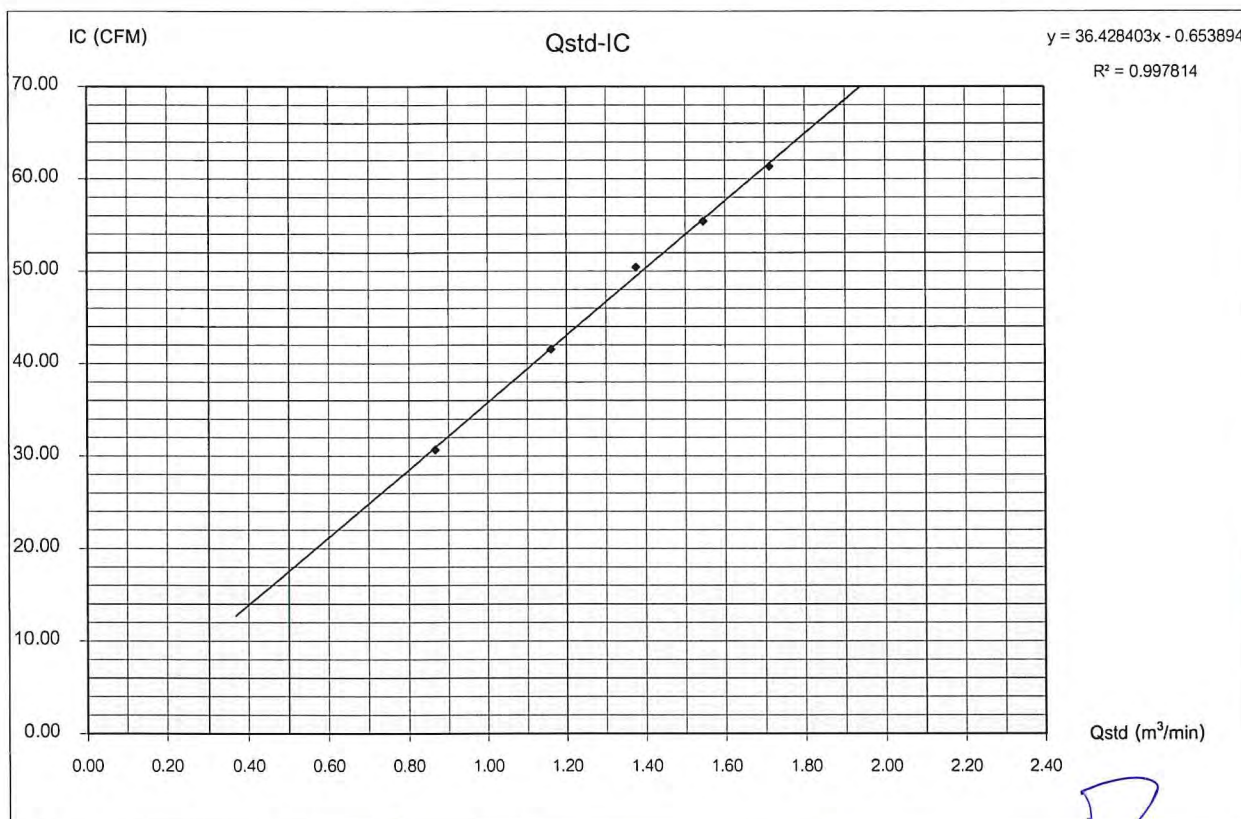
PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Quotation	2024-02184			Date	February 24, 2025
Sampler Location	บ้านละมั่งไร่			Start Time	5:22 PM
Sampler Number	PM-10 No.31	Transfer Standard Type	Orifice	Stop Time	5:32 PM
Instrument Model	HIVOL-BMBBE	Calibrator Model	TE-5025A	Calibrated By	Mr. Nikul Phokamla
Motor Serial Number	31	Calibrator Serial Number	3883		
Recorder Serial Number	507-008				

Plate No.	(Delta H)			(A)	(X)	(I)	(Y)	Temperature	Barometric Pressure	Start Meter	Stop Meter	
	Pressure Drop Across Orifice (inH ₂ O)			$[\Delta H_2O(Pa/P_{std})(T_{std}/Ta)]^{1/2}$	$Q_{std} = (1/m)[(A-b)]$	ample Flow Rate Indicaio	$IC = I[(Pa/P_{std})(T_{std}/Ta)]^{1/2}$					
	Positive	Negative	ΔH_2O		(m ³ /min)	(ft ³ /min)		(°K = °C+273)	(mmHg)			
5	1.5	1.5	3.0	1.71317	0.86757	31.0	30.66	303.0	756.0			
7	2.7	2.7	5.4	2.29846	1.16088	42.0	41.54	303.0	756.0			
10	3.8	3.8	7.6	2.72677	1.37551	51.0	50.44	303.0	756.0			
13	4.8	4.8	9.6	3.06462	1.54483	56.0	55.39	303.0	756.0			
18	5.9	5.9	11.8	3.39768	1.71173	62.0	61.32	303.0	756.0			
Linear Regression Y ON X : Y= mX + b							Average	303.0	756.0			
1	Slope (m)			1.99546	Linear Equation			r ²	0.997814	Pstd(mmHg)	760	
2	Intercept (b)			-0.01802	Set Point Flow Rate (X) (m ³ /min)		1.133	r	0.9989064	T _{NTP}	298	
3	Correlation Coefficient (r)			0.99983	Final Set Flow Rate = (I)		0	(Pa/Pstd)*(Tstd/Ta)		0.978322043		
Result									C=(Pa/Pstd)*(Tstd/Ta)^0.5		0.989101634	

COMMENT

Andersen Instruments, Inc.



Checked By

(Mr. Prayun Detkla)
Technician



Approved By

(Mr. Panupon Podang)
Environmental Scientist

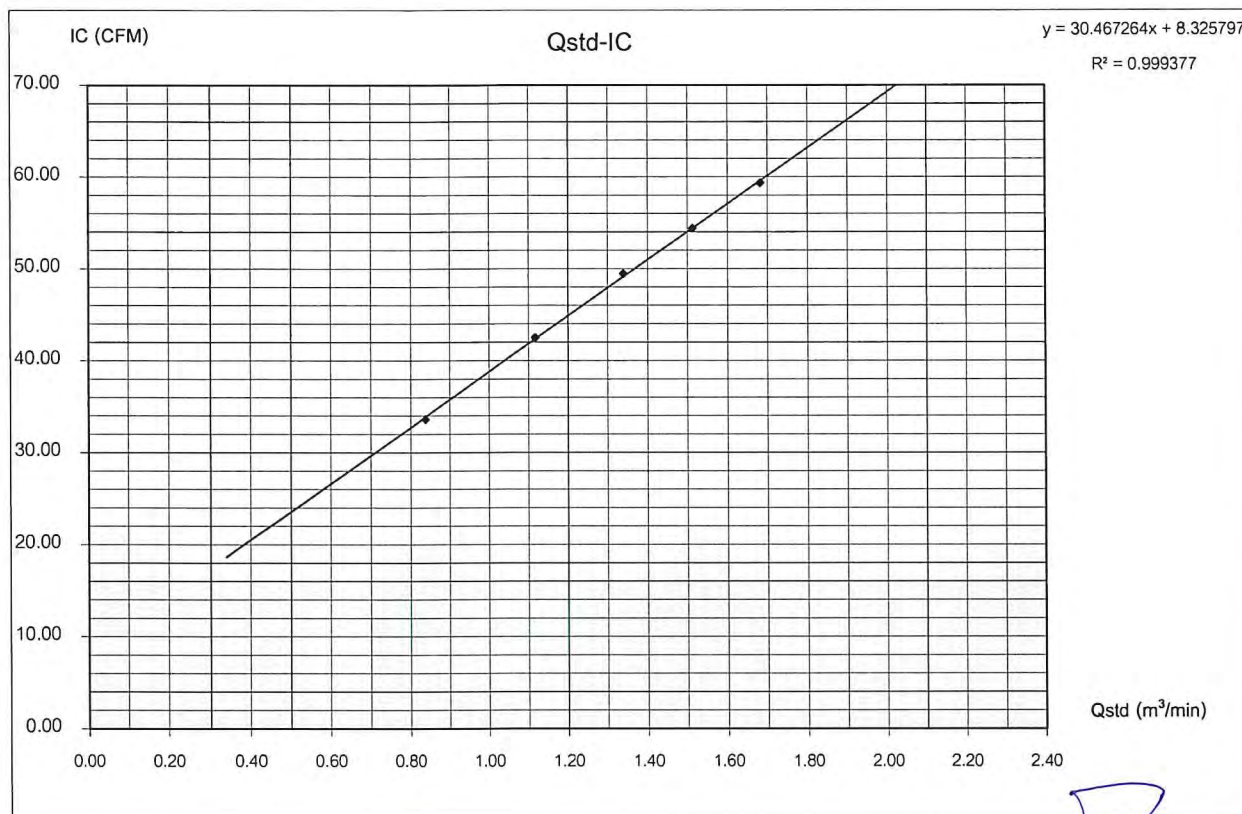
TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Quotation	2024-02184	Date	February 26, 2025
Sampler Location	บ้านคุณสาร	Start Time	4:21 PM
Sampler Number	TSP No.A31	Transfer Standard Type	Orifice
Instrument Model	HIVOL-BBCBE	Calibrator Model	TE-5025A
Motor Serial Number	57-507	Calibrator Serial Number	3883
Recorder Serial Number	506-012	Calibrated By	Mr.Nikul Phokamla

Plate No.	(Delta H)			(A)	(X)	(I)	(Y)	Temperature	Barometric Pressure	Start Meter	Stop Meter	
	Pressure Drop Across Orifice (inH ₂ O)			$[\Delta H_2O(Pa/P_{std})(T_{std}/Ta)]^{1/2}$	$Qstd = (1/m)[(A-b)]$	sample Flow Rate Indication	$IC = I[(Pa/P_{std})(T_{std}/Ta)]^{1/2}$					
	Positive	Negative	ΔH_2O		(m ³ /min)	(ft ³ /min)		(°K = °C+273)	(mmHg)			
5	1.4	1.4	2.8	1.65508	0.83846	34.0	33.63	303.0	756.0			
7	2.5	2.5	5.0	2.21170	1.11740	43.0	42.53	303.0	756.0			
10	3.6	3.6	7.2	2.65404	1.33907	50.0	49.46	303.0	756.0			
13	4.6	4.6	9.2	3.00009	1.51249	55.0	54.40	303.0	756.0			
18	5.7	5.7	11.4	3.33959	1.68263	60.0	59.35	303.0	756.0			
Linear Regression Y ON X : Y= mX + b							Average	303.0	756.0			
1	Slope (m)			1.99546	Linear Equation			r ²	0.999377	Pstd(mmHg)	760.0	
2	Intercept (b)			-0.01802	Set Point Flow Rate (X) (m ³ /min)		1.133	r	0.9996885	T _{NTP}	298.0	
3	Correlation Coefficient (r)			0.99983	Final Set Flow Rate = (I)		0	(Pa/Pstd)*(Tstd/Ta)			0.978322043	
Result									C=(Pa/Pstd)*(Tstd/Ta)^0.5			0.989101634

COMMENT

Andersen Instruments, Inc.



Checked By

(Mr. Prayun Detkla)

Technician



Approved By

(Mr. Panupon Podang)

Environmental Scientist

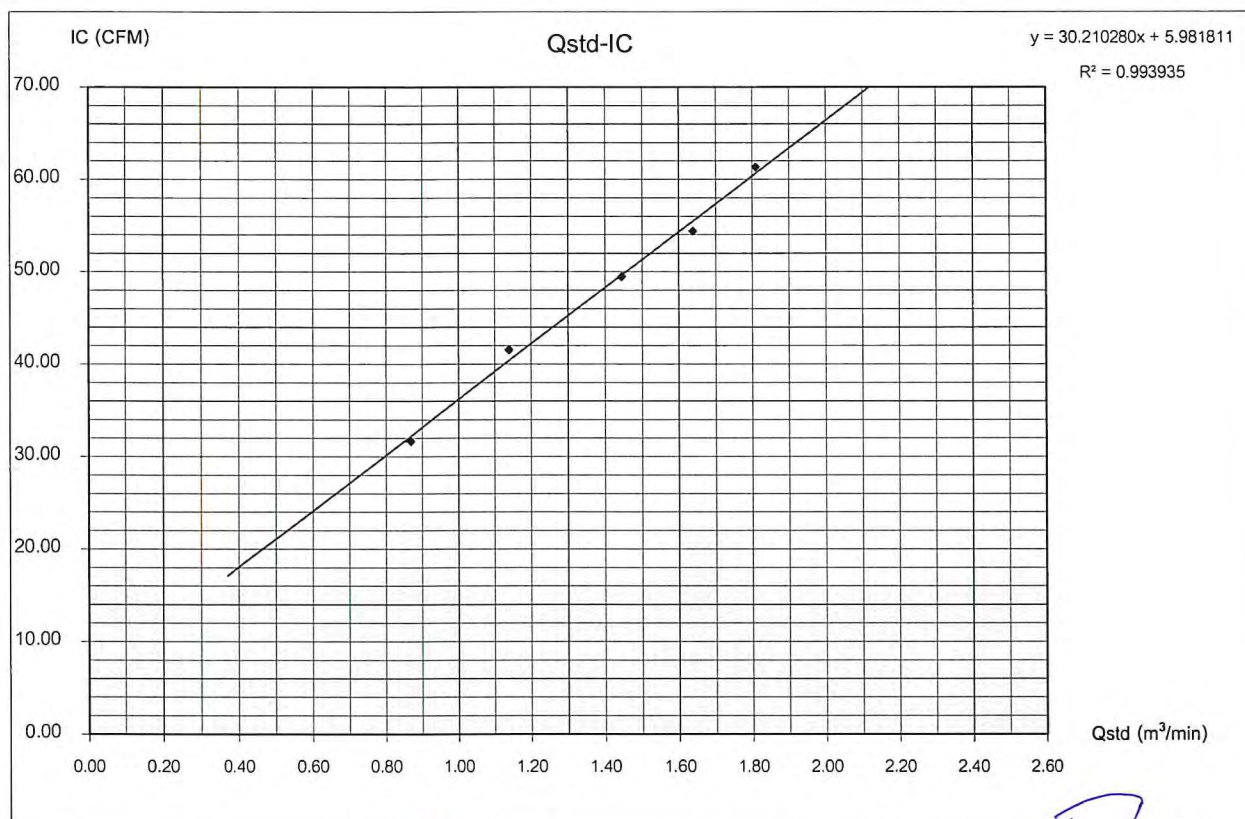
PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Quotation	2024-02184			Date	February 24, 2025
Sampler Location	บ้านคุณสาร			Start Time	4:31 PM
Sampler Number	PM-10 No.5	Transfer Standard Type	Orifice	Stop Time	4:41 PM
Instrument Model	HIVOL-BMBBE	Calibrator Model	TE-5025A	Calibrated By	Mr. Nikul Phokamla
Motor Serial Number	2015-5	Calibrator Serial Number	3883		
Recorder Serial Number	R-C21				

Plate No.	(Delta H)			(A)	(X)	(I)	(Y)	Temperature	Barometric Pressure	Start Meter	Stop Meter	
	Pressure Drop Across Orifice (inH ₂ O)			$[\Delta H \cdot O(Pa/P_{std})(T_{std}/Ta)]^{1/2}$	$Qstd = (1/m)[(A-b)]$	sample Flow Rate Indication	$IC = I[(Pa/P_{std})(T_{std}/Ta)]^{1/2}$					
	Positive	Negative	ΔH ₂ O		(m ³ /min)	(ft ³ /min)		(°K = °C+273)	(mmHg)			
5	1.5	1.5	3.0	1.71317	0.86757	32.0	31.65	303.0	756.0			
7	2.6	2.6	5.2	2.25550	1.13935	42.0	41.54	303.0	756.0			
10	4.2	4.2	8.4	2.86669	1.44564	50.0	49.46	303.0	756.0			
13	5.4	5.4	10.8	3.25052	1.63799	55.0	54.40	303.0	756.0			
18	6.5	6.7	13.2	3.59358	1.80991	62.0	61.32	303.0	756.0			
Linear Regression Y ON X : Y= mX + b							Average	303.0	756.0			
1	Slope (m)			1.99546	Linear Equation			r ²	0.993935	Pstd(mmHg)	760.0	
2	Intercept (b)			-0.01802	Set Point Flow Rate (X) (m ³ /min)		1.133	r	0.9969629	T _{NTP}	298.0	
3	Correlation Coefficient (r)			0.99983	Final Set Flow Rate = (I)		0	(Pa/Pstd)*(Tstd/Ta)			0.978322043	
Result									C=(Pa/Pstd)*(Tstd/Ta)^0.5			0.989101634

COMMENT

Andersen Instruments, Inc.



Checked By

(Mr. Prayun Detkla)
Technician



Approved By

(Mr. Panupon Podang)
Environmental Scientist

TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Quotation	2024-02184			Date	February 24, 2025
Sampler Location	บ้านต๋อง			Start Time	6:01 PM
Sampler Number	TSP No.A21	Transfer Standard Type	Orifice	Stop Time	6:11 PM
Instrument Model	HIVOL-BBCBE	Calibrator Model	TE-5025A	Calibrated By	Mr.Nikul Phokamla
Motor Serial Number	2216	Calibrator Serial Number	3883		
Recorder Serial Number	2398				

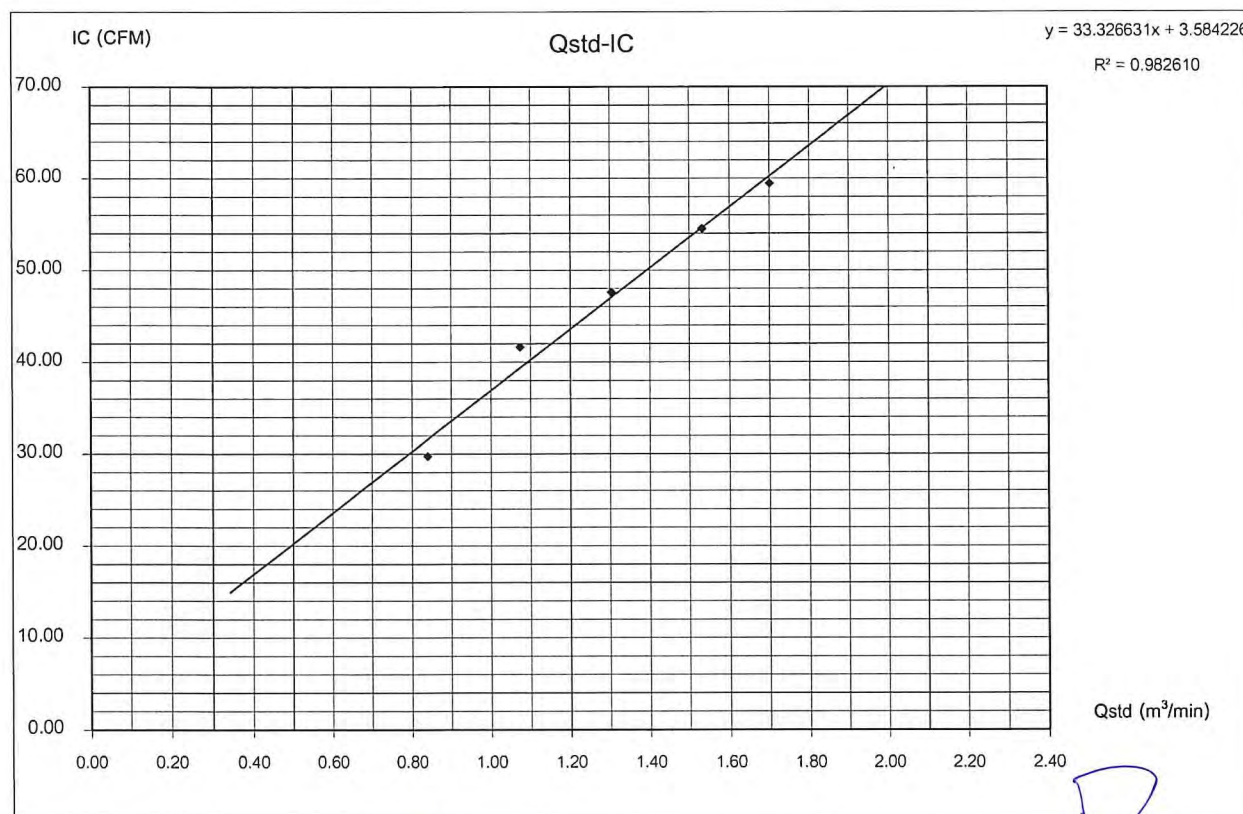
Plate No.	(Delta H)			(A)	(X)	(I)	(Y)	Temperature	Barometric Pressure	Start Meter	Stop Meter
	Pressure Drop Across Orifice (inH ₂ O)			$[\Delta H_2O(Pa/P_{std})(T_{std}/T_a)]^{1/2}$	$Q_{std} = (1/m)[(A-b)]$	Sample Flow Rate Indication	$IC = [(Pa/P_{std})(T_{std}/T_a)]^{1/2}$	(°K = °C+273)	(mmHg)		
	Positive	Negative	ΔH ₂ O		(m ³ /min)	(ft ³ /min)					
5	1.4	1.4	2.8	1.65892	0.84038	30.0	29.74	302.0	757.0		
7	2.3	2.3	4.6	2.12630	1.07460	42.0	41.64	302.0	757.0		
10	3.4	3.4	6.8	2.58524	1.30459	48.0	47.59	302.0	757.0		
13	4.7	4.7	9.4	3.03955	1.53226	55.0	54.53	302.0	757.0		
18	5.8	5.8	11.6	3.37656	1.70115	60.0	59.48	302.0	757.0		

Linear Regression Y ON X : Y = mX + b

1	Slope (m)	1.99546	Linear Equation			r^2	0.98261	Pstd(mmHg)	760.0
2	Intercept (b)	-0.01802	Set Point Flow Rate (X) (m ³ /min)		1.133	r	0.9912669	T _{NTP}	298.0
3	Correlation Coefficient (r)	0.99983	Final Set Flow Rate = (I)		0	(Pa/Pstd)*(Tstd/Ta)		0.982859881	
Result						C=(Pa/Pstd)*(Tstd/Ta)^0.5		0.9913929	

COMMENT

Andersen Instruments, Inc.



Checked By

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Technician



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Environmental Scientist

PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Quotation	2024-02184			Date	February 24, 2025
Sampler Location	บ้านต๋อม			Start Time	5:50 PM
Sampler Number	PM-10 No.28	Transfer Standard Type	Orifice	Stop Time	6:00 PM
Instrument Model	HIVOL-BMBBE	Calibrator Model	TE-5025A	Calibrated By	Mr. Nikul Phokamla
Motor Serial Number	2206	Calibrator Serial Number	3883		
Recorder Serial Number	2613				

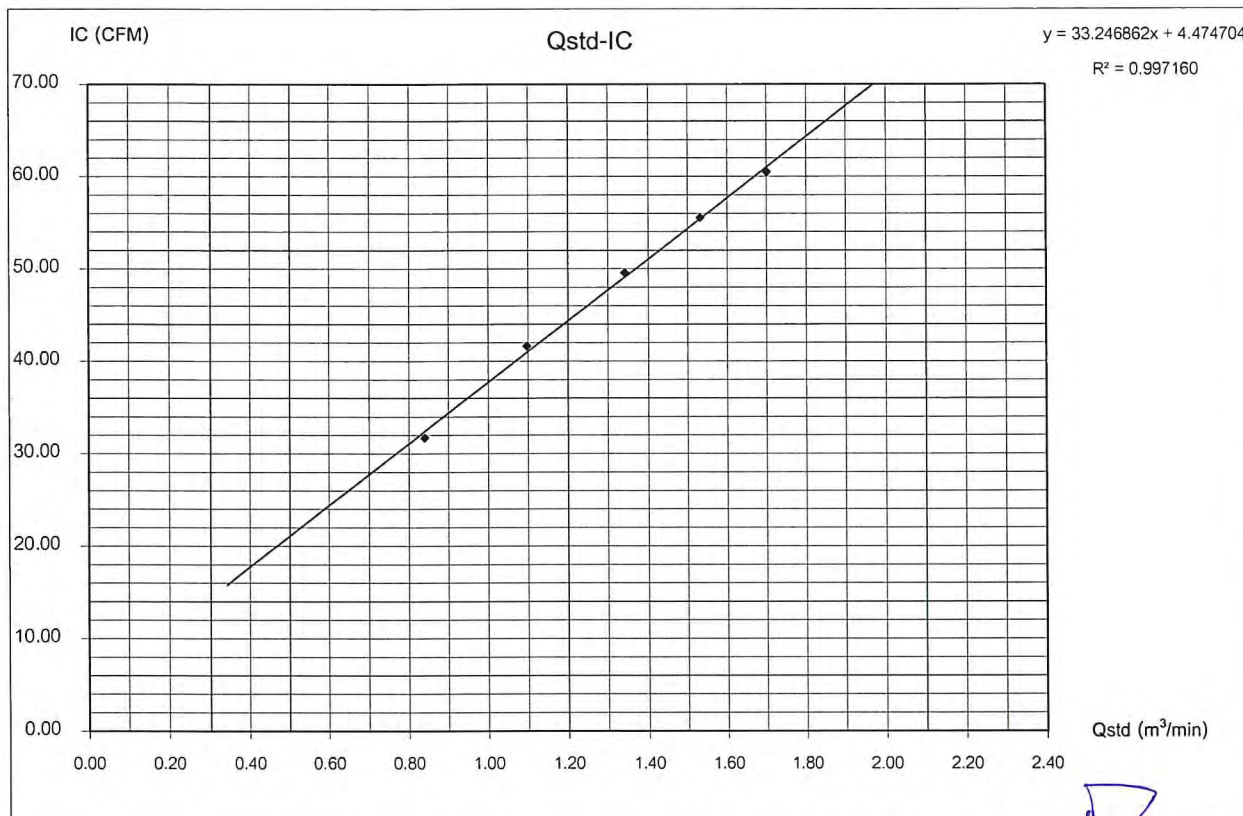
Plate No.	(Delta H)			(A)	(X)	(I)	(Y)	Temperature	Barometric Pressure	Start Meter	Stop Meter
	Positive	Negative	ΔH_2O	$[\Delta H_2O(Pa/P_{std})(T_{std}/T_a)]^{1/2}$	$Q_{std} = (1/m)[(A-b)]$ (m^3/min)	Sample Flow Rate Indication (ft^3/min)	$IC = [(Pa/P_{std})(T_{std}/T_a)]^{1/2}$ ($^{\circ}K = ^{\circ}C+273$)	($^{\circ}K = ^{\circ}C+273$)	(mmHg)		
5	1.4	1.4	2.8	1.65892	0.84038	32.0	31.72	302.0	757.0		
7	2.4	2.4	4.8	2.17203	1.09752	42.0	41.64	302.0	757.0		
10	3.6	3.6	7.2	2.66019	1.34215	50.0	49.57	302.0	757.0		
13	4.7	4.7	9.4	3.03955	1.53226	56.0	55.52	302.0	757.0		
18	5.8	5.8	11.6	3.37656	1.70115	61.0	60.47	302.0	757.0		

Linear Regression Y ON X : $Y = mX + b$

1	Slope (m)	1.99546	Linear Equation		Average	302.0	757.0		
2	Intercept (b)	-0.01802	Set Point Flow Rate (X) (m^3/min)	1.133	r^2	0.99716	Pstd(mmHg)	760.0	
3	Correlation Coefficient (r)	0.99983	Final Set Flow Rate = (I)	0	r	0.998579	T _{NTP}	298.0	
								$C = (Pa/P_{std}) * (T_{std}/T_a)$	
Result								0.982859881	
								$C = (Pa/P_{std}) * (T_{std}/T_a)^{0.5}$	
								0.9913929	

COMMENT

Andersen Instruments, Inc.



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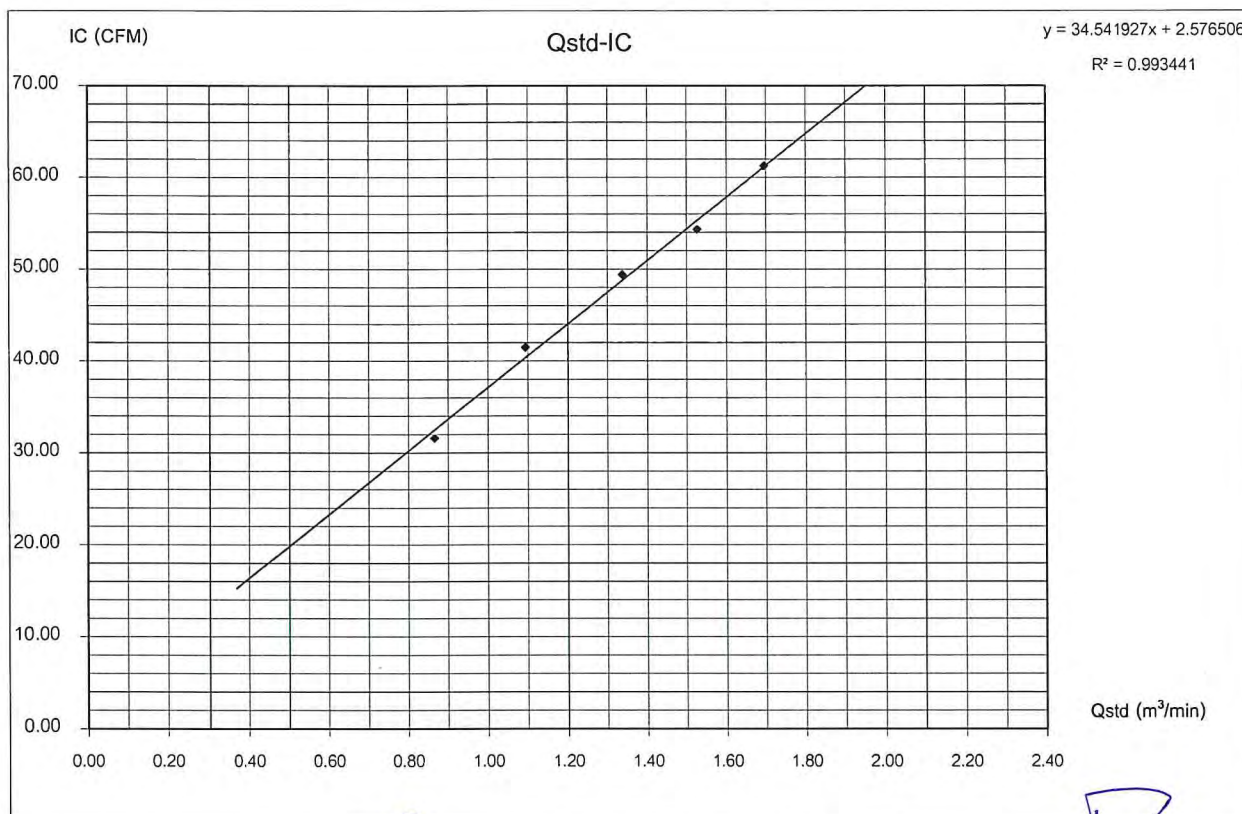
TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Quotation	2024-02184	Date	February 25, 2025
Sampler Location	บ้านโคกตะแบง (คุ้มบ้านโคกสังเค็ด)	Start Time	6:01 PM
Sampler Number	TSP No.A20	Transfer Standard Type	Orifice
Instrument Model	HIVOL-BBCBE	Calibrator Model	TE-5025A
Motor Serial Number	2142	Calibrator Serial Number	3883
Recorder Serial Number	2397	Calibrated By	Mr.Nikul Phokamla

Plate No.	(Delta H)			(A)	(X)	(I)	(Y)	Temperature	Barometric Pressure	Start Meter	Stop Meter
	Pressure Drop Across Orifice (inH ₂ O)			[ΔH ₂ O(Pa/P _{std})(T _{std} /Ta)] ^{1/2}	Qstd = (1/m)[(A-b)] (m ³ /min)	ample Flow Rate Indication (ft ³ /min)	IC = I[(Pa/P _{std})(T _{std} /Ta)] ^{1/2}	(°K = °C+273)	(mmHg)		
	Positive	Negative	ΔH ₂ O								
5	1.5	1.5	3.0	1.71149	0.86672	32.0	31.62	304.0	757.0		
7	2.4	2.4	4.8	2.16488	1.09393	42.0	41.50	304.0	757.0		
10	3.6	3.6	7.2	2.65142	1.33776	50.0	49.41	304.0	757.0		
13	4.7	4.7	9.4	3.02954	1.52725	55.0	54.35	304.0	757.0		
18	5.8	5.8	11.6	3.36544	1.69558	62.0	61.26	304.0	757.0		
Linear Regression Y ON X : Y= mX + b							Average	304.0	757.0		
1	Slope (m)			1.99546	Linear Equation			r ²	0.993441	Pstd(mmHg)	760.0
2	Intercept (b)			-0.01802	Set Point Flow Rate (X) (m ³ /min)		1.133	r	0.9967151	T _{NTP}	298.0
3	Correlation Coefficient (r)			0.99983	Final Set Flow Rate = (I)		0	(Pa/Pstd)*(Tstd/Ta)		0.976393698	
Result								C=(Pa/Pstd)*(Tstd/Ta)^0.5		0.988126357	

COMMENT

Andersen Instruments, Inc.



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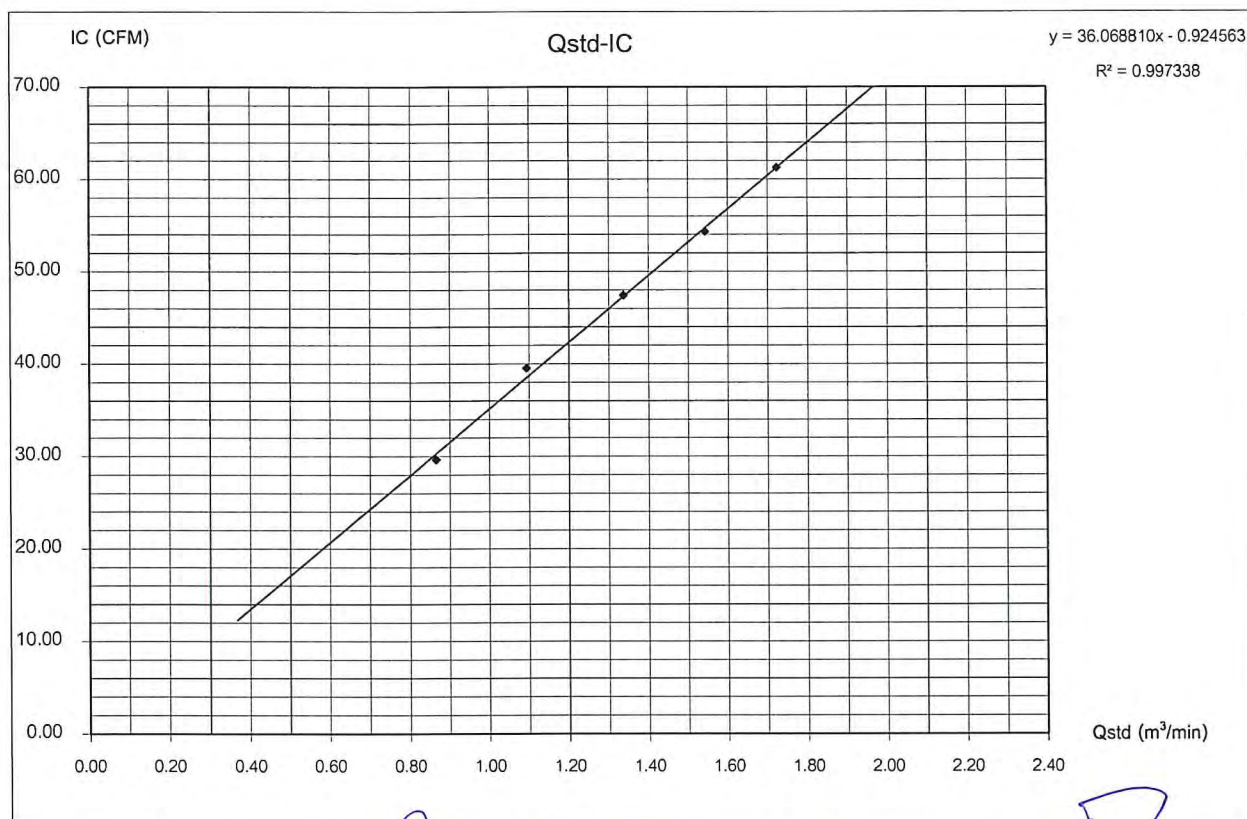
PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Quotation	2024-02184			Date	February 25, 2025
Sampler Location	บ้านโคกตะแบง (คุ้มบ้านโคกสังเค็ด)			Start Time	5:50 PM
Sampler Number	PM-10 No.29	Transfer Standard Type	Orifice	Stop Time	6:00 PM
Instrument Model	HIVOL-BMBBE	Calibrator Model	TE-5025A	Calibrated By	Mr. Nikul Phokamla
Motor Serial Number	2210	Calibrator Serial Number	3883		
Recorder Serial Number	2614				

Plate No.	(Delta H) Pressure Drop Across Orifice (inH ₂ O)			(A) [ΔH _{H₂O} (Pa/P _{std})(T _{std} /Ta)] ^{1/2}	(X) Qstd = (1/m)[(A-b)] (m ³ /min)	(I) ample Flow Rate Indicato (ft ³ /min)	(Y) IC = I[(Pa/P _{std})(T _{std} /Ta)] ^{1/2}	Temperature (°K = °C+273)	Barometric Pressure (mmHg)	Start Meter	Stop Meter
	Positive	Negative	ΔH ₂ O								
5	1.5	1.5	3.0	1.71149	0.86672	30.0	29.64	304.0	757.0		
7	2.4	2.4	4.8	2.16488	1.09393	40.0	39.53	304.0	757.0		
10	3.6	3.6	7.2	2.65142	1.33776	48.0	47.43	304.0	757.0		
13	4.8	4.8	9.6	3.06160	1.54331	55.0	54.35	304.0	757.0		
18	6.0	6.0	12.0	3.42297	1.72441	62.0	61.26	304.0	757.0		
Linear Regression Y ON X : Y= mX + b							Average	304.0	757.0		
1	Slope (m)			1.99546	Linear Equation			r ²	0.993968	Pstd(mmHg)	760.0
2	Intercept (b)			-0.01802	Set Point Flow Rate (X) (m ³ /min)		1.133	r	0.9969794	T _{NTP}	298.0
3	Correlation Coefficient (r)			0.99983	Final Set Flow Rate = (I)		0	(Pa/Pstd)*(Tstd/Ta)		0.976393698	
Result								C=(Pa/Pstd)*(Tstd/Ta)^0.5		0.988126357	

COMMENT

Andersen Instruments, Inc.



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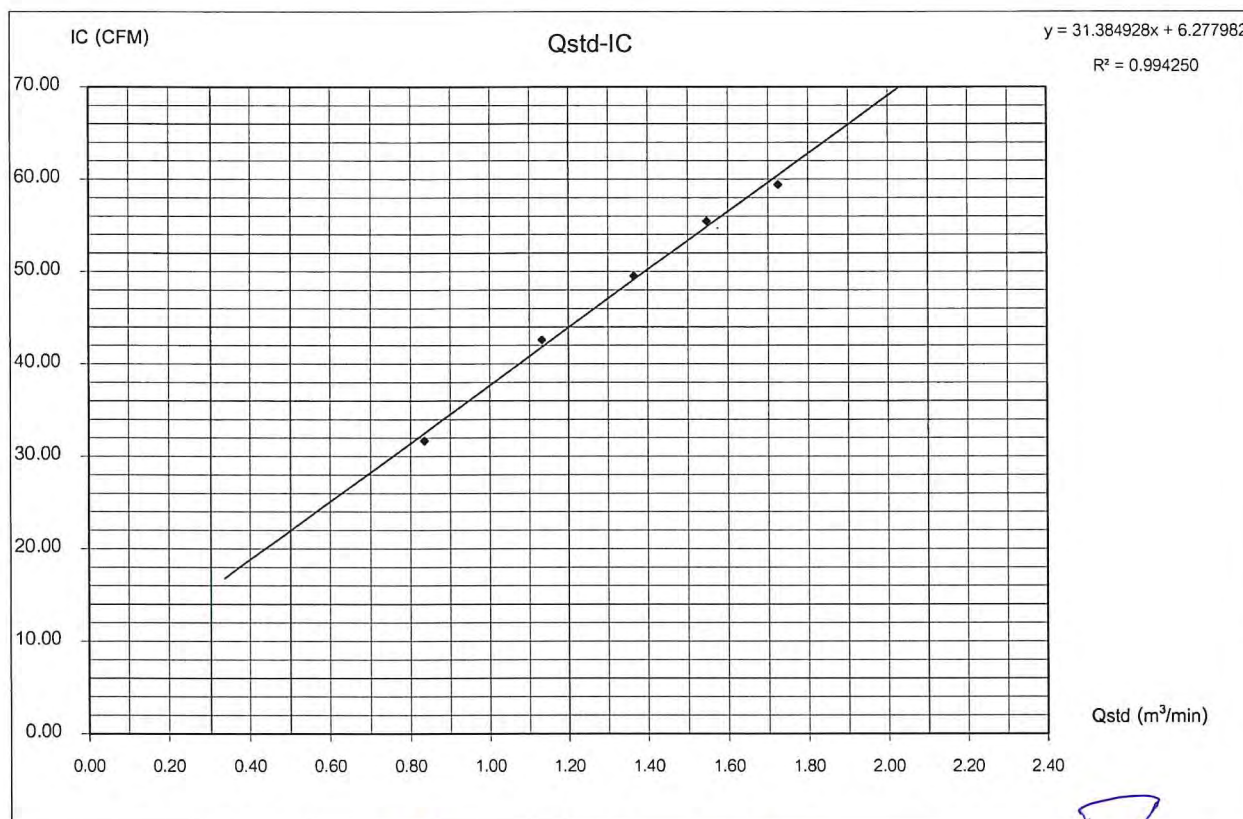
TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Quotation	2024-02184			Date	May 27, 2025
Sampler Location	บ้านละมั่งไร่			Start Time	3:31 PM
Sampler Number	TSP No.A24	Transfer Standard Type	Orifice	Stop Time	3:41 PM
Instrument Model	HIVOL-BBCBE	Calibrator Model	TE-5025A	Calibrated By	Mr.Nikul Phokamla
Motor Serial Number	2149	Calibrator Serial Number	2913		
Recorder Serial Number	2412				

Plate No.	(Delta H)			(A)	(X)	(I)	(Y)	Temperature	Barometric Pressure	Start Meter	Stop Meter	
	Pressure Drop Across Orifice (inH ₂ O)			[ΔH ₂ O(Pa/P _{std})(T _{std} /Ta)] ^{1/2}	Qstd = (1/m)[(A-b)] (m ³ /min)	Sample Flow Rate Indicator (ft ³ /min)	IC = I[(Pa/P _{std})(T _{std} /Ta)] ^{1/2}	(*K = °C+273)	(mmHg)			
	Positive	Negative	ΔH ₂ O									
5	1.3	1.3	2.6	1.59699	0.83533	32.0	31.69	303.0	758.0			
7	2.4	2.4	4.8	2.16988	1.13208	43.0	42.59	303.0	758.0			
10	3.5	3.5	7.0	2.62038	1.36544	50.0	49.52	303.0	758.0			
13	4.5	4.5	9.0	2.97123	1.54718	56.0	55.46	303.0	758.0			
18	5.6	5.6	11.2	3.31454	1.72501	60.0	59.42	303.0	758.0			
Linear Regression Y ON X : Y= mX + b							Average	303.0	758.0			
1	Slope (m)			1.93052	Linear Equation			r ²	0.99425	Pstd(mmHg)	760.0	
2	Intercept (b)			-0.01563	Set Point Flow Rate (X) (m ³ /min)		1.133	r	0.9971209	T _{NTP}	298.0	
3	Correlation Coefficient (r)			0.99959	Final Set Flow Rate = (I)		0	(Pa/Pstd)*(Tstd/Ta)		0.980910196		
Result									C=(Pa/Pstd)*(Tstd/Ta)^0.5		0.990409106	

COMMENT

Andersen Instruments, Inc.



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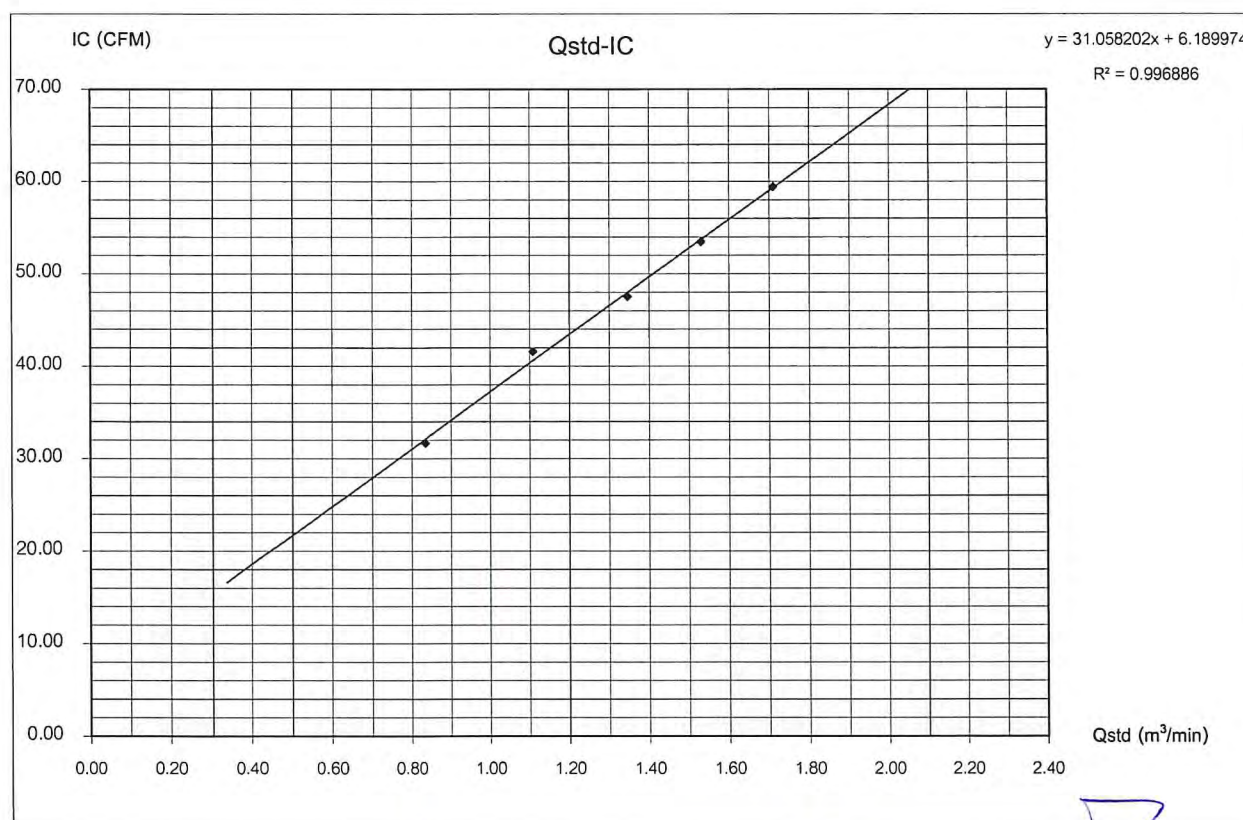
PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Quotation	2024-02184			Date	May 27, 2025
Sampler Location	บ้านละลมระไทร์			Start Time	3:41 PM
Sampler Number	PM-10 No.1	Transfer Standard Type	Orifice	Stop Time	3:51 PM
Instrument Model	HIVOL-BMBBE	Calibrator Model	TE-5025A	Calibrated By	Mr.Nikul Phokamla
Motor Serial Number	1	Calibrator Serial Number	2913		
Recorder Serial Number	-				

Plate No.	(Delta H)			(A)	(X)	(I)	(Y)	Temperature	Barometric Pressure	Start Meter	Stop Meter
	Pressure Drop Across Orifice (inH ₂ O)			$[\Delta H_2O(Pa/P_{std}/(T_{std}/Ta))]^{1/2}$	$Q_{std} = (1/m)[(A-b)]$	ample Flow Rate Indicator	$IC = I[(Pa/P_{std}/(T_{std}/Ta))]^{1/2}$				
	Positive	Negative	ΔH_2O		(m ³ /min)	(ft ³ /min)		(°K = °C+273)	(mmHg)		
5	1.3	1.3	2.6	1.59699	0.83533	32.0	31.69	303.0	758.0		
7	2.3	2.3	4.6	2.12419	1.10842	42.0	41.60	303.0	758.0		
10	3.4	3.4	6.8	2.58267	1.34591	48.0	47.54	303.0	758.0		
13	4.4	4.4	8.8	2.93803	1.52998	54.0	53.48	303.0	758.0		
18	5.5	5.5	11.0	3.28482	1.70961	60.0	59.42	303.0	758.0		
Linear Regression Y ON X : Y= mX + b							Average	303.0	758.0		
1	Slope (m)			1.93052	Linear Equation			r ²	0.996886	Pstd(mmHg)	760.0
2	Intercept (b)			-0.01563	Set Point Flow Rate (X) (m ³ /min)		1.133	r	0.9984418	T _{NTP}	298.0
3	Correlation Coefficient (r)			0.99959	Final Set Flow Rate = (I)		0	(Pa/Pstd)*(Tstd/Ta)			0.980910196
Result								C=(Pa/Pstd)*(Tstd/Ta)^0.5			0.990409106

COMMENT

Andersen Instruments, Inc.



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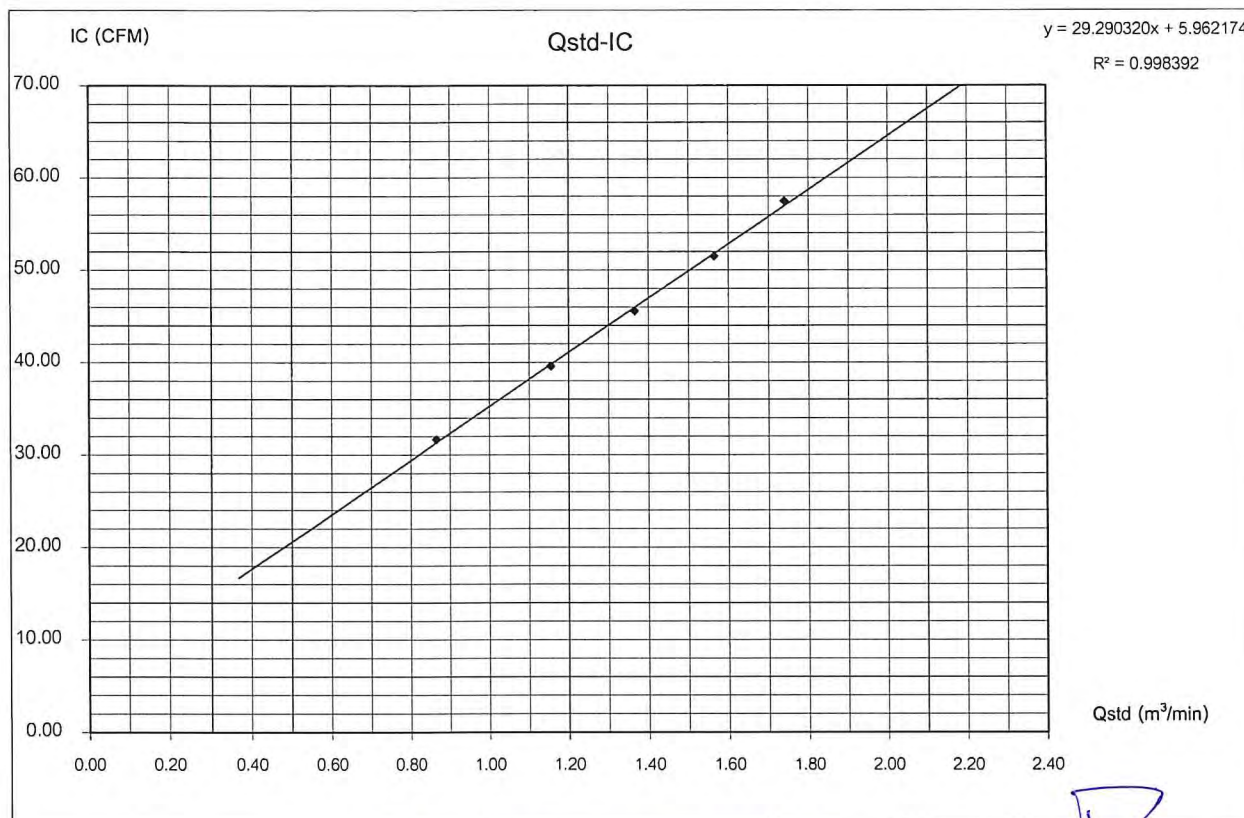
TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Quotation	2024-02184			Date	May 27, 2025
Sampler Location	บ้านคุณตาว			Start Time	2:24 PM
Sampler Number	TSP No.A11	Transfer Standard Type	Orifice	Stop Time	2:34 PM
Instrument Model	HIVOL-BBCBE	Calibrator Model	TE-5025A	Calibrated By	Mr.Nikul Phokamla
Motor Serial Number	2141	Calibrator Serial Number	2913		
Recorder Serial Number	102950701				

Plate	(Delta H)			(A)	(X)	(I)	(Y)	Temperature	Barometric	Start	Stop	
No.	Pressure Drop Across Orifice (inH ₂ O)			$[\Delta H_2O(Pa/P_{std})(T_{std}/Ta)]^{1/2}$	Qstd = (1/m)[(A-b)] (m ³ /min)	ample Flow Rate Indication (ft ³ /min)	$IC = I[(Pa/P_{std})(T_{std}/Ta)]^{1/2}$	(°K = °C+273)	Pressure (mmHg)	Meter	Meter	
	Positive	Negative	ΔH ₂ O									
5	1.4	1.4	2.8	1.65727	0.86655	32.0	31.69	303.0	758.0			
7	2.5	2.5	5.0	2.21462	1.15526	40.0	39.62	303.0	758.0			
10	3.5	3.5	7.0	2.62038	1.36544	46.0	45.56	303.0	758.0			
13	4.6	4.6	9.2	3.00406	1.56418	52.0	51.50	303.0	758.0			
18	5.7	5.7	11.4	3.34401	1.74028	58.0	57.44	303.0	758.0			
Linear Regression Y ON X : Y= mX + b							Average	303.0	758.0			
1	Slope (m)			1.93052	Linear Equation			r ²	0.998392	Pstd(mmHg)	760.0	
2	Intercept (b)			-0.01563	Set Point Flow Rate (X) (m ³ /min)		1.133	r	0.9991957	T _{NTP}	298.0	
3	Correlation Coefficient (r)			0.99959	Final Set Flow Rate = (I)		0	(Pa/Pstd)*(Tstd/Ta)		0.980910196		
Result									C=(Pa/Pstd)*(Tstd/Ta)^0.5		0.990409106	

COMMENT

Andersen Instruments, Inc.



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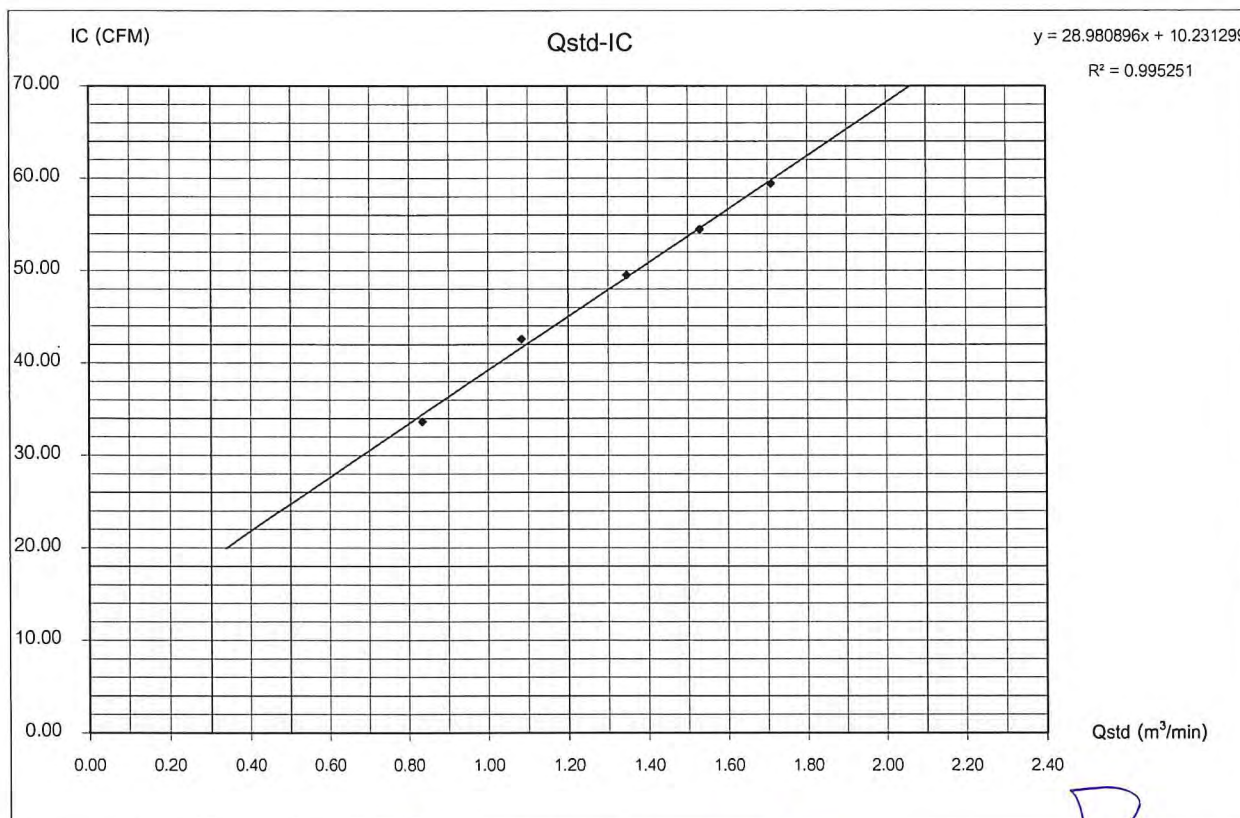
PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Quotation	2024-02184			Date	May 27, 2025
Sampler Location	บ้านคุณสาร			Start Time	2:34 PM
Sampler Number	PM-10 No.21	Transfer Standard Type	Orifice	Stop Time	2:44 PM
Instrument Model	HIVOL-BMBBE	Calibrator Model	TE-5025A	Calibrated By	Mr.Nikul Phokamla
Motor Serial Number	2132	Calibrator Serial Number	2913		
Recorder Serial Number	2392				

Plate No.	(Delta H)			(A)	(X)	(I)	(Y)	Temperature	Barometric Pressure	Start Meter	Stop Meter	
	Pressure Drop Across Orifice (inH ₂ O)			$[\Delta H_2O(Pa/P_{std})(T_{std}/Ta)]^{1/2}$	$Q_{std} = (1/m)[(A-b)]$ (m ³ /min)	Sample Flow Rate Indication (ft ³ /min)	$IC = I[(Pa/P_{std})(T_{std}/Ta)]^{1/2}$	("K = °C+273)	(mmHg)			
	Positive	Negative	ΔH ₂ O									
5	1.3	1.3	2.6	1.59699	0.83533	34.0	33.67	303.0	758.0			
7	2.2	2.2	4.4	2.07750	1.08423	43.0	42.59	303.0	758.0			
10	3.4	3.4	6.8	2.58267	1.34591	50.0	49.52	303.0	758.0			
13	4.4	4.4	8.8	2.93803	1.52998	55.0	54.47	303.0	758.0			
18	5.5	5.5	11.0	3.28482	1.70961	60.0	59.42	303.0	758.0			
Linear Regression Y ON X : Y= mX + b							Average	303.0	758.0			
1	Slope (m)			1.93052	Linear Equation			r ²	0.995251	Pstd(mmHg)	760.0	
2	Intercept (b)			-0.01563	Set Point Flow Rate (X) (m ³ /min)		1.133	r	0.9976227	T _{NTP}	298.0	
3	Correlation Coefficient (r)			0.99959	Final Set Flow Rate = (I)		0	(Pa/Pstd)*(Tstd/Ta)		0.980910196		
Result									C=(Pa/Pstd)*(Tstd/Ta)^0.5		0.990409106	

COMMENT

Andersen Instruments, Inc.



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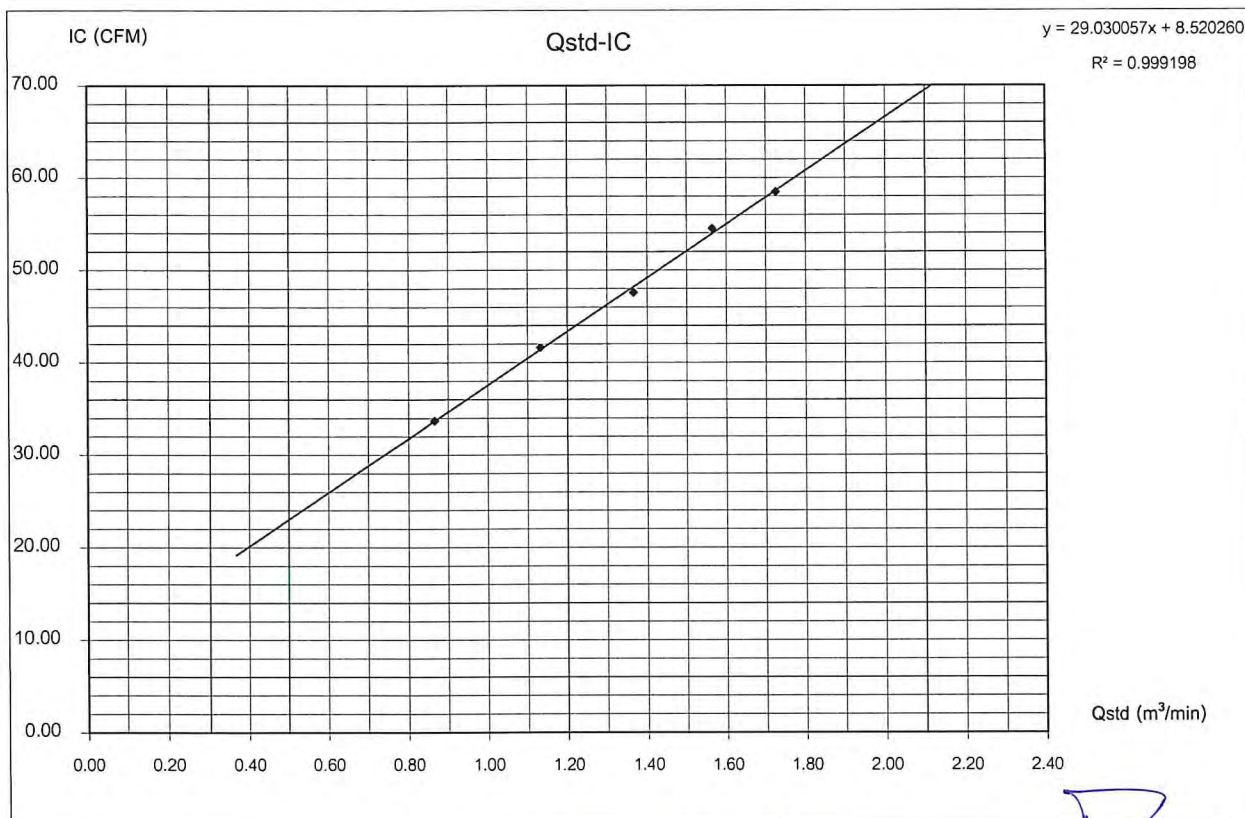
TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Quotation	2024-02184			Date	May 27, 2025
Sampler Location	บ้านศรีทอง			Start Time	4:24 PM
Sampler Number	TSP No.A22	Transfer Standard Type	Orifice	Stop Time	4:34 PM
Instrument Model	HIVOL-BBCBE	Calibrator Model	TE-5025A	Calibrated By	Mr.Nikul Phokamla
Motor Serial Number	2054	Calibrator Serial Number	2913		
Recorder Serial Number	2187				

Plate	(Delta H)			(A)	(X)	(I)	(Y)	Temperature	Barometric	Start	Stop	
No.	Pressure Drop Across Orifice (inH ₂ O)			[ΔH ₂ O(Pa/P _{std})(T _{std} /Ta)] ^{1/2}	Qstd = (1/m)[(A-b)] (m ³ /min)	ample Flow Rate Indication (ft ³ /min)	IC = I[(Pa/P _{std})(T _{std} /Ta)] ^{1/2}	(*K = °C+273)	Pressure (mmHg)	Meter	Meter	
	Positive	Negative	ΔH ₂ O									
5	1.4	1.4	2.8	1.65836	0.86712	34.0	33.70	303.0	759.0			
7	2.4	2.4	4.8	2.17131	1.13282	42.0	41.62	303.0	759.0			
10	3.5	3.5	7.0	2.62210	1.36633	48.0	47.57	303.0	759.0			
13	4.6	4.6	9.2	3.00604	1.56521	55.0	54.51	303.0	759.0			
18	5.6	5.6	11.2	3.31673	1.72615	59.0	58.47	303.0	759.0			
Linear Regression Y ON X : Y= mX + b							Average	303.0	759.0			
1	Slope (m)			1.93052	Linear Equation			r ²	0.999198	Pstd(mmHg)	760.0	
2	Intercept (b)			-0.01563	Set Point Flow Rate (X) (m ³ /min)		1.133	r	0.9995989	T _{NTP}	298.0	
3	Correlation Coefficient (r)			0.99959	Final Set Flow Rate = (I)		0	(Pa/Pstd)*(Tstd/Ta)		0.982204273		
Result									C=(Pa/Pstd)*(Tstd/Ta)^0.5		0.991062194	

COMMENT

Andersen Instruments, Inc.



Checked By

(Mr. Prayun Detkla)
Technician

Approved By

(Mr. Panupon Podang)
Environmental Scientist

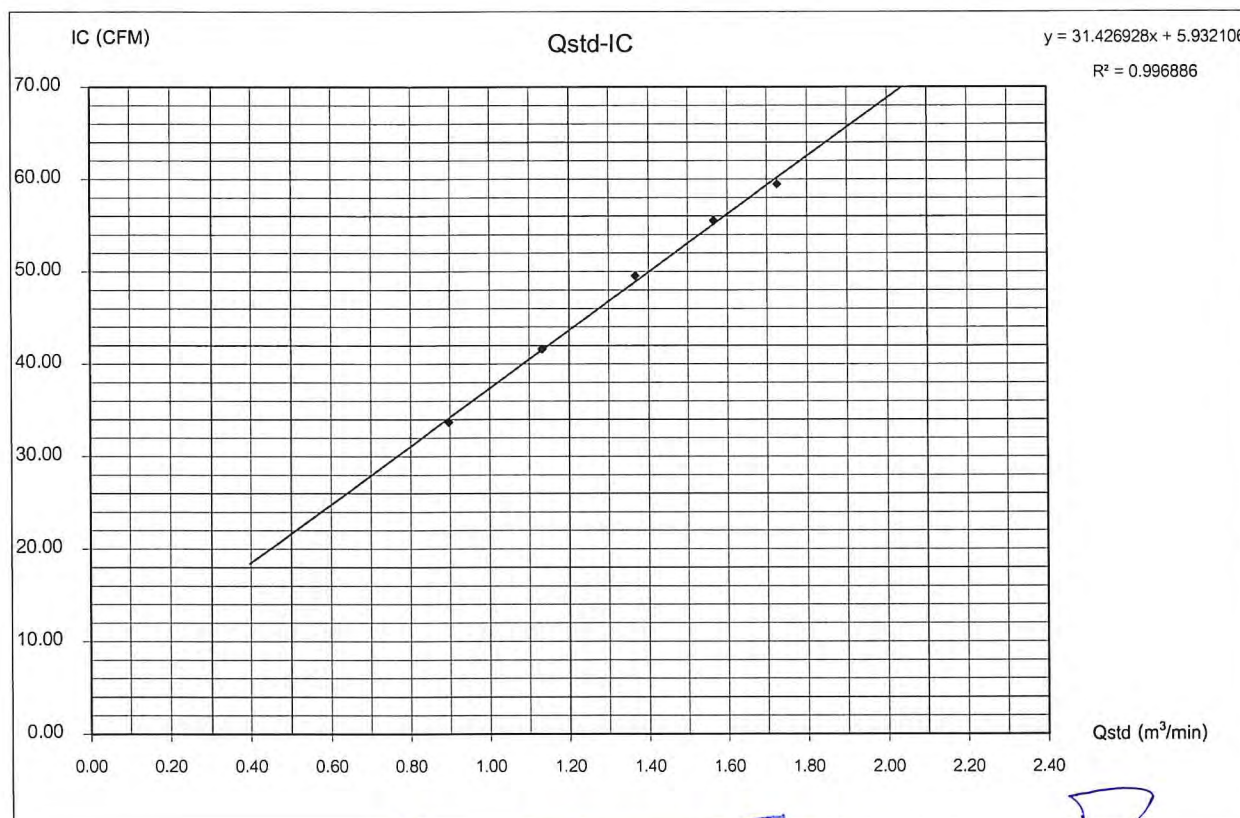
PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Quotation	2024-02184			Date	May 27, 2025
Sampler Location	บ้านศรีจอม			Start Time	4:34 PM
Sampler Number	PM-10 No.11	Transfer Standard Type	Orifice	Stop Time	4:44 PM
Instrument Model	HIVOL-BMBBE	Calibrator Model	TE-5025A	Calibrated By	Mr.Nikul Phokamla
Motor Serial Number	610-643	Calibrator Serial Number	2913		
Recorder Serial Number	R0411-004				

Plate No.	(Delta H)			(A)	(X)	(I)	(Y)	Temperature	Barometric Pressure	Start Meter	Stop Meter
	Pressure Drop Across Orifice (inH ₂ O)			$[\Delta H_2O(Pa/P_{std})(T_{std}/Ta)]^{1/2}$	Qstd = (1/m)[(A-b)] (m ³ /min)	sample Flow Rate Indication (ft ³ /min)	IC = I[(Pa/P _{std})(T _{std} /Ta)] ^{1/2}	(°K = °C+273)	(mmHg)		
	Positive	Negative	ΔH ₂ O								
5	1.5	1.5	3.0	1.71657	0.89727	34.0	33.70	303.0	759.0		
7	2.4	2.4	4.8	2.17131	1.13282	42.0	41.62	303.0	759.0		
10	3.5	3.5	7.0	2.62210	1.36633	50.0	49.55	303.0	759.0		
13	4.6	4.6	9.2	3.00604	1.56521	56.0	55.50	303.0	759.0		
18	5.6	5.6	11.2	3.31673	1.72615	60.0	59.46	303.0	759.0		
Linear Regression Y ON X : Y= mX + b							Average	303.0	759.0		
1	Slope (m)			1.93052	Linear Equation			r ²	0.996886	Pstd(mmHg)	760.0
2	Intercept (b)			-0.01563	Set Point Flow Rate (X) (m ³ /min)		1.133	r	0.9984418	T _{NTP}	298.0
3	Correlation Coefficient (r)			0.99959	Final Set Flow Rate = (I)		0	(Pa/Pstd)*(Tstd/Ta)			0.982204273
Result								C=(Pa/Pstd)*(Tstd/Ta)^0.5			0.991062194

COMMENT

Andersen Instruments, Inc.



Checked By

(Mr. Prayun Detkla)
Technician

Approved By

(Mr. Panupon Podang)
Environmental Scientist

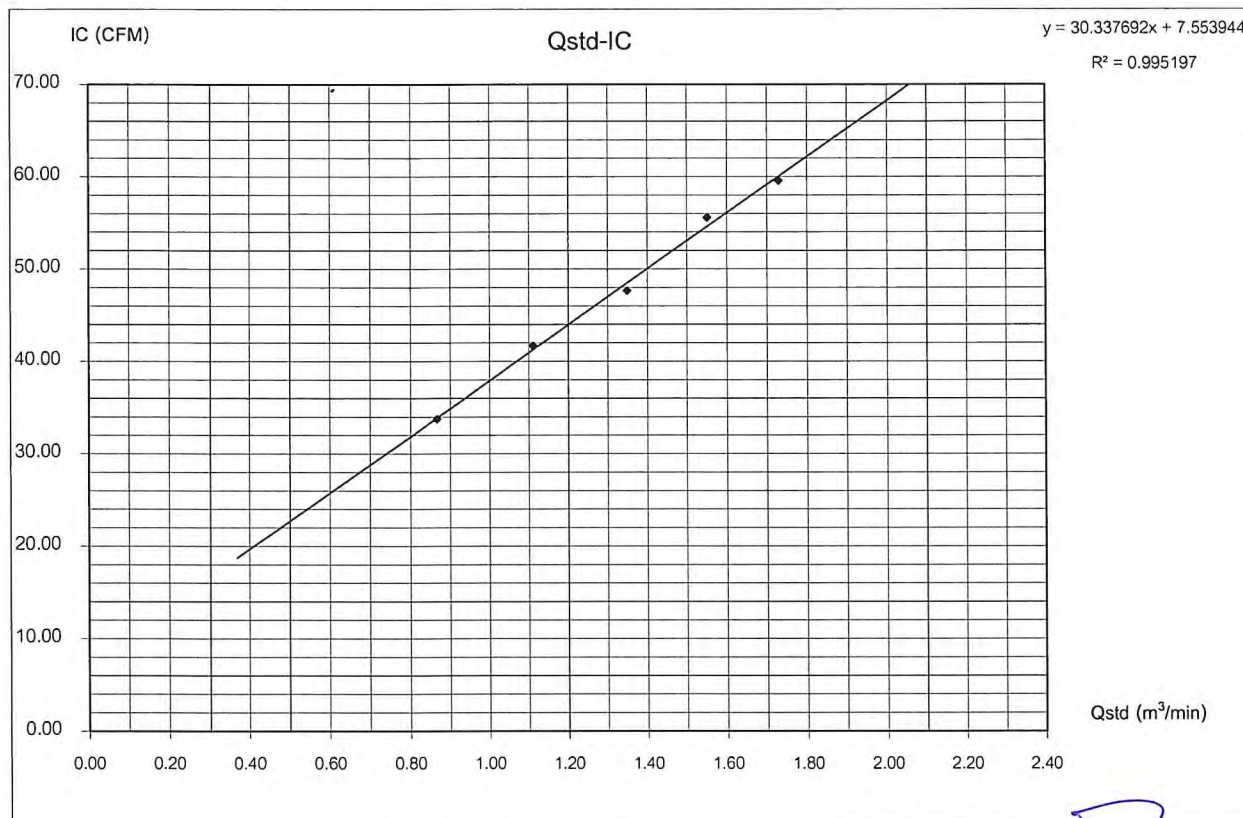
TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Quotation	2024-02184			Date	May 27, 2025
Sampler Location	บ้านโคกตะแบง (คุ้มบ้านโคกสังเม็ค)			Start Time	6:06 PM
Sampler Number	TSP No.A10	Transfer Standard Type	Onifice	Stop Time	6:16 PM
Instrument Model	HIVOL-BBCBE	Calibrator Model	TE-5025A	Calibrated By	Mr.Nikul Phokamla
Motor Serial Number	2012-04	Calibrator Serial Number	2913		
Recorder Serial Number	1504				

Plate No.	(Delta H)			(A)	(X)	(I)	(Y)	Temperature	Barometric Pressure	Start Meter	Stop Meter
	Pressure Drop Across Orifice (inH ₂ O)			$[\Delta H_2O(Pa/P_{std})(T_{std}/Ta)]^{1/2}$	$Qstd = (1/m)[(A-b)]$	sample Flow Rate Indication	$IC = I[(Pa/P_{std})(T_{std}/Ta)]^{1/2}$	(°K = °C+273)	(mmHg)		
	Positive	Negative	ΔH ₂ O		(m ³ /min)	(ft ³ /min)					
5	1.4	1.4	2.8	1.66111	0.86854	34.0	33.75	302.0	759.0		
7	2.3	2.3	4.6	2.12911	1.11096	42.0	41.69	302.0	759.0		
10	3.4	3.4	6.8	2.58865	1.34900	48.0	47.65	302.0	759.0		
13	4.5	4.5	9.0	2.97811	1.55074	56.0	55.59	302.0	759.0		
18	5.6	5.6	11.2	3.32222	1.72899	60.0	59.56	302.0	759.0		
Linear Regression Y ON X : Y= mX + b							Average	302.0	759.0		
1	Slope (m)			1.93052	Linear Equation			r ²	0.995197	Pstd(mmHg)	760.0
2	Intercept (b)			-0.01563	Set Point Flow Rate (X) (m ³ /min)		1.133	r	0.9975956	T _{NTP}	298.0
3	Correlation Coefficient (r)			0.99959	Final Set Flow Rate = (I)		0	(Pa/Pstd)*(Tstd/Ta)			0.985456605
Result								C=(Pa/Pstd)*(Tstd/Ta)^0.5			0.99270167

COMMENT

Andersen Instruments, Inc.



Checked By

(Mr. Prayun Detkla)
Technician



Approved By

(Mr. Panupon Podang)
Environmental Scientist

PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Quotation	2024-02184	Date	May 27, 2025
Sampler Location	บ้านโคกตะแบง (ตำบลบ้านโคกสังเค็ด)	Start Time	6:16 PM
Sampler Number	PM-10 No.6	Transfer Standard Type	Orifice
Instrument Model	HIVOL-BMBBE	Calibrator Model	TE-5025A
Motor Serial Number	PM-10 No.6	Calibrator Serial Number	2913
Recorder Serial Number	4642	Calibrated By	Mr.Nikul Phokamla

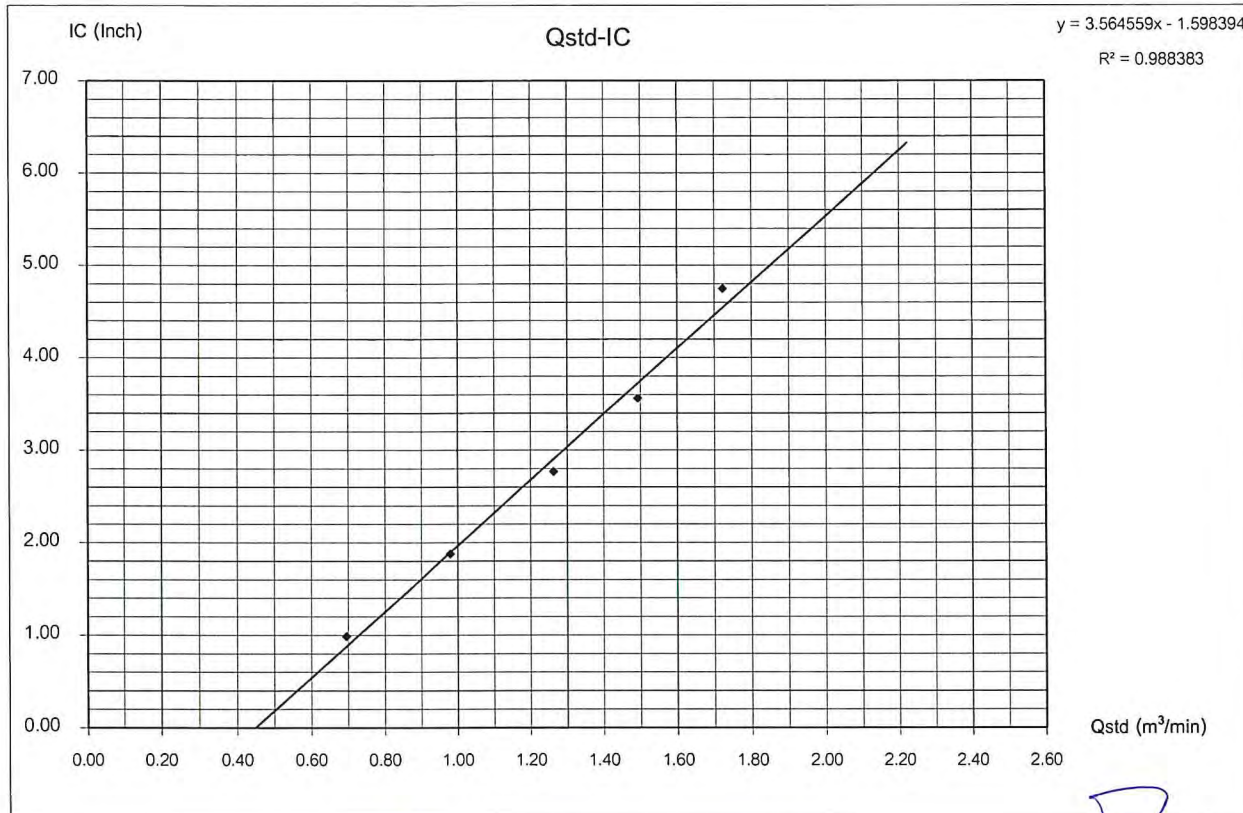
Plate No.	(Delta H)			(A)	(X)	(I)	(Y)	Temperature	Barometric Pressure	Start Meter	Stop Meter
	Pressure Drop Across Orifice (inH ₂ O)			$[\Delta H \cdot O(Pa/P_{std})(T_{std}/Ta)]^{1/2}$	$Q_{std} = (1/m)[(A-b)]$ (m ³ /min)	Sample Flow Rate Indication (inch/min)	$IC = [(Pa/P_{std})(T_{std}/Ta)]^{1/2}$	(°K = °C+273)	(mmHg)		
	Positive	Negative	ΔH ₂ O								
5	0.9	0.9	1.8	1.32702	0.69549	1.0	0.99	303.0	756.0		
7	1.8	1.8	3.6	1.87669	0.98021	1.9	1.88	303.0	756.0		
10	3.0	3.0	6.0	2.42279	1.26309	2.8	2.77	303.0	756.0		
13	4.2	4.2	8.4	2.86669	1.49303	3.6	3.56	303.0	756.0		
18	5.6	5.6	11.2	3.31017	1.72275	4.8	4.75	303.0	756.0		

Linear Regression Y ON X : Y= mX + b

1	Slope (m)	1.93052	Linear Equation		Average	303.0	756.0		
2	Intercept (b)	-0.01563	Set Point Flow Rate (X) (m ³ /min)	1.133	r ²	0.988383	Pstd(mmHg)	760.0	
3	Correlation Coefficient (r)	0.99959	Final Set Flow Rate = (I)	0	r	0.9941745	T _{NTP}	298.0	
							(Pa/Pstd)*(Tstd/Ta)	0.978322043	
Result							C=(Pa/Pstd)*(Tstd/Ta)^0.5	0.989101634	

COMMENT

Andersen Instruments, Inc.



Checked By

(Mr. Prayun Detkla)
Technician



Approved By

(Mr. Panupon Podang)
Environmental Scientist

CERTIFICATE OF CALIBRATION

Certificate No. : COF-022-67

Page 1 of 2 Pages

MEASUREMENT ITEM : Top Load Orifice
MANUFACTURER : TISCH
MODEL/TYPE : TE-5025A
SERIAL NUMBER : 3883
ID NUMBER : -
CONDITION AS-RECEIVED : Used item
CUSTOMER : Environment Research & Technology Co., Ltd.
25/114 Moo 6 Soi Chinaket 1, Ngamwongwan Road,
Toongsonghong, Laksi, Bangkok 10210

RECEIVED DATE : 26 Jun 2024
MEASUREMENT DATE : 26 Jun 2024
ISSUE DATE : 27 Jun 2024

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

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

CALIBRATION CONDITION:

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are 23.3 °C and 53.0 %RH.

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

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibration procedure:

The Orifice gas flow device was calibrated against Standard Rotary Displacement Meter (Roots Meter) Model G65/IMC/W2-dp. The WI-CL-004 was used as a calibration guideline.

Traceability:

This certificate provides a traceability of the measurement to recognized the national standards, and to realization of the international system of units (SI) through the NIMT (National Metrology Institute of Thailand) via Certificate number: MW-0063-23.

Uncertainty of Measurement:

The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor $k=2$. Which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty has been determined in accordance with the GUM 'Evaluation of measurement data - Guide to the expression of uncertainty in measurement'

Calibrated by:

- ☐ Mr. Sorawit Thachalad
☒ Miss Jittrapun Lertsomphol



Approved signatory:

Mr. Parinya Booncharoen
Calibration Department Manager

MEASUREMENT RESULTS:

The Orifice gas flow device was calibrated by direct comparison method with the Standard Rotary Displacement Meter (Roots Meter). The Humid air was used as a medium in the system. The standard conditions are 25°C (298.15 K) and 760 mmHg for standard temperature and standard pressure respectively.

Table 1: The results of Q Standard calibration data

Plate	Flow rate m^3/min	Pressure [Pa] mmHg	Temperature [Ta] °C	Temperature [Tm] °C	Δp_{meter} mmHg	$\Delta p_{Orifice}$ inH ₂ O	γ	Standard Flow [Q_s] m^3/min
1	0.699	751.705	23.36	22.60	55.738	1.627	1.272	0.645
2	1.005	751.676	23.49	22.82	61.668	3.315	1.815	0.919
3	1.117	751.621	23.73	23.21	41.170	4.339	2.076	1.050
4	1.163	751.557	23.90	23.37	29.781	4.860	2.196	1.111
5	1.421	751.550	23.97	23.50	29.382	7.313	2.694	1.357

Slope (m): 1.99546
 Intercept (b): -0.01802
 Correlation coefficient (r): 0.99983
 Uncertainty ($k=2$): 0.015 m^3/min

Table 2: The results of Q actual calibration data

Plate	Flow rate m^3/min	Pressure [Pa] mmHg	Temperature [Ta] °C	Temperature [Tm] °C	Δp_{meter} mmHg	$\Delta p_{Orifice}$ inH ₂ O	γ	Standard Flow [Q_s] m^3/min
1	0.699	751.705	23.36	22.60	55.738	1.627	0.801	0.649
2	1.005	751.676	23.49	22.82	61.668	3.315	1.144	0.925
3	1.117	751.621	23.73	23.21	41.170	4.339	1.309	1.057
4	1.163	751.557	23.90	23.37	29.781	4.860	1.386	1.119
5	1.421	751.550	23.97	23.50	29.382	7.313	1.700	1.368

Slope (m): 1.24981
 Intercept (b): -0.01133
 Correlation coefficient (r): 0.99984
 Uncertainty ($k = 2$): 0.015 m^3/min

End of Certificate of Calibration





JIRANATEE ASSOCIATES CO.,LTD.

Jiranatee Associates Co.,Ltd.
63/14-15, 67/35-36
Petchkasem 7,7/1, Rd. Watthapra, Bangkokyai,
Bangkok 10600 (Thailand)
Tel: +6608680812
Mobile: +66863999453
E-mail: jnac-calibration@jiranatee.com
Web site: www.jiranatee.com

Accredited calibration laboratory
ISO/IEC 17025:2017
NSC-TISI-TIS 17025
CALIBRATION 0367

Flow measurement laboratory
Calibration services department.



CERTIFICATE OF CALIBRATION

Certificate No. : COF-001-68

Page 1 of 2 Pages

MEASUREMENT ITEM : Top Load Orifice
MANUFACTURER : TISCH
MODEL/TYPE : TE-5025A
SERIAL NUMBER : 2913
ID NUMBER : -
CONDITION AS-RECEIVED : Used item
CUSTOMER : Environment Research & Technology Co., Ltd.
25/114 Moo 6 Soi Chinaket 1, Ngamwongwan Road,
Toongsonghong, Laksi, Bangkok 10210

RECEIVED DATE : 24 Jan 2025
MEASUREMENT DATE : 14 Feb 2025
ISSUE DATE : 17 Feb 2025

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

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

CALIBRATION CONDITION:

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are 24.2 °C and 56.1 %RH.

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

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibration procedure:

The Orifice gas flow device was calibrated against Standard Rotary Displacement Meter (Roots Meter) Model G65/IMC/W2-dp. The WI-CL-004 was used as a calibration guideline.

Traceability:

This certificate provides a traceability of the measurement to recognized the national standards, and to realization of the international system of units (SI) through the NIMT (National Metrology Institute of Thailand) via Certificate number: MW-0016-25.

Uncertainty of Measurement:

The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor $k=2$, Which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty has been determined in accordance with the GUM 'Evaluation of measurement data - Guide to the expression of uncertainty in measurement'

Calibrated by:

- ☐ Mr. Sorawit Thachalad
☒ Miss Jittraporn Lertsomphol



Approved signatory:

Mr. Parinya Booncharoen
Calibration Department Manager

MEASUREMENT RESULTS:

The Orifice gas flow device was calibrated by direct comparison method with the Standard Rotary Displacement Meter (Roots Meter). The Humid air was used as a medium in the system. The standard conditions are 25°C (298.15 K) and 760 mmHg for standard temperature and standard pressure respectively.

Table 1: The results of Q Standard calibration data

Plate	Flow rate m^3/min	Pressure [Pa] mmHg	Temperature [Ta] °C	Temperature [Tm] °C	Δp_{meter} mmHg	$\Delta p_{Orifice}$ inH ₂ O	γ	Standard Flow [Q_s] m^3/min
1	0.701	755.816	23.96	23.00	53.306	1.563	1.249	0.653
2	1.004	755.774	23.97	23.20	59.037	3.118	1.764	0.926
3	1.119	755.757	23.97	23.30	39.983	4.120	2.028	1.060
4	1.169	755.742	24.09	23.45	29.090	4.660	2.156	1.124
5	1.409	755.723	23.94	23.48	28.248	6.794	2.604	1.355

Slope (m): 1.93052
Intercept (b): -0.01563
Correlation coefficient (r): 0.99959
Uncertainty ($k=2$): 0.015 m^3/min

Table 2: The results of Q actual calibration data

Plate	Flow rate m^3/min	Pressure [Pa] mmHg	Temperature [Ta] °C	Temperature [Tm] °C	Δp_{meter} mmHg	$\Delta p_{Orifice}$ inH ₂ O	γ	Standard Flow [Q_o] m^3/min
1	0.701	755.816	23.96	23.00	53.306	1.563	0.784	0.654
2	1.004	755.774	23.97	23.20	59.037	3.118	1.107	0.928
3	1.119	755.757	23.97	23.30	39.983	4.120	1.273	1.062
4	1.169	755.742	24.09	23.45	29.090	4.660	1.354	1.127
5	1.409	755.723	23.94	23.48	28.248	6.794	1.634	1.358

Slope (m): 1.20915
Intercept (b): -0.00980
Correlation coefficient (r): 0.99959
Uncertainty ($k=2$): 0.015 m^3/min

End of Certificate of Calibration



Mettler-Toledo (Thailand) Ltd.

846/4 - 846/5 Lasalle Rd., Bangna Tai Sub-District

Bangna District, Bangkok 10260

+662 723 0382

MT-TH.ServiceSupport@mt.com



NSC-TISI-TIS 17025
CALIBRATION 0062

Accuracy Calibration Certificate

Customer

Company: Environment Research & Technology Co., Ltd.
Address: 25/114 Moo 6, Soi Chinaket 1, Ngamwongwan Rd., Toongsonghong
City: Laksi **Contact:** Ramita Taengthai
Zip / Postal: 10210
State / Province: Bangkok
Order Number: 
0 3 3 3 6 1 0 1 9

Weighing Device

Manufacturer: Mettler Toledo **Instrument Type:** Weighing Instrument
Model: AB204-S **Asset Number:** ERTC-L-IN-0048
Serial No.: 1123103723 **Terminal Model:** N/A
Building: N/A **Terminal Serial No.:** N/A
Floor: 4 **Terminal Asset No.:** N/A
Room: 406

Range	Max. Capacity	Readability (d)
1	220 g	0.0001 g

Procedure

Calibration Guideline: EURAMET cg-18 v. 4.0 (11/2015)
METTLER TOLEDO Work Instruction: CP/W002/20

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


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

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

	Temperature		Humidity	
As Found	Start: 23.1 °C	End: 23.3 °C	Start: 35.7 %	End: 35.2 %

As Found Calibration Date: 16-Jan-2025
As Left Calibration Date: N/A
Issue Date: 18-Jan-2025

Calibrator: 
Nithit Jongkrod

Approved Signatory: 
Technical Manager / Head of Calibration Center

Measurement Results

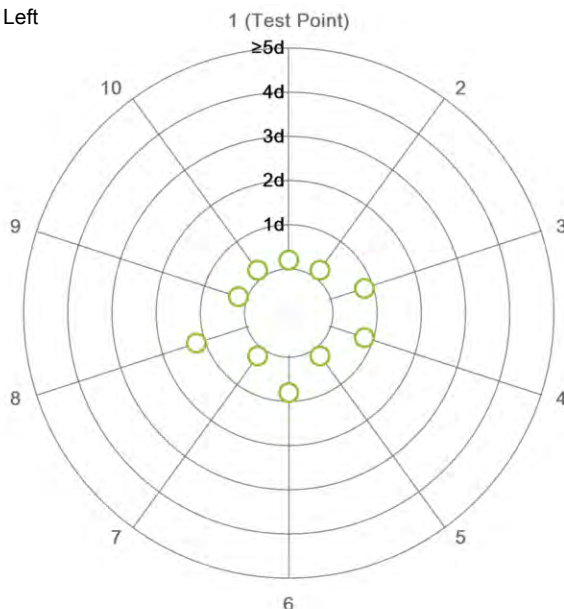
Repeatability

Test Load: 100 g

	As Found	As Left
1	100.0000 g	N/A
2	100.0000 g	N/A
3	100.0001 g	N/A
4	100.0001 g	N/A
5	100.0000 g	N/A
6	100.0001 g	N/A
7	100.0000 g	N/A
8	99.9999 g	N/A
9	100.0000 g	N/A
10	100.0000 g	N/A

Standard Deviation	0.00006 g	N/A
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○ As Found
◆ As Left



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

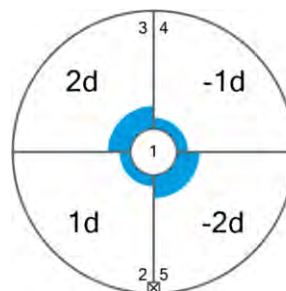
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

Test Load: 100 g

Position	As Found	As Left
1	100.0000 g	N/A
2	100.0001 g	N/A
3	100.0002 g	N/A
4	99.9999 g	N/A
5	99.9998 g	N/A

Maximum Deviation	0.0002 g	N/A
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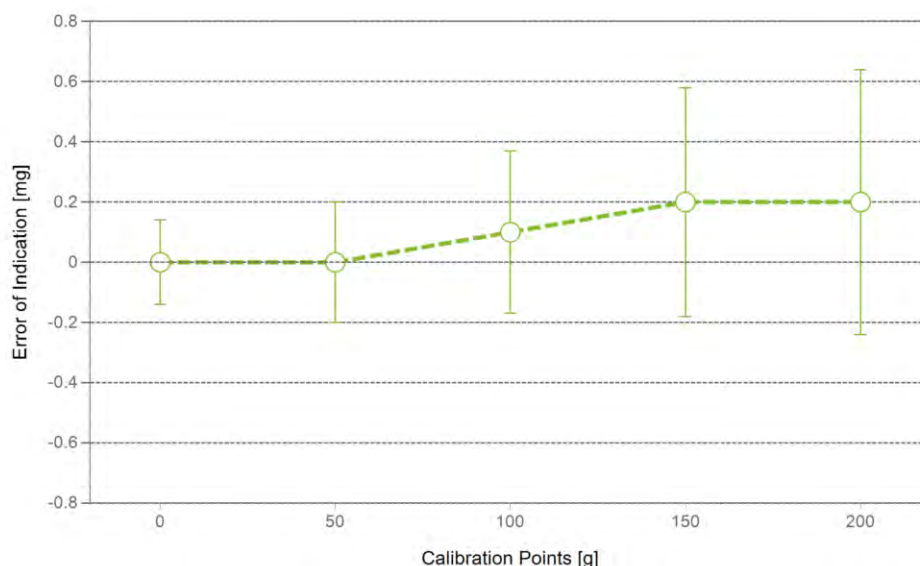
As Found

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

Error of Indication

As Found

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.0000 g	0.0000 g	0.0000 g	0.14 mg	2
2	0.0500 g	0.0500 g	0.0000 g	0.15 mg	2
3	0.1000 g	0.1000 g	0.0000 g	0.15 mg	2
4	0.5000 g	0.5000 g	0.0000 g	0.15 mg	2
5	1.0000 g	1.0000 g	0.0000 g	0.15 mg	2
6	5.0000 g	5.0000 g	0.0000 g	0.16 mg	2
7	10.0000 g	10.0000 g	0.0000 g	0.16 mg	2
8	50.0001 g	50.0001 g	0.0000 g	0.20 mg	2
9	99.9999 g	100.0000 g	0.0001 g	0.27 mg	2
10	150.0000 g	150.0002 g	0.0002 g	0.38 mg	2
11	200.0001 g	200.0003 g	0.0002 g	0.44 mg	2



○ As Found

◆ As Left

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

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

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

Test Equipment

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

Weight Set 1: OIML E2

Weight Set No.:	WS52	Date of Issue:	17-Apr-2024
Certificate Number:	191753	Calibration Due Date:	15-Oct-2025

Weight Set 2: OIML E2

Weight Set No.:	WS52-1	Date of Issue:	17-May-2024
Certificate Number:	C420107128	Calibration Due Date:	17-Oct-2025

Weight Set 3: OIML E2

Weight Set No.:	WS52-2	Date of Issue:	17-May-2024
Certificate Number:	C420107129	Calibration Due Date:	28-Oct-2025

Thermo Hygrometer

Equipment No.:	IN302	Date of Issue:	31-Oct-2024
Certificate Number:	SG-H-00908/67	Calibration Due Date:	17-Oct-2025

Remarks

Equipment condition: Good

Next calibration according to customer's procedure

Calibration data not decide by calibration laboratory

End of Accredited Section

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

Measurement Uncertainty of the Weighing Instrument in Use

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

Temperature coefficient for the evaluation of the measurement uncertainty in use: $3.0 \cdot 10^{-6} / K$

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

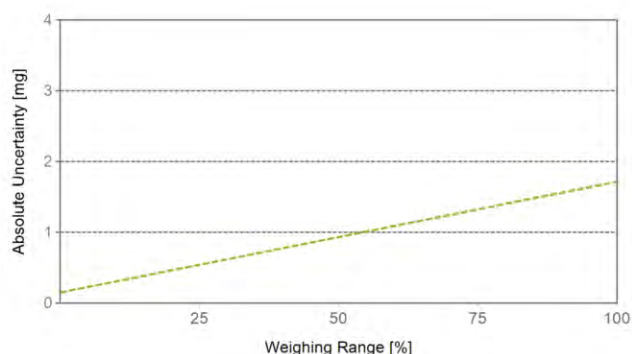
Linearization of Uncertainty Equation

Range			As Found	As Left
	d	Max		
1	0.0001 g	220 g	$U_1 = 0.15 \text{ mg} + 0.00712 \text{ mg/g} \cdot R$	N/A

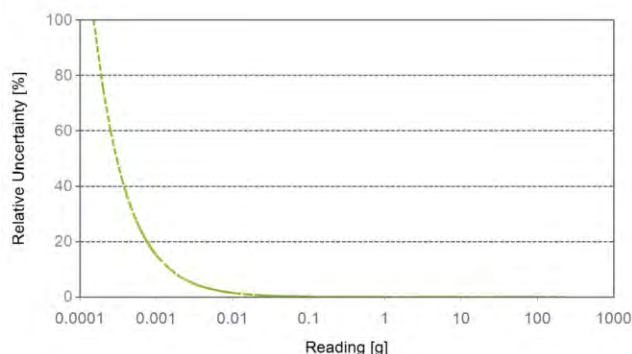
To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

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

Net Indication	As Found		As Left	
0.0220 g	0.15 mg	0.68%	N/A	N/A
0.2200 g	0.15 mg	0.069%	N/A	N/A
2.2000 g	0.17 mg	0.0075%	N/A	N/A
22.0000 g	0.31 mg	0.0014%	N/A	N/A
220.0000 g	1.7 mg	0.00078%	N/A	N/A



As Found



As Left

GWP® Certificate



As
Found



As
Left



The weighing device meets the given process requirements.

The weighing device meets the given process requirements.

Tests Performed:



As Found



As Left



No adjustments/modifications made. As Left results correspond to As Found.

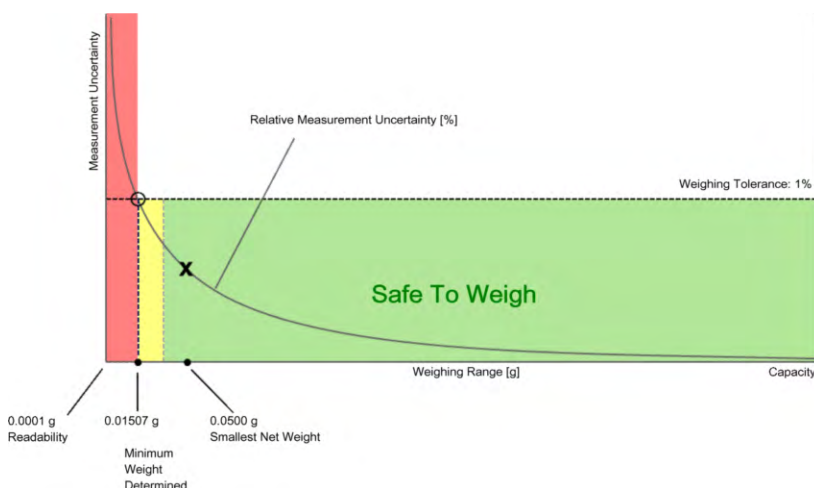
Process Requirements

Weighing Tolerance: 1%

Smallest Net Weight: 0.0500 g

Safety Factor: 2

Safe Weighing Range



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

Minimum Weight

As Found Minimum Weight Table

Minimum weights for different weighing tolerances and safety factors					
	Safety Factor				
Tolerance	1	2	3	5	10
0.1%	0.15163 g	0.30546 g	0.46152 g	0.78056 g	1.62097 g
0.2%	0.07555 g	0.15163 g	0.22827 g	0.38321 g	0.78056 g
0.5%	0.03015 g	0.06039 g	0.09072 g	0.15163 g	0.30546 g
1%	0.01507 g	0.03015 g	0.04526 g	0.07555 g	0.15163 g
2%	0.00753 g	0.01507 g	0.02261 g	0.03771 g	0.07555 g
5%	0.00301 g	0.00602 g	0.00904 g	0.01507 g	0.03015 g



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

As Left Minimum Weight Table

Minimum weights for different weighing tolerances and safety factors					
	Safety Factor				
Tolerance	1	2	3	5	10
0.1%	0.15163 g	0.30546 g	0.46152 g	0.78056 g	1.62097 g
0.2%	0.07555 g	0.15163 g	0.22827 g	0.38321 g	0.78056 g
0.5%	0.03015 g	0.06039 g	0.09072 g	0.15163 g	0.30546 g
1%	0.01507 g	0.03015 g	0.04526 g	0.07555 g	0.15163 g
2%	0.00753 g	0.01507 g	0.02261 g	0.03771 g	0.07555 g
5%	0.00301 g	0.00602 g	0.00904 g	0.01507 g	0.03015 g



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

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

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

Notes on minimum weight values in above table:

1. If "N/A" is shown above, no appropriate value could be calculated.
2. METTLER TOLEDO is not responsible for the definition of the process requirements.

Measurement Results

Results Summary

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

✓ = Passed

✗ = Failed

⚠ = Safety Factor not met

Repeatability

Test Load: 100 g

Tolerance	Control Limit	As Found		As Left	
		Std. Deviation	Result	Std. Deviation	Result
0.1%	N/A	0.00006 g*	N/A	0.00006 g*	N/A
0.2%	0.00005 g		✗		✗
0.5%	0.00013 g		✓		✓
1%	0.00025 g		✓		✓
2%	0.00050 g		✓		✓
5%	0.00125 g		✓		✓

*The calculated standard deviation value is below the rounding error of the balance. The $0.41 \cdot d$ rule is used for the assessment of this repeatability test and the calculation of the minimum weight.

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

Eccentricity

Test Load: 100 g

Tolerance	Control Limit	As Found		As Left	
		Deviation	Result	Deviation	Result
0.1%	0.0500 g	0.0002 g	✓	0.0002 g	✓
0.2%	0.1000 g		✓		✓
0.5%	0.2500 g		✓		✓
1%	0.5000 g		✓		✓
2%	1.0000 g		✓		✓
5%	2.5000 g		✓		✓

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

Error of Indication**As Found**

		Control limits for various weighing tolerances					
Reference Value	Error	0.1%	0.2%	0.5%	1%	2%	5%
0.0000 g	0.0000 g	N/A	N/A	N/A	N/A	N/A	N/A
50.0001 g	0.0000 g	0.0250 g	0.0500 g	0.1250 g	0.2500 g	0.5000 g	1.2500 g
99.9999 g	0.0001 g	0.0500 g	0.1000 g	0.2500 g	0.5000 g	1.0000 g	2.5000 g
150.0000 g	0.0002 g	0.0750 g	0.1500 g	0.3750 g	0.7500 g	1.5000 g	3.7500 g
200.0001 g	0.0002 g	0.1000 g	0.2000 g	0.5000 g	1.0000 g	2.0000 g	5.0000 g
Result		✓	✓	✓	✓	✓	✓

As Left

		Control limits for various weighing tolerances					
Reference Value	Error	0.1%	0.2%	0.5%	1%	2%	5%
0.0000 g	0.0000 g	N/A	N/A	N/A	N/A	N/A	N/A
50.0001 g	0.0000 g	0.0250 g	0.0500 g	0.1250 g	0.2500 g	0.5000 g	1.2500 g
99.9999 g	0.0001 g	0.0500 g	0.1000 g	0.2500 g	0.5000 g	1.0000 g	2.5000 g
150.0000 g	0.0002 g	0.0750 g	0.1500 g	0.3750 g	0.7500 g	1.5000 g	3.7500 g
200.0001 g	0.0002 g	0.1000 g	0.2000 g	0.5000 g	1.0000 g	2.0000 g	5.0000 g
Result		✓	✓	✓	✓	✓	✓

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



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.: 25MM1/1

Page.: 1 of 3

This Certificate was issued to replace to the Certificate No. 25MM1

Equipment : Electronic Balance

Manufacturer : AND

Model : BM-5

Serial No. : T1004302

ID No. : *ERTC-L-In-176*

Submitted by : Environment Research & Technology Company Limited.
25/114 Moo 6, Soi Chinaket 1, Ngamwongwan Road,
Toongsonghong, Laksi,
Bangkok 10210

Location : ห้องปฏิบัติการวิเคราะห์ (411)

Received order : 06 January 2025

Calibration Date : 06 January 2025

Ambient Temperature : 15 °C to 40 °C

Relative Humidity : 30 % to 90 %

Calibrated by : Tawatchai Pama

Approved by :


Approved Signatory

() Chakrit Waewwanjua

(✓) Suwit Imjai

() Kunchit Promprat

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.



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2501-0004ON-9

Cert.No.: 25MM1/1

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:-

<u>Instruments</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Traceable</u>	<u>Due date</u>
1) Standard Weight Set (E2)	-	MM-0020-23	NIMT	30 Jan 2025
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.				

Remark : National Institute of Metrology Thailand

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

Range capacity : 0 g to 5.2 g **Resolution** 0.000001 g

Before Adjustment :

<u>Applied Weight</u>	<u>Balance Reading</u>	<u>Correction</u>	<u>Measurement Uncertainty</u>	<u>Coverage Factor</u>
(g)	(g)	(g)	(\pm mg)	(k)
2.5	2.499999	+0.000001	0.026	2
5	4.999993	+0.000007	0.029	2

After Adjustment :

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

<u>Applied Weight</u>	<u>Standard Deviation of Reading (g)</u>
(g)	
2.5	0.0000070
5	0.0000082



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2501-0004ON-9

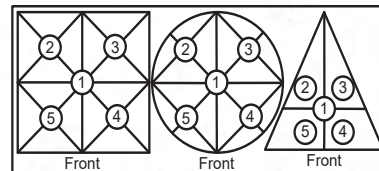
Cert.No.: 25MM1/1

Page: 3 of 3

Result of calibration

2. Effect of off center loading

A mass of 2 g was placed to various position on the pan.
The weighing machine reading error obtained is given in the table



Maximum difference between
off-center and central loading
(g)
0.000017

Position 1 (g)	Position 2 (g)	Position 3 (g)	Position 4 (g)	Position 5 (g)
+0.000012	0.000000	-0.000005	-0.000003	-0.000004

3. Departure from nominal value

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (\pm mg)	Coverage Factor (k)
Unload	0.000000	0.000000	0.012	2.37
0.014	0.013988	+0.000012	0.013	2.13
0.015	0.014993	+0.000007	0.013	2.2
0.5	0.499996	+0.000004	0.014	2.11
1	1.000001	-0.000001	0.016	2.06
1.5	1.500004	-0.000004	0.022	2
2	2.000009	-0.000009	0.022	2.04
2.5	2.499998	+0.000002	0.026	2
3	3.000010	-0.000010	0.027	2
4	4.000023	-0.000023	0.029	2
5	5.000017	-0.000017	0.029	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 %.

-o0o-

Calibration Data of NOx Analyzer

Analyzer Performance Test

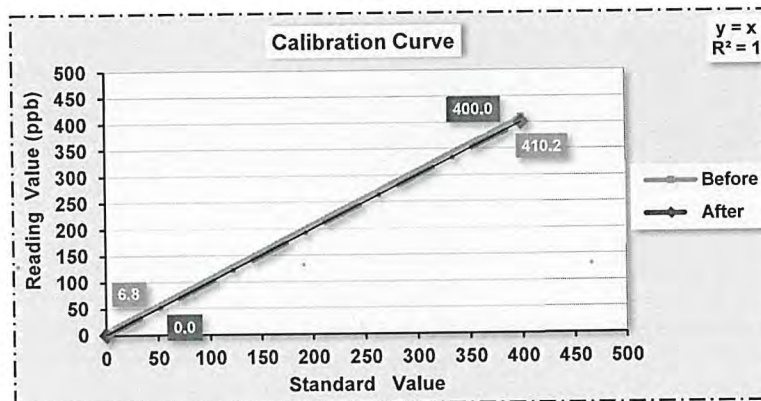
Equipment	Gas Analyzer (NOx)	Customer Name	ไฟฟ้าสุรินทร์
Manufacture	HORIBA	Location	Envi Research
Model	APNA-370	Quotation	2024-02184
Serial No.	FC2E28YU	Calibration Date	February 9, 2025
Analyzer Unit	ppb		

Instruments for Calibration

Instruments	Manufacture	Model	Serial Number
Zero Air Supply	Thermo Env.	111	0700419829
Dynamic Dilution Calibrator	Tanabyte	300	0165
Standard Gas Components	CO = 4,516 ppm		
Cylinder No : EB0123013	NO = 55.3 ppm		
Expire Date : Oct 22, 2027	SO ₂ = 54.9 ppm		

Single Point Calibration

Standard Gas	Standard Gas Value	Analyzer Value								% Abs Error
		NO _x (ppb)		NO (ppb)		NO ₂ (ppb)		Stability		
		Before	After	Before	After	Before	After	Before	After	
Zero	0	20.1	0.0	6.8	0.0	13.3	0.0	-	-	-
Span	400	416.5	400.0	410.2	400.0	6.3	0.0	-	-	2.6



STATUS TEST AND VALIDATION OF NOx ANALYZER MODEL APNA-370

Parameter	Unit	Observed Value		Nominal Range
		Before Adjust	After Adjust	
Range	ppb	500	500	0 - 500 Standard
Signal NO	mV	0.9	0.2	Voltage of the measured NO value
Signal NOx	mV	29.7	17.6	Voltage of the measured NOx value
Detector	°C	40.2	39.9	43 °C ± 5 °C
Ambient	kPa	100.4	100.6	Current atmospheric pressure
DC 24V	V	23.6	23.6	24V ±0.5
DC 5V	V	5.0	5.0	5V ±0.5
NO Slope	-	1.34290	1.33580	0.50000 - 2.0000
NOx Slope	-	1.34240	1.33350	0.50000 - 2.0000

Calibrate By :

(MR.PANUPON PODANG)
February 9, 2025



Checked By :

(MS.SUTATIP IM-NOI)
February 9, 2025

Calibration Data of NOx Analyzer

Analyzer Performance Test

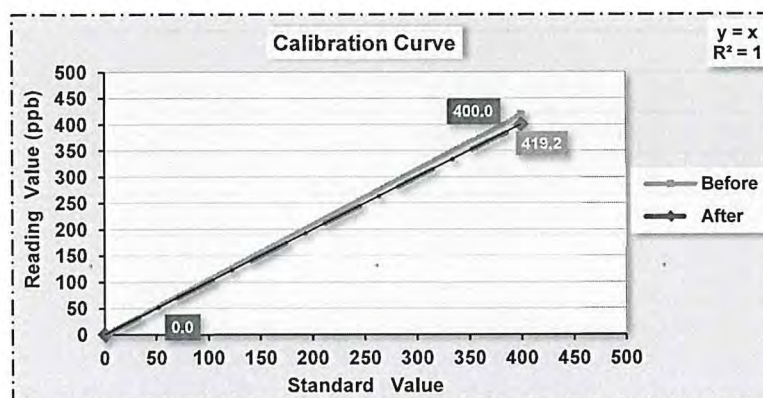
Equipment	Gas Analyzer (NOx)	Customer Name	ไฟฟ้าสุรินทร์
Manufacture	HORIBA	Location	Envi Research
Model	APNA-370	Quotation	2024-02184
Serial No.	KCDVY226	Calibration Date	February 9, 2025
Analyzer Unit	ppb		

Instruments for Calibration

Instruments	Manufacture	Model	Serial Number
Zero Air Supply	Thermo Env.	111	0700419829
Dynamic Dilution Calibrator	Tanabyte	300	0165
Standard Gas Components	CO = 4,516 ppm		
Cylinder No : EB0123013	NO = 55.3 ppm		
Expire Date : Oct 22, 2027	SO ₂ = 54.9 ppm		

Single Point Calibration

Standard Gas	Standard Gas Value	Analyzer Value								% Abs Error
		NO _x (ppb)		NO (ppb)		NO ₂ (ppb)		Stability		
		Before	After	Before	After	Before	After	Before	After	
Zero	0	-5.3	0.0	-0.1	0.0	-5.2	0.0	-	-	-
Span	400	422.0	400.0	419.2	400.0	2.8	0.0	-	-	4.8



STATUS TEST AND VALIDATION OF NOx ANALYZER MODEL APNA-370

Parameter	Unit	Observed Value		Nominal Range
		Before Adjust	After Adjust	
Range	ppb	500	500	0 - 500 Standard
Signal NO	mV	0.7	0.8	Voltage of the measured NO value
Signal NOx	mV	3.0	3.5	Voltage of the measured NOx value
Detector	°C	40.3	40.3	43 °C ± 5 °C
Ambient	kPa	101.0	101.0	Current atmospheric pressure
DC 24V	V	23.6	23.6	24V ±0.5
DC 5V	V	4.9	5.0	5V ±0.5
NO Slope	-	1.96520	1.68750	0.50000 - 2.0000
NOx Slope	-	1.54890	1.54870	0.50000 - 2.0000

Calibrate By :

(MR.PANUPON PODANG)
February 9, 2025

Checked By :

(MS.SUTATIP IM-NOI)
February 9, 2025

Calibration Data of NOx Analyzer

Analyzer Performance Test

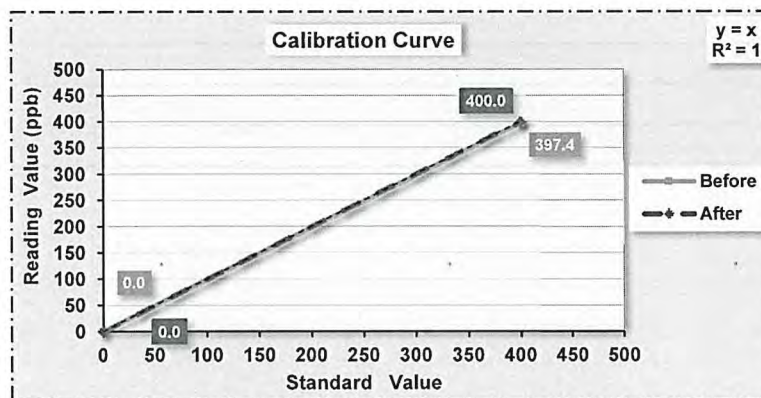
Equipment	Gas Analyzer (NOx)	Customer Name	ไฟฟ้าสุรินทร์
Manufacture	HORIBA	Location	Envi Research
Model	APNA-370	Quotation	2024-02184
Serial No.	TNTLC359	Calibration Date	February 9, 2025
Analyzer Unit	ppb		

Instruments for Calibration

Instruments	Manufacture	Model	Serial Number
Zero Air Supply	Thermo Env.	111	0700419829
Dynamic Dilution Calibrator	Tanabyte	300	0165
Standard Gas Components	CO = 4,516 ppm		
Cylinder No : EB0123013	NO = 55.3 ppm		
Expire Date : Oct 22, 2027	SO ₂ = 54.9 ppm		

Single Point Calibration

Standard Gas	Standard Gas Value	Analyzer Value								% Abs Error
		NO _x (ppb)		NO (ppb)		NO ₂ (ppb)		Stability		
		Before	After	Before	After	Before	After	Before	After	
Zero	0	-0.1	0.0	0.0	0.0	-0.1	0.0	-	-	-
Span	400	396.8	400.0	397.4	400.0	-0.6	0.0	-	-	0.7



STATUS TEST AND VALIDATION OF NOx ANALYZER MODEL APNA-370

Parameter	Unit	Observed Value		Nominal Range
		Before Adjust	After Adjust	
Range	ppb	500	500	0 - 500 Standard
Signal NO	mV	1.1	1.0	Voltage of the measured NO value
Signal NOx	mV	6.9	7.3	Voltage of the measured NOx value
Detector	°C	39.4	39.5	43 °C ± 5 °C
Ambient	kPa	100.8	100.8	Current atmospheric pressure
DC 24V	V	23.6	23.6	24V ±0.5
DC 5V	V	5.0	5.0	5V ±0.5
NO Slope	-	1.41540	1.41210	0.50000 - 2.0000
NOx Slope	-	1.37250	1.37240	0.50000 - 2.0000

Calibrate By :

(MR.PANUPON PODANG)
February 9, 2025



Checked By :

(MS.SUTATIP IM-NOI)
February 9, 2025

Calibration Data of NOx Analyzer

Analyzer Performance Test

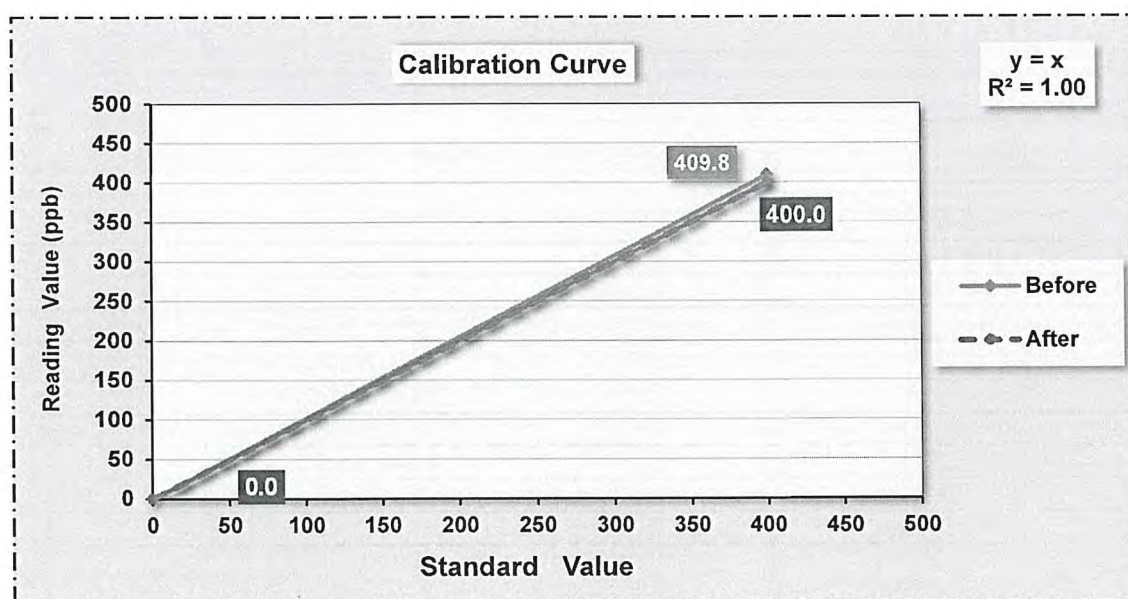
Equipment	Gas Analyzer (NOx)	Customer Name	ไฟฟ้าสุรินทร์
Manufacture	API	Location	Envi Research
Model	200A	Quotation	2024-02184
Serial No.	1464	Calibration Date	February 8, 2025
Analyzer Unit	ppb		

Instruments for Calibration

Instruments	Manufacture	Model	Serial Number
Zero Air Supply	Thermo Env.	111	0700419829
Dynamic Dilution Calibrator	Tanabyte	300	0165
Standard Gas Components	CO = 4,516 ppm		
Cylinder No : EB0123013	NO = 55.3 ppm		
Expire Date : Oct 22, 2027	SO ₂ = 54.9 ppm		

Single Point Calibration

Standard Gas	Standard Gas Value	Analyzer Value								% Abs Error
		NO _x (ppb)		NO (ppb)		NO ₂ (ppb)		Stability		
		Before	After	Before	After	Before	After	Before	After	
Zero	0	-0.6	0.0	-0.4	0.0	-0.2	0.0	-	-	-
Span	400	411.0	405.0	409.8	400.0	1.2	5.0	-	-	2.5



STATUS TEST AND VALIDATION OF NO_x ANALYZER MODEL 200A

Parameter	Display As	Unit	Observed Value		Nominal Range
			Before Adjust	After Adjust	
Range	RANGE	ppb	500	500	0 - 500 standard
Stability	STABIL	ppb	1.6	0.1	< 2 with zero air
Sample Flow	SAMP FL	cc / min	475.0	479.0	500 +/- 50
Ozone Flow	OZONE FL	cc / min	80.0	79.0	80 +/- 10
PMT signal	PMT	mV	50.7	44.7	0 to 5,000
Auto - Zero	AZERO	mV	37.4	36.7	-20 to 150
High Voltage Power Supply	HVPS	V	790.0	790.0	450 to 900
Reaction Cell Temperature	RCELL TEMP	°C	50.3	50.4	50 +/- 1
Box Temperature	BOX TEMP	°C	31.8	32.8	Ambient temp.+3 / -7
PMT Temperature	PMT TEMP	°C	7.1	7.1	7 +/- 1
Converter Temperature	MOLY TEMP	°C	314.3	314.5	315 +/- 5
Reaction Cell Pressure	RCEL	In - Hg - A	9.0	9.1	2 to 10 (Constant)
Sample Pressure	SAMP	In - Hg - A	30.9	31.0	Ambient - 1 (Constant)
NO _x Slope	NO _x SLOPE	-	1.3	1.3	1.000 +/- 0.300
NO _x Offset	NO _x OFFSET	mV	-1.8	-1.8	0 +/- 20
NO Slope	NO SLOPE	-	-1.3	1.3	1.000 +/- 0.300
NO Offset	NO OFFSET	mV	-0.4	-0.4	0 +/- 20

Calibrate By :

(MR.PANUPON PODANG)

February 8, 2025



Checked By :

(MS.SUTATIP IM-NOI)

February 8, 2025

Calibration Data of NOx Analyzer

Analyzer Performance Test

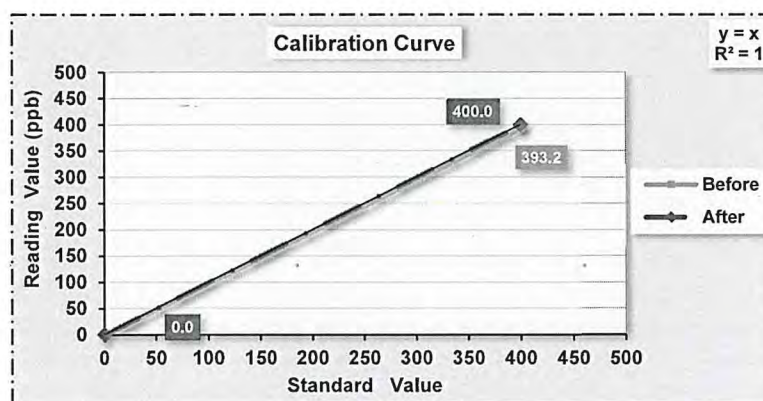
Equipment	Gas Analyzer (NOx)	Customer Name	ไฟฟ้าสุรินทร์
Manufacture	HORIBA	Location	Envi Research
Model	APNA-370	Quotation	2024-02184
Serial No.	KPACV8NA	Calibration Date	May 9, 2025
Analyzer Unit	ppb		

Instruments for Calibration

Instruments	Manufacture	Model	Serial Number
Zero Air Supply	Thermo Env.	111	0700419829
Dynamic Dilution Calibrator	Tanabyte	300	0165
Standard Gas Components	CO = 4,516 ppm		
Cylinder No : EB0123013	NO = 55.3 ppm		
Expire Date : Oct 22, 2027	SO ₂ = 54.9 ppm		

Single Point Calibration

Standard Gas	Standard Gas Value	Analyzer Value								% Abs Error
		NO _x (ppb)		NO (ppb)		NO ₂ (ppb)		Stability		
		Before	After	Before	After	Before	After	Before	After	
Zero	0	-1.0	0.0	-0.7	0.0	-0.3	0.0	-	-	-
Span	400	393.6	400.0	393.2	400.0	0.4	0.0	-	-	1.7



STATUS TEST AND VALIDATION OF NOx ANALYZER MODEL APNA-370

Parameter	Unit	Observed Value		Nominal Range
		Before Adjust	After Adjust	
Range	ppb	500	500	0 - 500 Standard
Signal NO	mV	0.7	0.9	Voltage of the measured NO value
Signal NOx	mV	3.1	3.2	Voltage of the measured NOx value
Detector	°C	40.3	40.3	43 °C ± 5 °C
Ambient	kPa	101.6	101.6	Current atmospheric pressure
DC 24V	V	23.7	23.7	24V ±0.5
DC 5V	V	5.0	5.0	5V ±0.5
NO Slope	-	0.85410	0.86450	0.50000 - 2.0000
NOx Slope	-	0.84525	0.85970	0.50000 - 2.0000

Calibrate By :

(MR.PANUPON PODANG)
May 9, 2025

Checked By :

(MS.SUTATIP IM-NOI)
May 9, 2025

Calibration Data of NOx Analyzer

Analyzer Performance Test

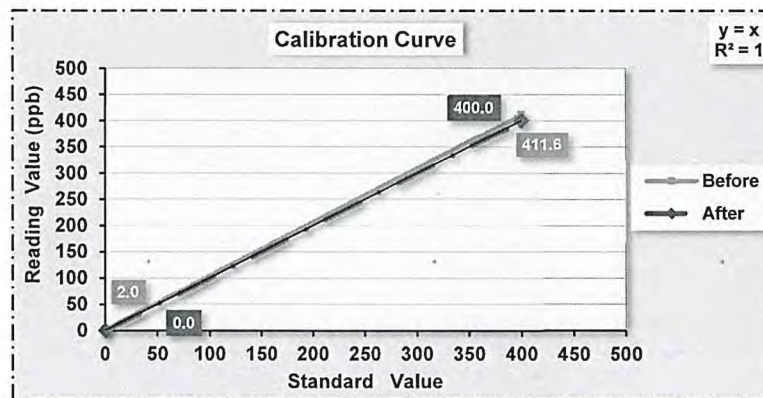
Equipment	Gas Analyzer (NOx)	Customer Name	ไฟฟ้าสุรินทร์
Manufacture	HORIBA	Location	Envi Research
Model	APNA-370	Quotation	2024-02184
Serial No.	4VWFEBUK	Calibration Date	May 9, 2025
Analyzer Unit	ppb		

Instruments for Calibration

Instruments	Manufacture	Model	Serial Number
Zero Air Supply	Thermo Env.	111	0700419829
Dynamic Dilution Calibrator	Tanabyte	300	0165
Standard Gas Components	CO = 4,516 ppm		
Cylinder No : EB0123013	NO = 55.3 ppm		
Expire Date : Oct 22, 2027	SO ₂ = 54.9 ppm		

Single Point Calibration

Standard Gas	Standard Gas Value	Analyzer Value								% Abs Error
		NO _x (ppb)		NO (ppb)		NO ₂ (ppb)		Stability		
		Before	After	Before	After	Before	After	Before	After	
Zero	0	4.3	0.0	2.0	0.0	2.3	0.0	-	-	-
Span	400	413.1	400.0	411.6	400.0	1.5	0.0	-	-	2.9



STATUS TEST AND VALIDATION OF NOx ANALYZER MODEL APNA-370

Parameter	Unit	Observed Value		Nominal Range
		Before Adjust	After Adjust	
Range	ppb	500	500	0 - 500 Standard
Signal NO	mV	0.4	0.2	Voltage of the measured NO value
Signal NOx	mV	8.1	7.3	Voltage of the measured NOx value
Detector	°C	40.7	40.7	43 °C ± 5 °C
Ambient	kPa	100.2	101.1	Current atmospheric pressure
DC 24V	V	23.8	23.8	24V ±0.5
DC 5V	V	5.0	5.0	5V ±0.5
NO Slope	-	1.34290	1.33560	0.50000 - 2.0000
NOx Slope	-	1.42400	1.32980	0.50000 - 2.0000

Calibrate By :

(MR.PANUPON PODANG)

May 9, 2025



Checked By :

(MS.SUTATIP IM-NOI)

May 9, 2025

Calibration Data of NOx Analyzer

Analyzer Performance Test

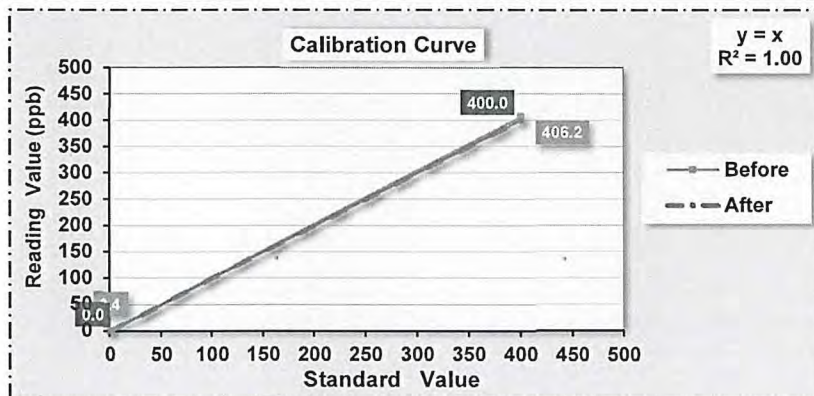
Equipment	Gas Analyzer (NOx)	Customer Name	ไฟฟ้าสุรินทร์
Manufacture	HORIBA	Location	Envi Research
Model	APNA-360	Quotation	2024-02184
Serial No.	EYC70000	Calibration Date	May 9, 2025
Analyzer Unit	ppm		

Instruments for Calibration

Instruments	Manufacture	Model	Serial Number
Zero Air Supply	Thermo Env.	111	0700419829
Dynamic Dilution Calibrator	Tanabyte	300	0165
Standard Gas Components	CO = 4,516 ppm		
Cylinder No : EB0123013	NO = 55.3 ppm		
Expire Date : Oct 22, 2027	SO ₂ = 54.9 ppm		

Single Point Calibration

Standard Gas	Standard Gas Value	Analyzer Value								% Abs Error
		NO _x (ppb)		NO (ppb)		NO ₂ (ppb)		Stability		
		Before	After	Before	After	Before	After	Before	After	
Zero	0	-1.5	0.0	0.4	0.0	-1.9	0.0	-	-	-
Span	400	411.3	400.0	406.2	400.0	5.1	0.0	-	-	1.6



STATUS TEST AND VALIDATION OF NOx ANALYZER MODEL APNA-360

Parameter	Unit	Observed Value		Nominal Range
		Before Adjust	After Adjust	
Range	ppm	0.5	5.0	0.1 - 1.0 Standard
Signal NO	mV	2.6	1.9	Voltage of the measured NO value
Signal NOx	mV	2.1	3.7	Voltage of the measured NOx value
Detector	kPa	85.9	85.9	(Present Air Pressure/101.3 x100 - 20) ± 4
Sample Flow	LPM	0.8	0.9	1.1 ± 0.3
NO Slope	-	1.17340	1.17340	0.50000 - 2.0000
NOx Slope	-	1.23590	1.23590	0.50000 - 2.0000
Motherboard Status	-	OK	OK	OK
Alarm Detected	-	None	None	None

Calibrate By :

(MR.PANUPON PODANG)

May 9, 2025



Checked By :

(MS.SUTATIP IM-NOI)

May 9, 2025

Calibration Data of NOx Analyzer

Analyzer Performance Test

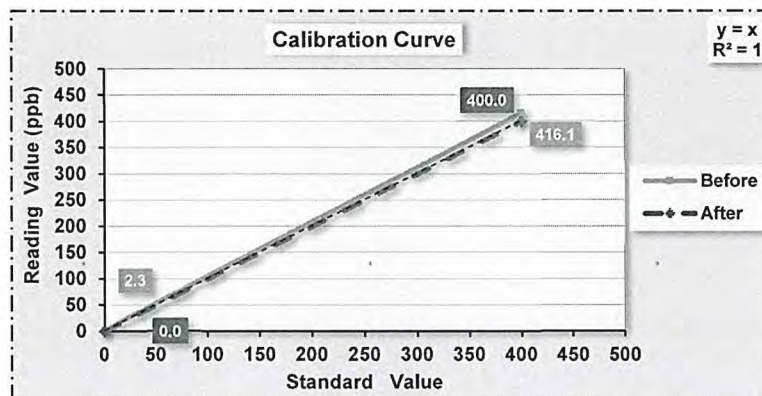
Equipment	Gas Analyzer (NOx)	Customer Name	ไฟฟ้าสุรินทร์
Manufacture	HORIBA	Location	Envi Research
Model	APNA-370	Quotation	2024-02184
Serial No.	NGABK8F2	Calibration Date	May 9, 2025
Analyzer Unit	ppb		

Instruments for Calibration

Instruments	Manufacture	Model	Serial Number
Zero Air Supply	Thermo Env.	111	0700419829
Dynamic Dilution Calibrator	Tanabyte	300	0165
Standard Gas Components	CO = 4,516 ppm		
Cylinder No : EB0123013	NO = 55.3 ppm		
Expire Date : Oct 22, 2027	SO ₂ = 54.9 ppm		

Single Point Calibration

Standard Gas	Standard Gas Value	Analyzer Value								% Abs Error
		NO _x (ppb)		NO (ppb)		NO ₂ (ppb)		Stability		
		Before	After	Before	After	Before	After	Before	After	
Zero	0	2.0	0.0	2.3	0.0	-0.3	0.0	-	-	-
Span	400	417.0	400.0	416.1	400.0	0.9	0.0	-	-	4.0



STATUS TEST AND VALIDATION OF NOx ANALYZER MODEL APNA-370

Parameter	Unit	Observed Value		Nominal Range
		Before Adjust	After Adjust	
Range	ppb	500	500	0 - 500 Standard
Signal NO	mV	0.6	0.8	Voltage of the measured NO value
Signal NOx	mV	2.1	6.2	Voltage of the measured NOx value
Detector	°C	40.7	40.6	43 °C ± 5 °C
Ambient	kPa	100.7	100.7	Current atmospheric pressure
DC 24V	V	23.6	23.6	24V ±0.5
DC 5V	V	5.0	5.0	5V ±0.5
NO Slope	-	1.60240	1.54700	0.50000 - 2.0000
NOx Slope	-	1.59450	1.54680	0.50000 - 2.0000

Calibrate By :

(MR.PANUPON PODANG)

May 9, 2025

Checked By :

(MS.SUTATIP IM-NOI)

May 9, 2025



THAI METEOROLOGICAL DEPARTMENT

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

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 28 August, 2024

Certification No. 325/24

Page : 1 of 3

Object : Weather Station

Manufacturer : Davis Instruments Inc.

Type : Vantage Pro2

Serial No. : AX161108018 ID No. : 28

Customer : Environment Research & Technology Company Limited.
25/113-114 Moo 6 Soi Chinaket 1, Ngamwongwan Road,
Toongsonghong, Laksi, Bangkok 10210.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1008.1 hPa

NATIONAL STANDARD WIND TUNNEL :

: Micromanometer Theodor Friedrichs FC014 Serial No. 9310119

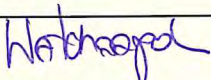
: HOOK GAGE NO 1425 Pitot Tube Theodor Friedrichs Type 0800.0000 serial 9023

N.I.S.T. Test Reference Number 731/241460 : Standard Velocity at 20 - 30 m/sec

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)
Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION : Standard Velocity at 0 - 20 m/sec

STANDARD THERMOMETER : Theodor Friedrich : Dry No.8390/94 Wet No. 8389/94
: Thermoschneider No.918802

Calibrated by : 

Mr. Watchapol Subwat
Mechanical Engineer

Signed :


Mr. Pisood Promsut

(Authorised Signatory)

for the Chief

Sub-Standard Instrument





THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 325/24

28 August, 2024

Page : 2 of 3

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure	Vacumm	Velocity	Velocity	Correction
	inches H2O	inches H2O	m/sec	m/sec	m/sec
1.00	-	-	-	0.9	0.10
3.02	-	-	-	2.7	0.32
5.00	-	-	-	4.9	0.10
7.00	-	-	-	6.7	0.30
9.02	-	-	-	8.9	0.12
11.01	-	-	-	10.7	0.31
13.01	-	-	-	13.0	0.01
15.01	-	-	-	14.9	0.11
17.02	-	-	-	17.0	0.02
20.02	-	-	-	20.1	-0.08

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

Calibrated by :

Watchapol

Mr. Watchapol Subwat
Mechanical Engineer

Calibration & Test Section
Meteorological Instruments Bureau





THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 325/24

28 August, 2024

Page : 3 of 3

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.5	45.6	-0.1
30.2	30.3	-0.1
15.4	15.4	0.0

Calibrated by :

Watchapol

Mr. Watchapol Subwat

Mechanical Engineer





THAI METEOROLOGICAL DEPARTMENT

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

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 15 January, 2025

Certification No. 043/25

Page : 1 of 3

Object : Weather Station

Manufacturer : Davis Instruments Inc.

Type : Vantage Pro 2 ID No. : No.22

Serial No. : Display AS160105011 Transmitter BD181211070

Customer : Environment Research & Technology Company Limited.
25/113-114 Moo 6 Soi Chinaket 1, Ngamwongwan Road,
Toongsonghong, Laksi, Bangkok 10210.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1014.2 hPa

NATIONAL STANDARD WIND TUNNEL :

: Micromanometer Theodor Friedrichs FC014 Serial No. 9310119

: HOOK GAGE NO 1425 Pitot Tube Theodor Friedrichs Type 0800.0000 serial 9023

N.I.S.T. Test Reference Number 731/241460 : Standard Velocity at 20 - 30 m/sec

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION : Standard Velocity at 0 - 20 m/sec

STANDARD THERMOMETER : Theodor Friedrich : Dry No.8390/94 Wet No. 8389/94

: Thermoschneider No.918802

Calibrated by : Watchapol

Signed :

Mr. Watchapol Subwat

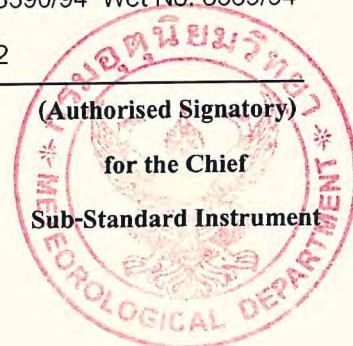
Mr. Pisood Promsut

Mechanical Engineer

(Authorised Signatory)

for the Chief

Sub-Standard Instrument





THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 043/25

15 January, 2025

Page : 2 of 3

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure inches H2O	Vacumm inches H2O	Velocity m/sec	Velocity m/sec	Correction m/sec
1.00	-	-	-	0.9	0.10
3.02	-	-	-	2.7	0.32
5.00	-	-	-	4.9	0.10
7.04	-	-	-	7.0	0.04
9.02	-	-	-	8.9	0.12
11.01	-	-	-	11.0	0.01
13.01	-	-	-	13.0	0.01
15.01	-	-	-	15.0	0.01
17.02	-	-	-	17.0	0.02
20.02	-	-	-	20.0	0.02

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

Calibrated by :

Watchapol

Mr. Watchapol Subwat

Mechanical Engineer

Calibration & Test Section
Meteorological Instruments Bureau





THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 0-2396-0156,0-2399-0469

The Result of Calibration

Certification No. 043/25

15 January, 2025

Page : 3 of 3

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
48.2	48.0	0.2
30.5	30.4	0.1
15.8	15.8	0.0

Calibrated by :

Watcharapol

Mr. Watcharapol Subwat
Mechanical Engineer

Calibration & Test Section
Meteorological Instruments Bureau





THAI METEOROLOGICAL DEPARTMENT

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

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 12 December, 2024

Certification No. 444/24

Page : 1 of 2

Object : เครื่องมือตรวจวัดอุตุนิยมวิทยา

Manufacturer : Davis Instruments

Type : Vantage Pro2 ID No. : No.31

Mfg Code : Display A80409D18N

Customer : Environment Research & Technology Company Limited.
25/113-114 Moo 6 Soi Chinaket 1, Ngamwongwan Road,
Toongsonghong, Laksi, Bangkok 10210.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1009.5 hPa

NATIONAL STANDARD WIND TUNNEL

: Micromanometer Theodor Friedrichs FC014 Serial No. 9310119

: HOOK GAGE NO 1425 Pitot Tube Theodor Friedrichs Type 0800.0000 serial 9023

N.I.S.T. Test Reference Number 731/241460 : Standard Velocity at 20 - 30 m/sec

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION : Standard Velocity at 0 - 20 m/sec

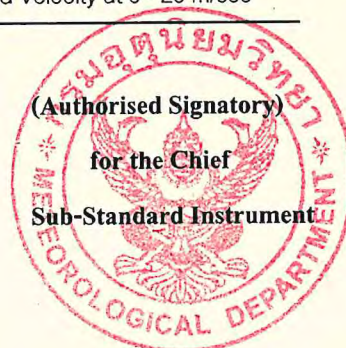
Calibrated by :

Mr. Watcharapol Subwat

Mechanical Engineer

Signed :

Mr. Pisood Promsut





THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 444/24

12 December, 2024

Page : 2 of 2

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure inches H2O	Vacumm inches H2O	Velocity m/sec	Velocity m/sec	Correction m/sec
1.00	-	-	-	0.9	0.10
3.02	-	-	-	2.7	0.32
5.00	-	-	-	4.9	0.10
7.04	-	-	-	6.7	0.34
9.02	-	-	-	9.0	0.02
11.01	-	-	-	10.7	0.31
13.01	-	-	-	13.0	0.01
15.01	-	-	-	14.7	0.31
17.02	-	-	-	17.0	0.02
20.02	-	-	-	20.0	0.02

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

Calibrated by :

Watchapol

Mr. Watchapol Subwat

Mechanical Engineer

Calibration & Test Section

Meteorological Instruments Bureau





THAI METEOROLOGICAL DEPARTMENT

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

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 15 January, 2025

Certification No. 042/25

Page : 1 of 3

Object : Weather Station

Manufacturer : Davis Instruments Inc.

Type : Vantage Pro 2 ID No. : No.21

Serial No. : Display AS160105017 Transmitter BE181108006

Customer : Environment Research & Technology Company Limited.
25/113-114 Moo 6 Soi Chinaket 1, Ngamwongwan Road,
Toongsonghong, Laksi, Bangkok 10210.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1014.5 hPa

NATIONAL STANDARD WIND TUNNEL :

: Micromanometer Theodor Friedrichs FC014 Serial No. 9310119

: HOOK GAGE NO 1425 Pitot Tube Theodor Friedrichs Type 0800.0000 serial 9023

N.I.S.T. Test Reference Number 731/241460 : Standard Velocity at 20 - 30 m/sec

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION : Standard Velocity at 0 - 20 m/sec

STANDARD THERMOMETER : Theodor Friedrich : Dry No.8390/94 Wet No. 8389/94

: Thermoschneider No.918802

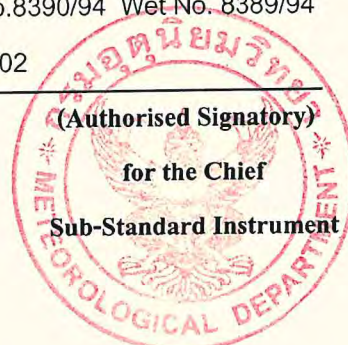
Calibrated by : Watchapol

Signed :

Mr. Watchapol Subwat

Mr. Pisood Promsut

Mechanical Engineer





THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 042/25

15 January, 2025

Page : 2 of 3

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure	Vacumm	Velocity	Velocity	Correction
	inches H2O	inches H2O	m/sec	m/sec	m/sec
1.00	-	-	-	0.9	0.10
3.02	-	-	-	2.7	0.32
5.00	-	-	-	4.9	0.10
7.04	-	-	-	7.0	0.04
9.02	-	-	-	8.9	0.12
11.01	-	-	-	11.0	0.01
13.01	-	-	-	13.0	0.01
15.01	-	-	-	15.0	0.01
17.02	-	-	-	17.0	0.02
20.02	-	-	-	20.0	0.02

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

Calibrated by :

Watchapol

Mr. Watchapol Subwat

Mechanical Engineer

Calibration & Test Section
Meteorological Instruments Bureau





THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 0-2396-0156,0-2399-0469

The Result of Calibration

Certification No. 042/25

15 January, 2025

Page : 3 of 3

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
48.2	48.1	0.1
30.5	30.4	0.1
15.8	15.8	0.0

Calibrated by :

Watchapol

Mr. Watchapol Subwat

Mechanical Engineer

Calibration & Test Section
Meteorological Instruments Bureau





THAI METEOROLOGICAL DEPARTMENT

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

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 15 January, 2025

Certification No. 041/25

Page : 1 of 2

Object : Wind speed and wind direction

Manufacturer : Davis Instruments Inc.

Type : Weather Wizard III Product No. 7425

Serial No. : WC40922A02 ID No. : No.32

Customer : Environment Research & Technology Company Limited.
25/113-114 Moo 6 Soi Chinaket 1, Ngamwongwan Road,
Toongsonghong, Laksi, Bangkok 10210.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1014.7 hPa

NATIONAL STANDARD WIND TUNNEL :

: Micromanometer Theodor Friedrichs FC014 Serial No. 9310119

: HOOK GAGE NO 1425 Pitot Tube Theodor Friedrichs Type 0800.0000 serial 9023

N.I.S.T. Test Reference Number 731/241460 : Standard Velocity at 20 - 30 m/sec

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION : Standard Velocity at 0 - 20 m/sec

Calibrated by :

Mr. Watcharapol Subwat

Mechanical Engineer

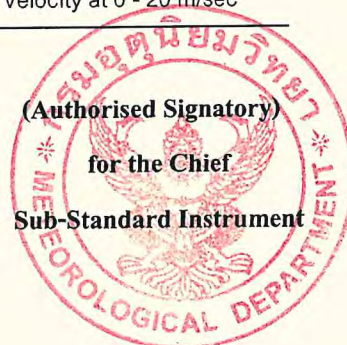
Signed :

Mr. Pisood Promsut

(Authorised Signatory)

for the Chief

Sub-Standard Instrument





THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 041/25

15 January, 2025

Page : 2 of 2

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure inches H2O	Vacumm inches H2O	Velocity m/sec	Velocity m/sec	Correction m/sec
1.00	-	-	-	0.9	0.10
3.02	-	-	-	2.7	0.32
5.00	-	-	-	4.9	0.10
7.04	-	-	-	6.9	0.14
9.02	-	-	-	9.0	0.02
11.01	-	-	-	10.7	0.31
13.01	-	-	-	13.0	0.01
15.01	-	-	-	15.0	0.01
17.02	-	-	-	17.0	0.02
20.02	-	-	-	20.0	0.02

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

Calibrated by :

Watchapol

Mr. Watchapol Subwat

Mechanical Engineer





THAI METEOROLOGICAL DEPARTMENT

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

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 15 January, 2025

Certification No. 040/25

Page : 1 of 2

Object : Wind speed and wind direction

Manufacturer : Davis Instruments Inc.

Type : Weather Wizard III Product No. 7425

Serial No. : WC30506A54A ID No. : No.4

Customer : Environment Research & Technology Company Limited.
25/113-114 Moo 6 Soi Chinaket 1, Ngamwongwan Road,
Toongsonghong, Laksi, Bangkok 10210.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1014.9 hPa

NATIONAL STANDARD WIND TUNNEL :

: Micromanometer Theodor Friedrichs FC014 Serial No. 9310119

: HOOK GAGE NO 1425 Pitot Tube Theodor Friedrichs Type 0800.0000 serial 9023

N.I.S.T. Test Reference Number 731/241460 : Standard Velocity at 20 - 30 m/sec

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION : Standard Velocity at 0 - 20 m/sec

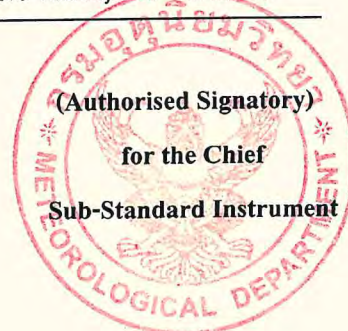
Calibrated by :

Mr. Watcharapol Subwat

Mechanical Engineer

Signed :

Mr. Pisood Promsut





THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 040/25

15 January, 2025

Page : 2 of 2

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure inches H2O	Vacumm inches H2O	Velocity m/sec	Velocity m/sec	Correction m/sec
1.00	-	-	-	0.9	0.10
3.02	-	-	-	2.7	0.32
5.00	-	-	-	4.9	0.10
7.04	-	-	-	6.7	0.34
9.02	-	-	-	8.9	0.12
11.01	-	-	-	10.7	0.31
13.01	-	-	-	12.9	0.11
15.01	-	-	-	15.0	0.01
17.02	-	-	-	17.0	0.02
20.02	-	-	-	20.0	0.02

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

Calibrated by :

Watchapol

Mr. Watchapol Subwat

Mechanical Engineer



Calibration & Test Section

Meteorological Instruments Bureau



THAI METEOROLOGICAL DEPARTMENT

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

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 12 December, 2024

Certification No. 442/24

Page : 1 of 2

Object : Wind speed and wind direction

Manufacturer : Davis Instruments Inc.

Type : Weather Wizard III Product No. 7425

Serial No. : WC40801A97 ID No. : No.16

Customer : Environment Research & Technology Company Limited.
25/113-114 Moo 6 Soi Chinaket 1, Ngamwongwan Road,
Toongsonghong, Laksi, Bangkok 10210.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1009.2 hPa

NATIONAL STANDARD WIND TUNNEL :

: Micromanometer Theodor Friedrichs FC014 Serial No. 9310119

: HOOK GAGE NO 1425 Pitot Tube Theodor Friedrichs Type 0800.0000 serial 9023

N.I.S.T. Test Reference Number 731/241460 : Standard Velocity at 20 - 30 m/sec

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION : Standard Velocity at 0 - 20 m/sec

Calibrated by :

Watchapol

Signed :

[Signature]

Mr. Watchapol Subwat

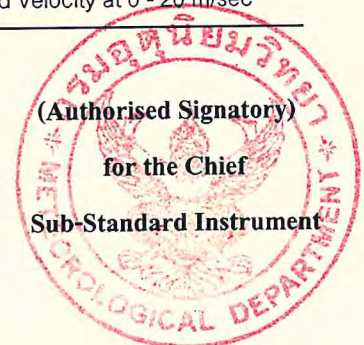
Mr. Pisood Promsut

Mechanical Engineer

(Authorised Signatory)

for the Chief

Sub-Standard Instrument





THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 442/24

12 December, 2024

Page : 2 of 2

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure inches H2O	Vacumm inches H2O	Velocity m/sec	Velocity m/sec	Correction m/sec
1.00	-	-	-	0.9	0.10
3.02	-	-	-	2.7	0.32
5.00	-	-	-	4.9	0.10
7.04	-	-	-	6.7	0.34
9.02	-	-	-	8.5	0.52
11.01	-	-	-	10.7	0.31
13.01	-	-	-	12.5	0.51
15.01	-	-	-	14.7	0.31
17.02	-	-	-	16.5	0.52
20.02	-	-	-	19.7	0.32

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

Calibrated by :

Watchapol

Mr. Watchapol Subwat

Mechanical Engineer

Calibration & Test Section

Meteorological Instruments Bureau





THAI METEOROLOGICAL DEPARTMENT

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

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 28 August, 2024

Certification No. 322/24

Page : 1 of 2

Object : Wind speed and wind direction

Manufacturer : Davis Instruments Inc.

Type : Weather Wizard III Product No. 7425

Serial No. : WE91016A19 ID No. : No.7

Customer : Environment Research & Technology Company Limited.
25/113-114 Moo 6 Soi Chinaket 1, Ngamwongwan Road,
Toongsonghong, Laksi, Bangkok 10210.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1007.5 hPa

NATIONAL STANDARD WIND TUNNEL :

: Micromanometer Theodor Friedrichs FC014 Serial No. 9310119


: HOOK GAGE NO 1425 Pitot Tube Theodor Friedrichs Type 0800.0000 serial 9023

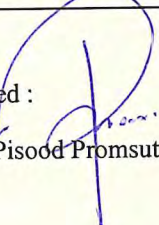
N.I.S.T. Test Reference Number 731/241460 : Standard Velocity at 20 - 30 m/sec

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION : Standard Velocity at 0 - 20 m/sec

Calibrated by : 
Mr. Watcharapol Subwat
Mechanical Engineer

Signed : 
Mr. Pisood Promsut





THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 322/24

28 August, 2024

Page : 2 of 2

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure inches H2O	Vacumm inches H2O	Velocity m/sec	Velocity m/sec	Correction m/sec
1.00	-	-	-	0.4	0.60
3.02	-	-	-	2.7	0.32
5.00	-	-	-	4.5	0.50
7.04	-	-	-	6.7	0.34
9.02	-	-	-	8.5	0.52
11.01	-	-	-	10.7	0.31
13.01	-	-	-	12.5	0.51
15.01	-	-	-	14.7	0.31
17.02	-	-	-	16.5	0.52
20.02	-	-	-	19.7	0.32

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

Calibrated by :

Watchapol

Mr. Watcharapol Subwat

Mechanical Engineer

Calibration & Test Section
Meteorological Instruments Bureau





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.: 25CH55

Page.: 1 of 3

Equipment : pH Meter
Manufacturer : Eutech
Model : pHTestr 30
Serial No. : 3195381
ID No. : -
Condition As-Received: Used Item
Received Date : 14 January 2025
Calibration Date : 15 January 2025
Reference : 2501-0443DN-8
Submitted by : Environment Research & Technology Company Limited.
25/114 Moo 6, Soi Chinaket 1, Ngamwongwan Road,
Toongsonghong, Laksi, Bangkok 10210

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
- CP-CH5 by direct measurement with
certified reference material (CRM)

Calibrated by : Walalak Sirithean

Approved by : _____
Approved Signatory

() Pornthippa Tameyakul
() Ponpan Paipim
(✓) Saithip Meangmai

Issue Date : 17 January 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.: 25CH55

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)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 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

<u>Buffer Solution</u>	<u>Manufacturer</u>	<u>Lot No.</u>	<u>Exp. date</u>
pH 4.008	CPA chem	1034203	27 Sep 2026
pH 6.999	Hach Lenge GmbH	C03220	29 Oct 2026
pH 10.010	CPA chem	1034205	27 Sep 2025

Calibration Results

Function : pH Measurement

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

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.: 3195381	4.008	4.01	N/A	0.0071	2.00
	6.999	7.00	N/A	0.0085	2.00
	10.010	10.01	N/A	0.0092	2.00

Remark

- pH meter does not have voltage mode.
- Can not connect the BNC because the plug does not match with the socket.
- N/A = Not Available



Cert.No.: 25CH55

Page.: 3 of 3

Calibration Results

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : -

- Serial No. : 3195381

Dimension of probe

- Length : 58 mm.

- Diameter : 6 mm.

- Immersion Depth : 36 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor <i>k</i>
25.0	25.001	25.0	-0.001	0.13	2.00
30.0	30.003	30.0	-0.003	0.13	2.00
35.0	35.000	35.0	0.000	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 %.

-o0o-



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.: 25TM33

Page : 1 of 3

Equipment : Hot Air Oven

Manufacturer : Memmert

Model : UF 110

Serial No. : B414.0652

ID No. : ERTC-L-In-098

Submitted by : Environment Research & Technology Company Limited.
25/114 Moo 6, Soi Chinaket 1, Ngamwongwan Road,
Toongsonghong, Laksi,
Bangkok 10210

Location : หน้าห้อง 510

Received Order : 06 January 2025

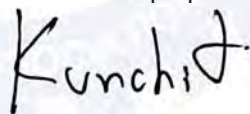
Calibration Date : 06 January 2025

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

AC Line Voltage : (220 ± 22) V

Calibrated by : Khit Ruttanaprapachai

Approved by : 
Approved Signatory

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

Issue Date : 18 January 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.



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2501-0004ON-3

Cert. No.: 25TM33

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:-

<u>Instrument</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Traceable</u>	<u>Due Date</u>
1) Data Acquisition	MY49001451	24LM44	TPA	17 Mar 2025
2) Data Acquisition	MY49001451	24LM79	TPA	29 May 2025

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

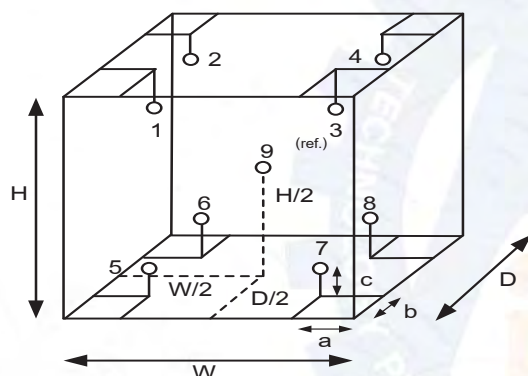
3. This certification is traceable to the International System of Unit.

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

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



Environment during calibration		
	Beginning	Finished
Temp. (°C)	28	27
REL.Humid. (%)	55	58
AC Supply (Volt)	222	221

Ref. Std. ID No.: @ Calibration Point		
Position :	(104) °C	(180) °C
1	19RTD-2/1	24-19TC-01
2	19RTD-2/2	24-19TC-02
3	19RTD-2/3	24-19TC-03
4	19RTD-2/4	24-19TC-04
5	19RTD-2/5	24-19TC-05
6	24-19RTD-2/6	24-19TC-06
7	19RTD-2/7	24-19TC-07
8	19RTD-2/8	24-19TC-08
9 (ref.)	19RTD-2/9	24-19TC-09

Probe Installation Details :

a = 5.0 cm
b = 5.0 cm
c = 5.0 cm

Dimension of Chamber :

D = 0.40 m
W = 0.56 m
H = 0.48 m
Capacity = 0.11 m³



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2501-0004ON-3
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 25TM33

Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor <i>k</i>
104.0	104.0	104.0	0.13	1.2	1.8	2
180.0	180.0	180.0	0.54	3.6	4.7	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	Position									
	1	2	3	4	5	6	7	8	9 (ref.)	
104.0	104.884	103.140	103.191	103.508	104.382	103.829	104.340	103.742	104.282	0.42
180.0	181.068	177.733	178.025	179.100	181.089	180.099	181.795	180.145	181.130	1.4

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

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

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

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

UUC* : Unit Under Calibration

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

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

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 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.: 25TM32

Page : 1 of 3

Equipment : Hot Air Oven

Manufacturer : Binder

Model : FED 115 E2

Serial No. : 11-22823

ID No. : ERTC-L-In-076

Submitted by : Environment Research & Technology Company Limited.
25/114 Moo 6, Soi Chinaket 1, Ngamwongwan Road,
Toongsonghong, Laksi,
Bangkok 10210

Location : หน้าห้อง 510

Received Order : 06 January 2025

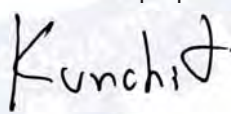
Calibration Date : 06 January 2025

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

AC Line Voltage : (220 ± 22) V

Calibrated by : Khit Ruttanaprapachai

Approved by : 
Approved Signatory

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

Issue Date : 18 January 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.



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2501-0004ON-2

Cert. No.: 25TM32

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:-

<u>Instrument</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Traceable</u>	<u>Due Date</u>
1) Data Acquisition	MY49001451	24LM44	TPA	17 Mar 2025
2) Data Acquisition	MY49001451	24LM79	TPA	29 May 2025

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

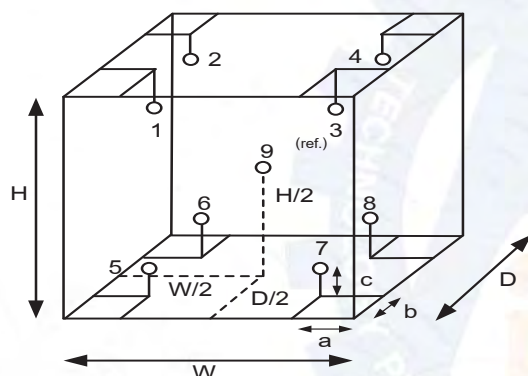
3. This certification is traceable to the International System of Unit.

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

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



Environment during calibration		
	Beginning	Finished
Temp. (°C)	28	27
REL.Humid. (%)	55	58
AC Supply (Volt)	222	221

Ref. Std. ID No.: @ Calibration Point		
Position :	(104) °C	(180) °C
1	19RTD-2/1	24-19TC-01
2	19RTD-2/2	24-19TC-02
3	19RTD-2/3	24-19TC-03
4	19RTD-2/4	24-19TC-04
5	19RTD-2/5	24-19TC-05
6	24-19RTD-2/6	24-19TC-06
7	19RTD-2/7	24-19TC-07
8	19RTD-2/8	24-19TC-08
9 (ref.)	19RTD-2/9	24-19TC-09

Probe Installation Details :

a = 5.0 cm
b = 5.0 cm
c = 5.0 cm

Dimension of Chamber :

D = 0.40 m
W = 0.60 m
H = 0.48 m
Capacity = 0.12 m³



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2501-0004ON-2
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 25TM32

Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor <i>k</i>
104	104	104	0.13	2.0	2.2	2
180	180	180	0.74	3.8	4.8	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (±°C)
	Position									
	1	2	3	4	5	6	7	8	9 (ref.)	
104	104.727	103.435	104.430	103.878	103.258	102.923	104.882	103.647	102.939	0.80
180	178.529	178.085	181.353	181.341	179.519	177.627	181.808	179.627	178.498	1.7

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 %.

-o0o-

Mettler-Toledo (Thailand) Ltd.

846/4 - 846/5 Lasalle Rd., Bangna Tai Sub-District

Bangna District, Bangkok 10260

+662 723 0382


MT-TH.ServiceSupport@mt.com



NSC-TISI-TIS 17025
CALIBRATION 0062

Accuracy Calibration Certificate

Customer

Company: Environment Research & Technology
Address: 25/114 Moo 6, Soi Chinaket 1, Ngamwongwan Rd., Toongsonghong
City: Laksi **Contact:** Ramita Taengthai
Zip / Postal: 10210
State / Province: Bangkok
Order Number: 
0 3 3 3 6 1 0 1 9

Weighing Device

Manufacturer: Mettler Toledo **Instrument Type:** Weighing Instrument
Model: MS204S/01 **Asset Number:** ERTC-L-IN-088
Serial No.: B334691537 **Terminal Model:** N/A
Building: N/A **Terminal Serial No.:** N/A
Floor: 5 **Terminal Asset No.:** N/A
Room: 504

Range	Max. Capacity	Readability (d)
1	220 g	0.0001 g

Procedure



Calibration Guideline: EURAMET cg-18 v. 4.0/CENAM-ema:2015
METTLER TOLEDO Work Instruction: CP/W002/20

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

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

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

	Temperature		Humidity	
As Found	Start: 19.7 °C	End: 19.6 °C	Start: 40.0 %	End: 45.0 %

As Found Calibration Date: 15-Jan-2025 **Calibrator:** 
As Left Calibration Date: N/A
Issue Date: 17-Jan-2025
Approved Signatory: 
Supapit Kruapoo
Technical Manager / Head of Calibration Center

Measurement Results

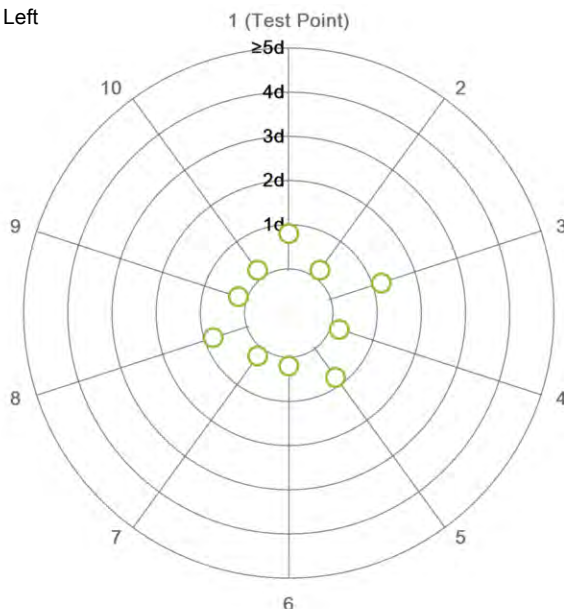
Repeatability

Test Load: 100 g

	As Found	As Left
1	100.0000 g	N/A
2	100.0001 g	N/A
3	100.0002 g	N/A
4	100.0001 g	N/A
5	100.0000 g	N/A
6	100.0001 g	N/A
7	100.0001 g	N/A
8	100.0000 g	N/A
9	100.0001 g	N/A
10	100.0001 g	N/A

Standard Deviation	0.00006 g	N/A
--------------------	-----------	-----

○ As Found
◆ As Left



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

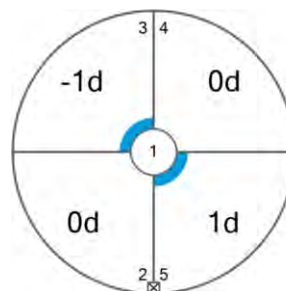
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

Test Load: 100 g

Position	As Found	As Left
1	100.0000 g	N/A
2	100.0000 g	N/A
3	99.9999 g	N/A
4	100.0000 g	N/A
5	100.0001 g	N/A

Maximum Deviation	0.0001 g	N/A
-------------------	----------	-----



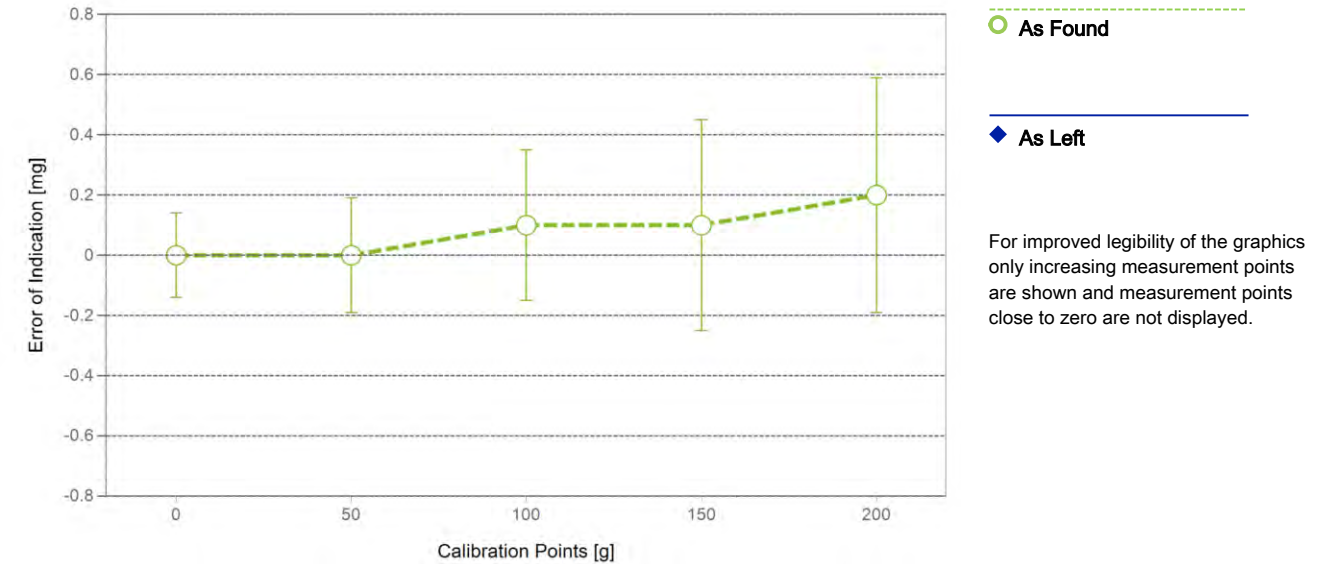
As Found

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

Error of Indication

As Found

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.0000 g	0.0000 g	0.0000 g	0.14 mg	2
2	0.0500 g	0.0500 g	0.0000 g	0.15 mg	2
3	0.1000 g	0.1000 g	0.0000 g	0.15 mg	2
4	0.5000 g	0.5000 g	0.0000 g	0.15 mg	2
5	1.0000 g	1.0000 g	0.0000 g	0.15 mg	2
6	5.0000 g	5.0000 g	0.0000 g	0.16 mg	2
7	10.0000 g	10.0001 g	0.0001 g	0.16 mg	2
8	50.0000 g	50.0000 g	0.0000 g	0.19 mg	2
9	99.9999 g	100.0000 g	0.0001 g	0.25 mg	2
10	149.9999 g	150.0000 g	0.0001 g	0.35 mg	2
11	200.0001 g	200.0003 g	0.0002 g	0.39 mg	2



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

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

The results of this calibration certificate relate only to the calibrated item.

Test Equipment

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

Weight Set 1: OIML E2

Weight Set No.:	WS38	Date of Issue:	15-Dec-2023
Certificate Number:	189517	Calibration Due Date:	15-Jun-2025

Weight Set 2: OIML E2

Weight Set No.:	WS38-1	Date of Issue:	22-Feb-2024
Certificate Number:	C411772496	Calibration Due Date:	22-Aug-2025

Weight Set 3: OIML E2

Weight Set No.:	WS38-3	Date of Issue:	27-Feb-2024
Certificate Number:	C411772498	Calibration Due Date:	27-Aug-2025

Thermo Hygrometer

Equipment No.:	IN256	Date of Issue:	19-Jul-2024
Certificate Number:	SG-H-00636/67	Calibration Due Date:	18-Jul-2025

Remarks

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

End of Accredited Section

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

Measurement Uncertainty of the Weighing Instrument in Use

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

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

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

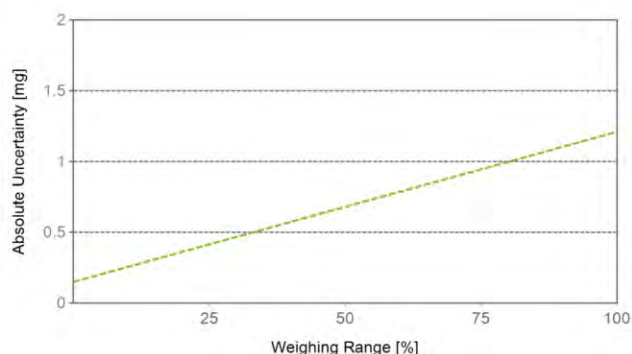
Linearization of Uncertainty Equation

Range			As Found	As Left
	d	Max		
1	0.0001 g	220 g	$U_1 = 0.15 \text{ mg} + 0.00482 \text{ mg/g} \cdot R$	N/A

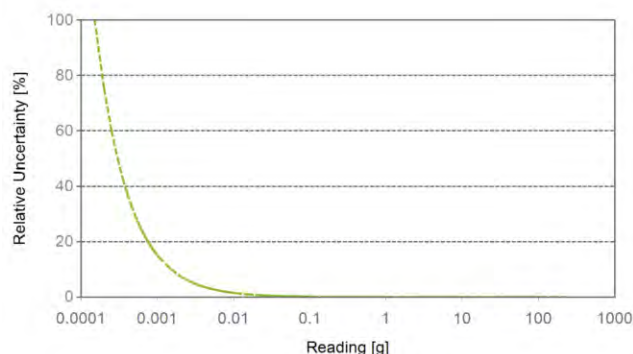
To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

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

Net Indication	As Found		As Left	
0.0220 g	0.15 mg	0.68%	N/A	N/A
0.2200 g	0.15 mg	0.069%	N/A	N/A
2.2000 g	0.16 mg	0.0073%	N/A	N/A
22.0000 g	0.26 mg	0.0012%	N/A	N/A
220.0000 g	1.2 mg	0.00055%	N/A	N/A



As Found



As Left

GWP® Certificate



**As
Found**



**As
Left**



The weighing device meets the given process requirements.

The weighing device meets the given process requirements.

Tests Performed:



As Found



As Left



No adjustments/modifications made. As Left results correspond to As Found.

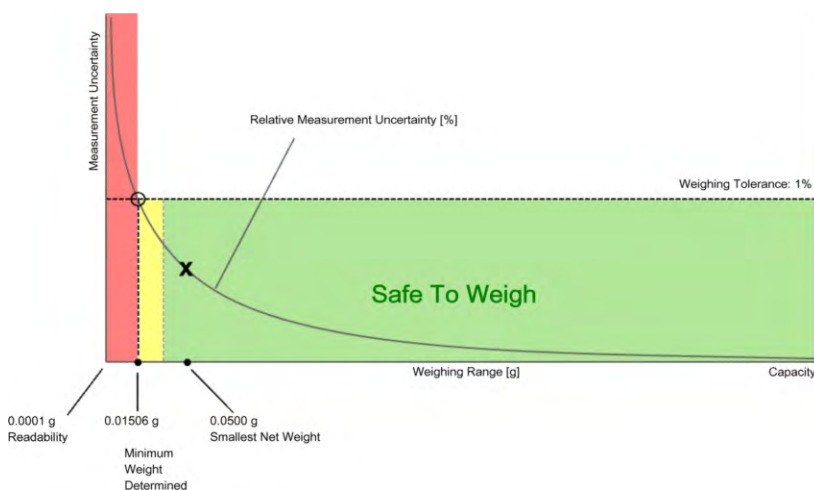
Process Requirements

Weighing Tolerance: 1%

Smallest Net Weight: 0.0500 g

Safety Factor: 2

Safe Weighing Range



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

Minimum Weight

As Found Minimum Weight Table

Minimum weights for different weighing tolerances and safety factors					
	Safety Factor				
Tolerance	1	2	3	5	10
0.1%	0.15128 g	0.30404 g	0.45829 g	0.77136 g	1.58179 g
0.2%	0.07546 g	0.15128 g	0.22748 g	0.38098 g	0.77136 g
0.5%	0.03014 g	0.06034 g	0.09059 g	0.15128 g	0.30404 g
1%	0.01506 g	0.03014 g	0.04523 g	0.07546 g	0.15128 g
2%	0.00753 g	0.01506 g	0.02260 g	0.03768 g	0.07546 g
5%	0.00301 g	0.00602 g	0.00904 g	0.01506 g	0.03014 g



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

As Left Minimum Weight Table

Minimum weights for different weighing tolerances and safety factors					
	Safety Factor				
Tolerance	1	2	3	5	10
0.1%	0.15128 g	0.30404 g	0.45829 g	0.77136 g	1.58179 g
0.2%	0.07546 g	0.15128 g	0.22748 g	0.38098 g	0.77136 g
0.5%	0.03014 g	0.06034 g	0.09059 g	0.15128 g	0.30404 g
1%	0.01506 g	0.03014 g	0.04523 g	0.07546 g	0.15128 g
2%	0.00753 g	0.01506 g	0.02260 g	0.03768 g	0.07546 g
5%	0.00301 g	0.00602 g	0.00904 g	0.01506 g	0.03014 g



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

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

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

Notes on minimum weight values in above table:

1. If "N/A" is shown above, no appropriate value could be calculated.
2. METTLER TOLEDO is not responsible for the definition of the process requirements.

Measurement Results

Results Summary

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

✓ = Passed

✗ = Failed

⚠ = Safety Factor not met

Repeatability

Test Load: 100 g

Tolerance	Control Limit	As Found		As Left	
		Std. Deviation	Result	Std. Deviation	Result
0.1%	N/A	0.00006 g*	N/A	0.00006 g*	N/A
0.2%	0.00005 g		✗		✗
0.5%	0.00013 g		✓		✓
1%	0.00025 g		✓		✓
2%	0.00050 g		✓		✓
5%	0.00125 g		✓		✓

*The calculated standard deviation value is below the rounding error of the balance. The $0.41 \cdot d$ rule is used for the assessment of this repeatability test and the calculation of the minimum weight.

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

Eccentricity

Test Load: 100 g

Tolerance	Control Limit	As Found		As Left	
		Deviation	Result	Deviation	Result
0.1%	0.0500 g	0.0001 g	✓	0.0001 g	✓
0.2%	0.1000 g		✓		✓
0.5%	0.2500 g		✓		✓
1%	0.5000 g		✓		✓
2%	1.0000 g		✓		✓
5%	2.5000 g		✓		✓

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

Error of Indication**As Found**

		Control limits for various weighing tolerances					
Reference Value	Error	0.1%	0.2%	0.5%	1%	2%	5%
0.0000 g	0.0000 g	N/A	N/A	N/A	N/A	N/A	N/A
50.0000 g	0.0000 g	0.0250 g	0.0500 g	0.1250 g	0.2500 g	0.5000 g	1.2500 g
99.9999 g	0.0001 g	0.0500 g	0.1000 g	0.2500 g	0.5000 g	1.0000 g	2.5000 g
149.9999 g	0.0001 g	0.0750 g	0.1500 g	0.3750 g	0.7500 g	1.5000 g	3.7500 g
200.0001 g	0.0002 g	0.1000 g	0.2000 g	0.5000 g	1.0000 g	2.0000 g	5.0000 g
Result		✓	✓	✓	✓	✓	✓

As Left

		Control limits for various weighing tolerances					
Reference Value	Error	0.1%	0.2%	0.5%	1%	2%	5%
0.0000 g	0.0000 g	N/A	N/A	N/A	N/A	N/A	N/A
50.0000 g	0.0000 g	0.0250 g	0.0500 g	0.1250 g	0.2500 g	0.5000 g	1.2500 g
99.9999 g	0.0001 g	0.0500 g	0.1000 g	0.2500 g	0.5000 g	1.0000 g	2.5000 g
149.9999 g	0.0001 g	0.0750 g	0.1500 g	0.3750 g	0.7500 g	1.5000 g	3.7500 g
200.0001 g	0.0002 g	0.1000 g	0.2000 g	0.5000 g	1.0000 g	2.0000 g	5.0000 g
Result		✓	✓	✓	✓	✓	✓

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



Inctech Metrological Center Co.Ltd.

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Saimai, Bangkok 10220, Thailand

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Calibration Cert. # 3884.01
ISO/IEC 17025

Certificate of Calibration

Certificate No. : MT24-9500

Page : 1 of 2

Customer : Environment research & Technogy Co.,Ltd.

Address : 25/114 Moo6 Soi Chinaket1, Ngamwongwan Road, Toongsonghong, Laksi, Bangkok 10210

Description : Incubator

Manufacturer : Hotpack

Model : 352601

Serial No. : 78633

Identification No. : ERTC-L-In-133

Calibration Place : Customer Laboratory

Order No. : 4090/24

Received date : Nov 29, 2024

Calibration date : Nov 29, 2024

Environment Condition :

Temperature : (25+/-10) °C

Humidity : (50+/-30) %RH

Calibration Method : Calibration were conducted using In-house calibration procedure *CP-MT-006* According to comparison with LXI Data Acquisition Switch Unit with sensor. The calibration methods based on Euramet Calibration Guide No.20 - guidelines on the Calibration of Temperature and/or Humidity Controlled Enclosures.

Reference Standard Instruments :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
Data Acquisition System with Sensor	DAQ970A	MY58003374	MT24-1056	Jan 05, 2025

The effect that the result relate only to the items calibrated. It was found accurate as shown on date and place of calibration only.

Traceability : This measurement are traceable to the International System of Unit (SI), through National Institute of Metrology Thailand (NIMT)

The reported expanded uncertainty of measurement was based on standard uncertainty multiplied by coverage factor $k = 2$, providing a level of confidence of not less than 95%



Calibrated by : Mr.Yuttakorn Jamneansri

Approved by : (Mr.Panuwat Phuklan)

Issue date : Dec 06, 2024

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Certificate No. : MT24-9500

Page : 2 of 2

Function : Temperature measurement

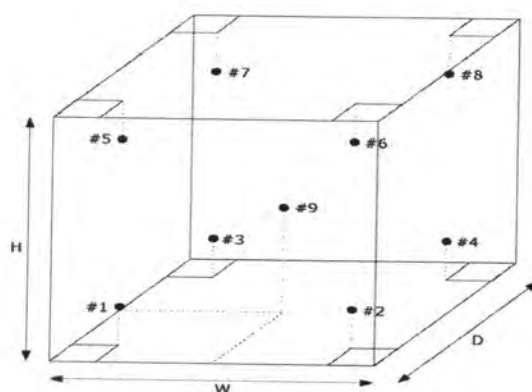
Result : Without adjustment

Calibration point : 20 °C

Resolution : 0.1 °C

Calibration point (°C)	Temperature of UUC* at each position (°C)									Uncertainty of measurement (+/- °C)
	Ch.1	Ch.2	Ch.3	Ch.4	Ch.5	Ch.6	Ch.7	Ch.8	Ch.9	
20	20.276	20.230	20.142	20.019	19.785	20.414	20.187	20.072	20.426	0.41

Setting temperature (°C)	Indicating Temperature (°C)	Measured stability (+/- °C)	Measured uniformity (°C)	Overall variation (°C)
20.0	20.0	0.27	0.97	1.1


Front view

- #1 Lower Left Front
- #2 Lower Right Front
- #3 Lower Left Rear
- #4 Lower Right Rear
- #5 Upper Left Front
- #6 Upper Right Front
- #7 Upper Left Rear
- #8 Upper Right Rear
- #9 Geometric Center

UUC* = Unit under calibration

Uniformity = Maximum and Minimum difference of measured temperature at any probes and the measured temperature at the reference and same time.

Overall Variation = Difference of temperature value between the maximum and minimum any time.

Stability = One half of the maximum difference of measured temperatures at any one probe.



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

Certificate of Testing

Cert.No.: 24TW185

Page.: 1 of 2

Equipment :	DO Meter
Manufacturer :	YSI
Model :	5000-115V
Serial No. :	03C1280 AC
ID No. :	ERTC-L-In-164
Received Date :	03 September 2024
Test Date :	04 September 2024
Reference :	2409-0126DN-1
Submitted by :	Environment Research & Technology Company Limited. 25/114 Moo 6, Soi Chinaket 1, Ngamwongwan Road, Toongsonghong, Laksi, Bangkok 10210
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 Sirithean 
Approved by :	<hr/> <div>Approved Signatory</div>
() Unnopphol Harachai	
() Ponpan Paipim	
(✓) Saithip Meangmai	
Issue Date :	6 September 2024



Cert.No.: 24TW185

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).

<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	N03679	140RC001	23MM537	14 Sep 2024

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.: 15K100353

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.18	8.18	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 Cert. # 3884.01
ISO/IEC 17025

Certificate of Calibration

Certificate No. : MT24-9501

Page : 1 of 3

Customer : Environment research & Technogy Co.,Ltd.

Address : 25/114 Moo6 Soi Chinaket1, Ngamwongwan Road, Toongsonghong, Laksi, Bangkok 10210

Description : Heating Block (COD Reactor)

Manufacturer : Hanna

Model : HI 8398000-02

Serial No. : G0059491

Identification No. : ERTC-L-In-112

Calibration Place : Customer Laboratory

Order No. : 4090/24

Received date : Nov 29, 2024

Calibration date : Nov 30, 2024

Environment Condition :

Temperature : (25+/-10) °C

Humidity : (50+/-30) %RH

Calibration Method : Calibration were conducted using In-house calibration procedure CP-MT-009 According to comparison with Data Acquisition System with Sensor.

Reference Standard Instruments :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
Data Acquisition System with Sensor	DAQ970A	MY58003374	MT24-1056	Jan 05, 2025

The effect that the result relate only to the items calibrated. It was found accurate as shown on date and place of calibration only.

Traceability : This measurement are traceable to the International System of Unit (SI), through National Institute of Metrology Thailand (NIMT)

The reported expanded uncertainty of measurement was based on standard uncertainty multiplied by coverage factor $k = 2$, providing a level of confidence of not less than 95%



Calibrated by : Mr.Yuttakorn Jamneansri

Approved by : (Mr.Panuwat Phuklan)

Issue date : Dec 06, 2024

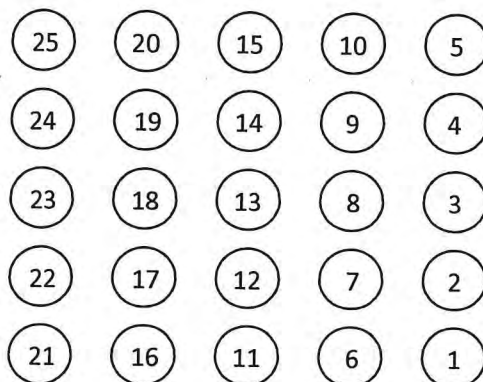
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Calibration Cert. # 3884.01
ISO/IEC 17025**Certificate No. : MT24-9501****Page : 2 of 3****Position****Top view****Function : Temperature measurement****Result : Without adjustment****Calibration point : 150 °C****Immersion depth : 50 mm**

Position No.	UUC* setting (°C)	Standard reading (°C)	UUC* correction (°C)	Uncertainty of measurement (+/- °C)
1	150	148.332	-1.668	0.12
2	150	150.432	0.432	0.12
3	150	148.622	-1.378	0.12
4	150	149.608	-0.393	0.12
5	150	149.680	-0.320	0.12
6	150	148.969	-1.031	0.12
7	150	151.055	1.055	0.12
8	150	149.487	-0.513	0.12
9	150	150.206	0.206	0.12
10	150	150.921	0.921	0.12

UUC* = Unit under calibration

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Calibration Cert. # 3884.01
ISO/IEC 17025**Certificate No.** : MT24-9501**Page** : 3 of 3**Function** : Temperature measurement Cont.**Calibration point** : 150 °C**Immersion depth** : 50 mm**Result** : Without adjustment

Position No.	UUC* setting (°C)	Standard reading (°C)	UUC* correction (°C)	Uncertainty of measurement (+/- °C)
11	150	149.555	-0.445	0.12
12	150	148.965	-1.035	0.12
13	150	150.947	0.947	0.12
14	150	149.405	-0.595	0.12
15	150	150.115	0.115	0.12
16	150	148.956	-1.044	0.12
17	150	150.198	0.198	0.12
18	150	148.435	-1.565	0.12
19	150	149.894	-0.106	0.12
20	150	149.335	-0.665	0.12
21	150	148.472	-1.528	0.12
22	150	150.094	0.094	0.12
23	150	149.977	-0.023	0.12
24	150	148.514	-1.486	0.12
25	150	149.154	-0.846	0.12

UUC* = Unit under calibration

Mettler-Toledo (Thailand) Ltd.

846/4 - 846/5 Lasalle Rd., Bangna Tai Sub-District

Bangna District, Bangkok 10260

+662 723 0382


MT-TH.ServiceSupport@mt.com



NSC-TISI-TIS 17025
CALIBRATION 0062

Accuracy Calibration Certificate

Customer

Company: Environment Research & Technology
Address: 25/114 Moo 6, Soi Chinaket 1, Ngamwongwan Rd., Toongsonghong
City: Laksi **Contact:** Ramita Taengthai
Zip / Postal: 10210
State / Province: Bangkok
Order Number: 
0 3 3 3 6 1 0 1 9

Weighing Device

Manufacturer: Mettler Toledo **Instrument Type:** Weighing Instrument
Model: MS204TS/00 **Asset Number:** ERTC-L-IN-114
Serial No.: B547728937 **Terminal Model:** N/A
Building: N/A **Terminal Serial No.:** N/A
Floor: 5 **Terminal Asset No.:** N/A
Room: 504

Range	Max. Capacity	Readability (d)
1	220 g	0.0001 g

Procedure



Calibration Guideline: EURAMET cg-18 v. 4.0/CENAM-ema:2015
METTLER TOLEDO Work Instruction: CP/W002/20

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

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

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

	Temperature		Humidity	
As Found	Start: 21.1 °C	End: 20.3 °C	Start: 37.8 %	End: 42.2 %

As Found Calibration Date: 15-Jan-2025 **Calibrator:** 
As Left Calibration Date: N/A
Issue Date: 17-Jan-2025
Approved Signatory: 
Supapit Kruapoo
Technical Manager / Head of Calibration Center

Measurement Results

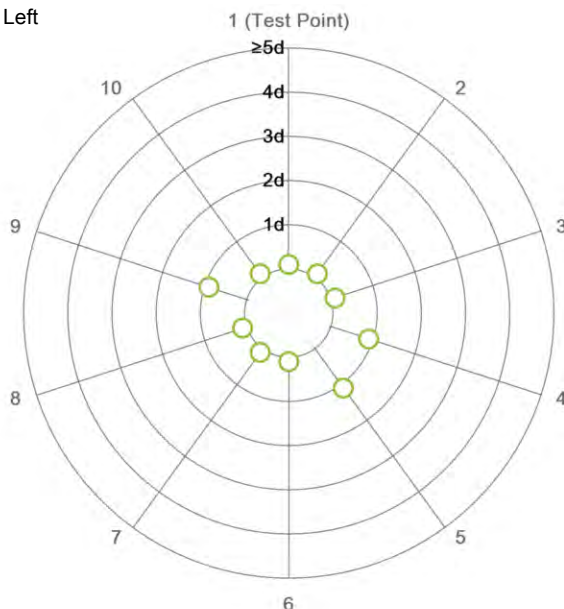
Repeatability

Test Load: 100 g

	As Found	As Left
1	99.9999 g	N/A
2	99.9999 g	N/A
3	99.9999 g	N/A
4	99.9998 g	N/A
5	100.0000 g	N/A
6	99.9999 g	N/A
7	99.9999 g	N/A
8	99.9999 g	N/A
9	99.9998 g	N/A
10	99.9999 g	N/A

Standard Deviation	0.00006 g	N/A
--------------------	-----------	-----

○ As Found
◆ As Left



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

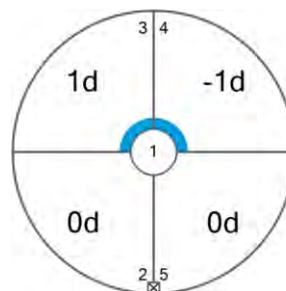
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

Test Load: 100 g

Position	As Found	As Left
1	99.9999 g	N/A
2	99.9999 g	N/A
3	100.0000 g	N/A
4	99.9998 g	N/A
5	99.9999 g	N/A

Maximum Deviation	0.0001 g	N/A
-------------------	----------	-----



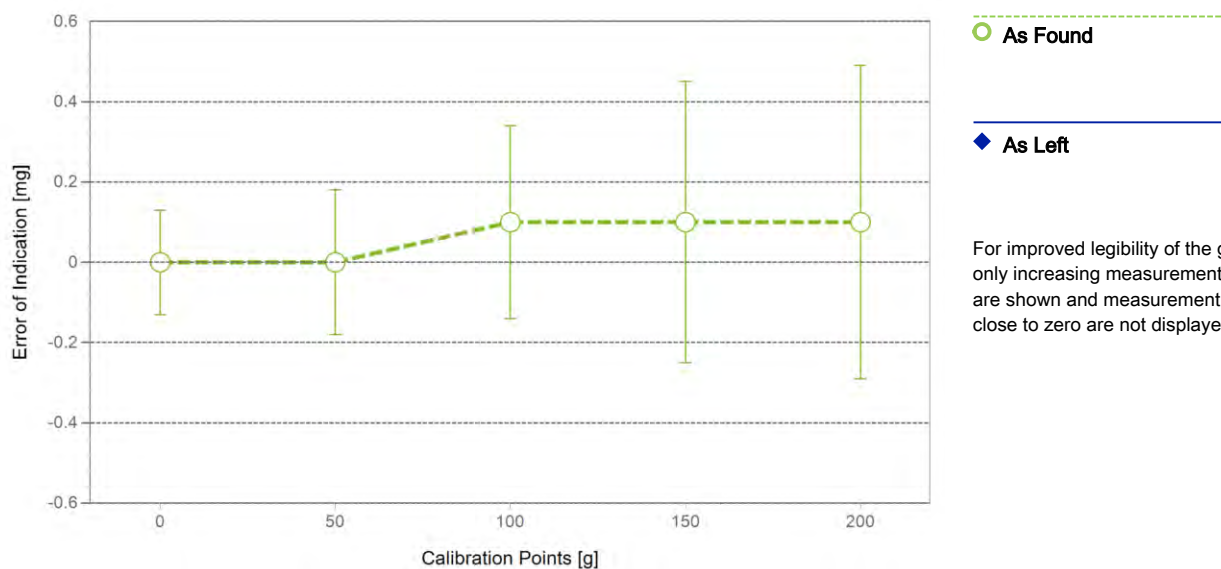
As Found

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

Error of Indication

As Found

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.0000 g	0.0000 g	0.0000 g	0.13 mg	2
2	0.0500 g	0.0500 g	0.0000 g	0.14 mg	2
3	0.1000 g	0.1000 g	0.0000 g	0.14 mg	2
4	0.5000 g	0.5000 g	0.0000 g	0.14 mg	2
5	1.0000 g	1.0000 g	0.0000 g	0.14 mg	2
6	5.0000 g	5.0000 g	0.0000 g	0.15 mg	2
7	10.0000 g	10.0000 g	0.0000 g	0.15 mg	2
8	50.0000 g	50.0000 g	0.0000 g	0.18 mg	2
9	99.9999 g	100.0000 g	0.0001 g	0.24 mg	2
10	149.9999 g	150.0000 g	0.0001 g	0.35 mg	2
11	200.0001 g	200.0002 g	0.0001 g	0.39 mg	2



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

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

Test Equipment

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

Weight Set 1: OIML E2

Weight Set No.:	WS38	Date of Issue:	15-Dec-2023
Certificate Number:	189517	Calibration Due Date:	15-Jun-2025

Weight Set 2: OIML E2

Weight Set No.:	WS38-1	Date of Issue:	22-Feb-2024
Certificate Number:	C411772496	Calibration Due Date:	22-Aug-2025

Weight Set 4: OIML E2

Weight Set No.:	WS38-3	Date of Issue:	27-Feb-2024
Certificate Number:	C411772498	Calibration Due Date:	27-Aug-2025

Thermo Hygrometer

Equipment No.:	IN256	Date of Issue:	19-Jul-2024
Certificate Number:	SG-H-00636/67	Calibration Due Date:	18-Jul-2025

Remarks

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

End of Accredited Section

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

Measurement Uncertainty of the Weighing Instrument in Use

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

Temperature coefficient for the evaluation of the measurement uncertainty in use: $3.0 \cdot 10^{-6} / K$

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

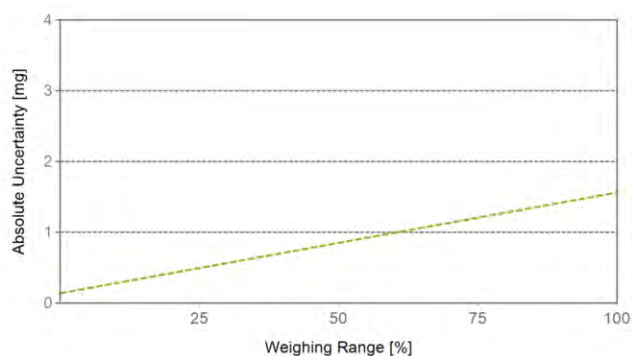
Linearization of Uncertainty Equation

Range			As Found	As Left
	d	Max		
1	0.0001 g	220 g	$U_1 = 0.14 \text{ mg} + 0.00647 \text{ mg/g} \cdot R$	N/A

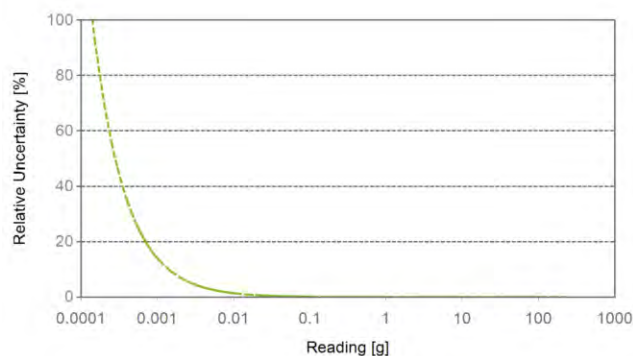
To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

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

Net Indication	As Found		As Left	
0.0220 g	0.14 mg	0.64%	N/A	N/A
0.2200 g	0.14 mg	0.064%	N/A	N/A
2.2000 g	0.15 mg	0.0070%	N/A	N/A
22.0000 g	0.28 mg	0.0013%	N/A	N/A
220.0000 g	1.6 mg	0.00071%	N/A	N/A



As Found



As Left

GWP® Certificate



**As
Found**



**As
Left**



The weighing device meets the given process requirements.

The weighing device meets the given process requirements.

Tests Performed:



As Found



As Left



No adjustments/modifications made. As Left results correspond to As Found.

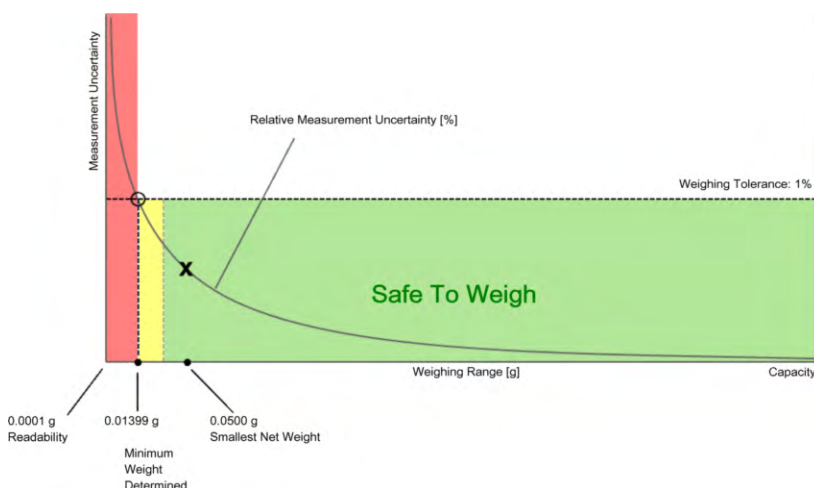
Process Requirements

Weighing Tolerance: 1%

Smallest Net Weight: 0.0500 g

Safety Factor: 2

Safe Weighing Range



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

Minimum Weight

As Found Minimum Weight Table

Minimum weights for different weighing tolerances and safety factors					
	Safety Factor				
Tolerance	1	2	3	5	10
0.1%	0.14075 g	0.28335 g	0.42783 g	0.72259 g	1.49521 g
0.2%	0.07015 g	0.14075 g	0.21182 g	0.35535 g	0.72259 g
0.5%	0.02800 g	0.05608 g	0.08423 g	0.14075 g	0.28335 g
1%	0.01399 g	0.02800 g	0.04203 g	0.07015 g	0.14075 g
2%	0.00699 g	0.01399 g	0.02100 g	0.03502 g	0.07015 g
5%	0.00280 g	0.00560 g	0.00839 g	0.01399 g	0.02800 g



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

As Left Minimum Weight Table

Minimum weights for different weighing tolerances and safety factors					
	Safety Factor				
Tolerance	1	2	3	5	10
0.1%	0.14075 g	0.28335 g	0.42783 g	0.72259 g	1.49521 g
0.2%	0.07015 g	0.14075 g	0.21182 g	0.35535 g	0.72259 g
0.5%	0.02800 g	0.05608 g	0.08423 g	0.14075 g	0.28335 g
1%	0.01399 g	0.02800 g	0.04203 g	0.07015 g	0.14075 g
2%	0.00699 g	0.01399 g	0.02100 g	0.03502 g	0.07015 g
5%	0.00280 g	0.00560 g	0.00839 g	0.01399 g	0.02800 g



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

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

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

Notes on minimum weight values in above table:

1. If "N/A" is shown above, no appropriate value could be calculated.
2. METTLER TOLEDO is not responsible for the definition of the process requirements.

Measurement Results

Results Summary

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

✓ = Passed

✗ = Failed

⚠ = Safety Factor not met

Repeatability

Test Load: 100 g

Tolerance	Control Limit	As Found		As Left	
		Std. Deviation	Result	Std. Deviation	Result
0.1%	N/A	0.00006 g*	N/A	0.00006 g*	N/A
0.2%	0.00005 g		✗		✗
0.5%	0.00013 g		✓		✓
1%	0.00025 g		✓		✓
2%	0.00050 g		✓		✓
5%	0.00125 g		✓		✓

*The calculated standard deviation value is below the rounding error of the balance. The $0.41 \cdot d$ rule is used for the assessment of this repeatability test and the calculation of the minimum weight.

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

Eccentricity

Test Load: 100 g

Tolerance	Control Limit	As Found		As Left	
		Deviation	Result	Deviation	Result
0.1%	0.0500 g	0.0001 g	✓	0.0001 g	✓
0.2%	0.1000 g		✓		✓
0.5%	0.2500 g		✓		✓
1%	0.5000 g		✓		✓
2%	1.0000 g		✓		✓
5%	2.5000 g		✓		✓

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

Error of Indication**As Found**

		Control limits for various weighing tolerances					
Reference Value	Error	0.1%	0.2%	0.5%	1%	2%	5%
0.0000 g	0.0000 g	N/A	N/A	N/A	N/A	N/A	N/A
50.0000 g	0.0000 g	0.0250 g	0.0500 g	0.1250 g	0.2500 g	0.5000 g	1.2500 g
99.9999 g	0.0001 g	0.0500 g	0.1000 g	0.2500 g	0.5000 g	1.0000 g	2.5000 g
149.9999 g	0.0001 g	0.0750 g	0.1500 g	0.3750 g	0.7500 g	1.5000 g	3.7500 g
200.0001 g	0.0001 g	0.1000 g	0.2000 g	0.5000 g	1.0000 g	2.0000 g	5.0000 g
Result		✓	✓	✓	✓	✓	✓

As Left

		Control limits for various weighing tolerances					
Reference Value	Error	0.1%	0.2%	0.5%	1%	2%	5%
0.0000 g	0.0000 g	N/A	N/A	N/A	N/A	N/A	N/A
50.0000 g	0.0000 g	0.0250 g	0.0500 g	0.1250 g	0.2500 g	0.5000 g	1.2500 g
99.9999 g	0.0001 g	0.0500 g	0.1000 g	0.2500 g	0.5000 g	1.0000 g	2.5000 g
149.9999 g	0.0001 g	0.0750 g	0.1500 g	0.3750 g	0.7500 g	1.5000 g	3.7500 g
200.0001 g	0.0001 g	0.1000 g	0.2000 g	0.5000 g	1.0000 g	2.0000 g	5.0000 g
Result		✓	✓	✓	✓	✓	✓

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



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0624

MTC No. EEL. BP. 2/0967

CALIBRATION CERTIFICATE

Submitted by : Environment Research & Technology Co.,Ltd.

Address : 25/114 Moo 6, Chinaket 1, Ngamwongwan Road, Toongsonghong, Laksi, Bangkok, 10210.

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

Instrument Calibrated :

Description : Sound Calibrator

Manufacturer : BSWA TECH

Model : CA114

Serial No. : 590048

Ambient Environment

Temperature : $(23 \pm 3) ^\circ\text{C}$

Relative Humidity : $(50 \pm 15) \%$

Ambient Pressure : $(101.325 \pm 1.500) \text{ kPa}$

Standards used : 1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.
3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.
4. Digital Multimeter Agilent 34401A S/N MY44005560.
5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.
6. Audio Analyzer Panasonic VP-7722A S/N 041477D122.
7. Condenser Microphone B&K 4180 S/N 2633526.

Calibration Procedure: CP-102-04 based on IEC 60942-2003; The sound pressure level generated by sound calibrator under test shall be measured by standard microphone using an insert voltage technique.

This instrument has been calibrated against standards maintained at Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

Date of Receipt : 2 Sep. 2024

Date of Calibration : 12 Sep. 2024

1 / 2

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

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FM.BL.MTC.002 Rev.5

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Bangkok 10900, Thailand
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(66) 08 1889 6827

Request No. 21-67/0624

MTC No. EEL. BP. 2/0967

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.

Nominal Output of Unit Under Test = 94 dB re 20 μ Pa at 1000 Hz

Acoustic Output in dB re 20 μ Pa, Corrected to Reference Conditions: 101.325 kPa, 23.0 °C and 50 %RH.

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	94.31	0.31	± 0.10	± 0.75 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	1000.8	0.8	± 1.5	$\pm 2.0\%$

3. Total Distortion


Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	1.90	± 0.50	$\pm 4.0\%$

Note : 1. No adjustment.


2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :


(Mr. Weerachai Deechaiyae)

Approved by :


(Mr. Prawate Kluaypa)

Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 12 Sep. 2024

Date of Issue : 16 Sep. 2024

Ref : 2011267090203244002

End of Certificate

2 / 2

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0153

MTC No. EEL. BP. 70/0168

CALIBRATION CERTIFICATE

Submitted by : Environment Research & Technology Co.,Ltd.

Address : 25/114 Moo 6, Soi Chinaket 1, Ngamwongwan Road, Toongsonghong, Laksi, Bangkok, 10210.

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

Instrument Calibrated :

Description : Sound Calibrator

Manufacturer : BSWA

Model : CA114

Serial No. : 590043

Ambient Environment

Temperature : $(23 \pm 3) ^\circ\text{C}$

Relative Humidity : $(50 \pm 15) \%$

Ambient Pressure : $(101.325 \pm 1.500) \text{ kPa}$

Standards used : 1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.

2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.

3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.

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

5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.

6. Audio Analyzer Panasonic VP-7722A S/N 041477D122.

7. Condenser Microphone B&K 4180 S/N 2889871.

Calibration Procedure: CP-102-04 based on IEC 60942-2003; The sound pressure level generated by sound calibrator under test shall be measured by standard microphone using an insert voltage technique.

This instrument has been calibrated against standards maintained at Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

Date of Receipt : 13 Jan. 2025

Date of Calibration : 17 Jan. 2025

1 / 2

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FM.BL.MTC.002 Rev.5

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0153

MTC No. EEL. BP. 70/0168

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.

Nominal Output of Unit Under Test = 94 dB re 20 μ Pa at 1000 Hz

Acoustic Output in dB re 20 μ Pa, Corrected to Reference Conditions: 101.325 kPa, 23.0 °C and 50 %RH.

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	93.44	-0.56	± 0.10	± 0.75 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	1000.8	0.8	± 1.5	$\pm 2.0\%$

3. Total Distortion


Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	1.70	± 0.50	$\pm 4.0\%$

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :


.....
(Mr. Weerachai Deechaiyae)

Approved by :


.....
(Mr. Prawate Kluaypa)

Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 17 Jan. 2025

Date of Issue : 20 Jan. 2025

Ref : 2011268011300134005

End of Certificate

2 / 2

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Sound Level Meter Calibration Report

Support Equipment Type	:	Sound Level Calibrator
Manufacture	:	Larson Davis
Model	:	CAL200
Serial No.	:	5652
Range of Calibrator		
- Support Equipment Type	:	113.5
- Frequency	:	1,000 Hz.
Calibrated By	:	Ms.Budsakorn Somrak
Calibration Date	:	February 25, 2025
Customer Name	:	บริษัท ไฟฟ้าสุรินทร์ จำกัด : โครงการโรงไฟฟ้าในโรงงานน้ำตาล ขนาดกำลังการผลิตเท่ากับ 30 เมกะวัตต์

[illegible]

Checked By

.....
Mr.Prayun Detkla

Technician



Approved By

.....
Ms.Sutatip Im-noi

Environmental Scientist

Sound Level Meter Calibration Report

Support Equipment Type	:	Sound Level Calibrator
Manufacture	:	Larson Davis
Model	:	CAL250
Serial No.	:	2528
Range of Calibrator		
- Support Equipment Type	:	113.5
- Frequency	:	1,000 Hz.
Calibrated By	:	Ms.Supawan Suwannapa
Calibration Date	:	June 5, 2025
Customer Name	:	บริษัท ไฟฟ้าสุรินทร์ จำกัด : โครงการโรงไฟฟ้าในโรงงานน้ำตาล ขนาดกำลังการผลิต เท่ากับ 30 เมกะวัตต์

[illegible]

Checked By

Mr. Prayun Detkla

Technician



D. Approved By

Ms.Sutatip Im-noi

Environmental Scientist



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0590

MTC No. EEL. BP. 48/0867

CALIBRATION CERTIFICATE

Submitted by : Environment Research & Technology Co.,Ltd.

Address : 25/114 Moo 6, Soi Chinaket 1, Ngamwongwan Road, Toongsonghong, Laksi, Bangkok, 10210.

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

Instrument Calibrated :

Description : Precision Acoustic Calibrator

Manufacturer : Larson Davis

Model : CAL200

Serial No. : 5652

Ambient Environment

Temperature : $(23 \pm 3) ^\circ\text{C}$

Relative Humidity : $(50 \pm 15) \%$

Ambient Pressure : $(101.325 \pm 1.500) \text{ kPa}$

Standards used : 1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.

2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.

3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.

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

5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.

6. Audio Analyzer Panasonic VP-7722A S/N 041477D122.

7. Condenser Microphone B&K 4180 S/N 2633526.

Calibration Procedure: CP-102-04 based on IEC 60942-2003. The sound pressure level of instrument was measured by standard microphone using an insert voltage technique.

This instrument has been calibrated against standards maintained at Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

Date of Receipt : 15 Aug. 2024

Date of Calibration : 27 Aug. 2024

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0590

MTC No. EEL. BP. 48/0867

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.

Nominal Output of Unit Under Test = 94 dB re 20 μ Pa at 1000 Hz

Acoustic Output in dB re 20 μ Pa , Corrected to Reference Conditions : 101.325 kPa , 23.0 °C and 50 %RH

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer4180	93.50	-0.50	± 0.10	± 0.40 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer4180	1000.0	0.0	± 1.5	$\pm 1.0\%$

3. Total distortion

Standard Microphone Type	Measured Total distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer4180	1.60	± 0.50	$\pm 3.0\%$

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was included at level of 0.26 dB from manual.

Date of Calibration : 27 Aug. 2024

2 / 3
W

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0590

MTC No. EEL. BP. 48/0867

Nominal Output of Unit Under Test = 114 dB re 20 μ Pa at 1000 Hz

Acoustic Output in dB re 20 μ Pa , Corrected to Reference Conditions : 101.325 kPa , 23.0 °C and 50 %RH

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	113.51	-0.49	± 0.10	± 0.40 dB

2. Frequency

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

3. Total Distortion


Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	0.41	± 0.50	$\pm 3.0\%$

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was included at level of 0.26 dB from manual.

Calibrated by :



(Mr. Weerachai Deechaiyae)

Approved by :



(Mr. Prawate Kluaypa)

Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 27 Aug. 2024

Date of Issue : 28 Aug. 2024

Ref : 2011267081503036004

End of Certificate

3 / 3

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FM.BL.MTC.002 Rev.5

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0084

MTC No. EEL. BP. 46/1167

CALIBRATION CERTIFICATE

Submitted by : Environment Research & Technology Co.,Ltd.

Address : 25/114 Moo 6, Soi Chinaket 1, Ngamwongwan Road, Toongsonghong, Laksi, Bangkok, 10210.

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

Instrument Calibrated :

Description : PrecisionAcoustic Calibrator

Manufacturer : Larson Davis

Model : CA250

Serial No. : 2528

Ambient Environment

Temperature : $(23 \pm 3) ^\circ\text{C}$

Relative Humidity : $(50 \pm 15) \%$

Ambient Pressure : $(101.325 \pm 1.500) \text{ kPa}$

Standards used : 1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.
3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.
4. Digital Multimeter Agilent 34401A S/N MY44005560.
5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.
6. Audio Analyzer Panasonic VP-7722A S/N 041477D122.
7. Condenser Microphone B&K 4180 S/N 2633526.

Calibration Procedure: CP-102-04 based on IEC 60942-2003; The sound pressure level generated by sound calibrator under test shall be measured by standard microphone using an insert voltage technique.

This instrument has been calibrated against standards maintained at Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

Date of Receipt : 19 Nov. 2024

Date of Calibration : 20 Nov. 2024

1/2 W

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

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FM.BL.MTC.002 Rev.5

Head Office

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0084

MTC No. EEL. BP. 46/1167

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.

Nominal Output of Unit Under Test = 114.0 dB re 20 μ Pa at 250 Hz

Acoustic Output in dB re 20 μ Pa, Corrected to Reference Conditions: 101.325 kPa, 23.0 °C and 50 %RH.

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	113.49	-0.51	± 0.10	± 0.40 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	249.6	-0.4	± 0.40	$\pm 1.0\%$

3. Total Distortion


Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	0.61	± 0.50	$\pm 3.0\%$

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :


(Mr. Weerachai Deechaiyae)

Approved by :


(Mr. Prawate Kluaypa)
Director

Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Date of Calibration : 20 Nov. 2024

Date of Issue : 22 Nov. 2024

Ref : 2011267111904236001

End of Certificate

2 / 2

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FM.BL.MTC.002 Rev.5

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Personal Pump Calibration Report

Equipment Type	: Personal Pump
Equipment Range	: 0.005 – 5.0 L/min
Calibration Range	: 0.01 – 3.0 L/min
Calibration Type	: DryCal Bubble Type
Volume for Calibration	: 1.7 L/min, 2.0 L/min
Calibrated By	: Mr.Natthapon Suttimon
Calibration Date	: February 25, 2025
Customer Name	: บริษัท ไฟฟ้าสรินทร์ จำกัด : โครงการโรงไฟฟ้าในโรงงานน้ำตาล ขนาดกำลังการผลิตเท่ากับ 30 เมกะวัตต์

[illegible]

Checked By

Mr. Prayun Detkla
Technician



Approved By

Ms.Sutatip Im-noi
Environmental Scientist

Sound Level Meter Calibration Report

Support Equipment Type	:	Sound Level Calibrator
Manufacture	:	Larson Davis
Model	:	CAL250
Serial No.	:	2528
Range of Calibrator		
- Support Equipment Type	:	113.5
- Frequency	:	1,000 Hz.
Calibrated By	:	Ms.Supawan Suwannapa
Calibration Date	:	June 5, 2025
Customer Name	:	บริษัท ไฟฟ้าสุรินทร์ จำกัด : โครงการโรงไฟฟ้าในโรงงานน้ำตาล ขนาดกำลังการผลิตเท่ากับ 30 เมกะวัตต์

[illegible]

Checked By

Mr. Prayun Detkla
Technician



Approved By

$$S_n$$

Ms.Sutatip Im-noi
Environmental Scientist

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

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

Request No.23-67/0674

MTC.No.23-67/0674

Number of page(s) 2

CALIBRATION CERTIFICATE

Nomenclature : DRYCAL

Manufacturer : BIOS International Corporation, USA.

Serial No.: 4492

Model : DCL-M Rev.1.08

Scale range : 0.1 l/min to 7 l/min

Subdivision : (0.0001, 0.001) l/min

Submitted by : ENVIRONMENT RESEARCH & TECHNOLOGY CO.,LTD.

25/114 Moo 6, Soi Chinaket 1, Ngamwongwan Road,

Toongsonghong, Laksi, Bangkok 10210, Thailand.

Received date : 2 September 2024 Condition of measured item : Normal

Calibration date : 6 September 2024

Standard :

Standard	Certificate No.	Date due	Traceability
RTD Thermometer	PSL-T 0811/67	3-Jul-26	TISTR
Molbox/PressureTransducer/UpStream	MP-0076-23	2-Apr-25	NIMT
Primary Flow Calibrator S/N 119521	MW-0033-23	6-Jun-25	NIMT

Calibrated by :

Terasak Panna

(Mr.Terasak Panna)

Approved by :

K. Jyph

(Ms.Kirana Luanghirun)

Director

Mechanical Engineering Standards Laboratory

Ref. 2013267090203252001

Issued Date 9 September 2024

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FM.BL.MTC.002 Rev.4

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Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217

Fax. (66) 0 2579 8592

E-mail : sumalee@tistr.or.th

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

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

Request No.23-67/0674

2/2

MTC.No.23-67/0674

Calibration point : (0.2, 1, 2.5) l/min

Ambient condition : Temperature (23 ± 3) °C , Relative humidity (55 ± 15) %

Atmospheric pressure (1010 ± 13) hPa

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

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

Measurement data :

UUC Value (l/min)	Standard Value (l/min)	Temperature (°C)	Pressure (hPa)	Deviation (%)	Uncertainty (%)
0.2013	0.20461	25.066	1006.18	-1.62	0.93
1.004	1.0088	24.762	1008.47	-0.51	0.89
2.501	2.5067	24.586	1012.51	-0.24	0.89

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

The end of calibration certificate.

Tk

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FM.BL.MTC.002 Rev.4

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Request No. 22-67 / 0792

MTC No. PSL-H 0311 / 67

Certificate of Calibration

Customer : Environment Research & Technology Company Limited
25/114 Moo 6, Soi Chinaket 1, Ngamwongwan Rd., Laksi, Bangkok

Item : Thermo-Hygrometer (Thermal Environment Monitor)

Model /Type : hs-32

Serial Number : MCD070019

Manufacturer : METROSONICS

Date of Request : 30 September 2024

Date of Calibration : 22 October 2024

The certifies the above equipment was calibrated in accordance with the recognised International Standard ISO/IEC 17025:2017 and the operation according to procedure no. WI.CP.18.

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95 %.

Calibrated by :



(Ms. Panit Thummasri)

Approved by :



(Mr. Kamchai Singhapiwat)
Director

Photometry and Temperature Standards Laboratory

Ref. No : 2012267093003509001

Issued Date : 31 October 2024

Page 1 of 4

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

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FM.BL.MTC.002 Rev.5

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Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217

(66) 08 1889 6827

Request No. 22-67 / 0792

MTC No. PSL-H 0311 / 67

Description of Unit Under Calibration :

Customer : Environment Research & Technology Company Limited
Address : 25/114 Moo 6, Soi Chinaket 1, Ngamwongwan Rd., Laksi, Bangkok
Item : Thermo-Hygrometer (Thermal Environment Monitor)
Serial Number : MCD070019
Calibration Required : Temperature at (30, 35, 40) °C
Ambient Condition : Ambient temperature (23 ± 3) °C
Relative humidity (55 ± 20) %
Laboratory Address : Photometry and Temperature Standards Laboratory
Soi 1, Bangpoo Industrial Estate, Sukhumvit Rd., Samutprakan

Reference Standard :

Digital Thermometer with Sensor, Model : F250H, S/N : 9345 008 2331, Sensor RTD Probe No. RTD-01 and RTD-02 which was calibrated by Industrial Metrology and Testing Service Centre, Certificate No. PSL-T 0865-1/67.

The temperature scale in use of this laboratory is the International Temperature Scale of 1990.

Calibration Procedure :

The certifies the above equipment was calibrated according to procedure no. WI.CP.18.

Support Equipment :

Temperature & Humidity Controlled Chamber, Model : 9141-5110, S/N : 1205101

Adjustments : NONE

Head Office

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Request No. 22-67 / 0792

MTC No. PSL-H 0311 / 67

Results of Calibration :- (☒) Without Adjustment (☐) After Adjustment

Table : Temperature Measurement @ Wet Bulb

Average Measured Temperature (°C)	Average Displayed of UUC (°C)	Correction Measured of UUC (°C)	Expanded Uncertainty of Measurement (± °C)
29.9	29.9	0.0	0.50
35.0	34.8	0.2	0.50
40.0	39.3	0.7	0.50

Table : Temperature Measurement @ Dry Bulb

Average Measured Temperature (°C)	Average Displayed of UUC (°C)	Correction Measured of UUC (°C)	Expanded Uncertainty of Measurement (± °C)
29.9	30.0	-0.1	0.50
35.0	34.9	0.1	0.50
40.0	39.6	0.4	0.50

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Request No. 22-67 / 0792

MTC No. PSL-H 0311 / 67

Results of Calibration :-

Table : Temperature Measurement @ Globe Bulb

Average Measured Temperature (°C)	Average Displayed of UUC (°C)	Correction Measured of UUC (°C)	Expanded Uncertainty of Measurement (± °C)
30.0	30.0	0.0	0.50
35.0	34.8	0.2	0.50
40.0	39.4	0.6	0.50

- Note :**
1. This calibration was done without removing reservoir cover, white plates and blackened copper sphere of the instrument.
 2. The calibration data for instrument in this report is reported within the condition existing at the time of measurement only.

...end of certificate...

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Request No. 22-67 / 0792

MTC No. PSL-H 0313 / 67

Certificate of Calibration

Customer : Environment Research & Technology Company Limited
25/114 Moo 6, Soi Chinaket 1, Ngamwongwan Rd., Laksi, Bangkok

Item : Thermo-Hygrometer (Thermal Environment Monitor)

Model /Type : hs-32

Serial Number : MCH110038

Manufacturer : METROSONICS

Date of Request : 30 September 2024

Date of Calibration : 22 October 2024

The certifies the above equipment was calibrated in accordance with the recognised International Standard ISO/IEC 17025:2017 and the operation according to procedure no. WI.CP.18.

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95 %.

Calibrated by :



(Ms. Panit Thummasri)

Approved by :



(Mr. Kamchai Singhapiwat)
Director

Photometry and Temperature Standards Laboratory

Ref. No : 2012267093003509003

Issued Date : 31 October 2024

Page 1 of 4

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FM.BL.MTC.002 Rev.5

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Request No. 22-67 / 0792

MTC No. PSL-H 0313 / 67

Description of Unit Under Calibration :

Customer : Environment Research & Technology Company Limited
Address : 25/114 Moo 6, Soi Chinaket 1, Ngamwongwan Rd., Laksi, Bangkok
Item : Thermo-Hygrometer (Thermal Environment Monitor)
Serial Number : MCH110038
Calibration Required : Temperature at (30, 35, 40) °C
Ambient Condition : Ambient temperature (23 ± 3) °C
Relative humidity (55 ± 20) %
Laboratory Address : Photometry and Temperature Standards Laboratory
Soi 1, Bangpoo Industrial Estate, Sukhumvit Rd., Samutprakan

Reference Standard :

Digital Thermometer with Sensor, Model : F250H, S/N : 9345 008 2331, Sensor RTD Probe No. RTD-01 and RTD-02 which was calibrated by Industrial Metrology and Testing Service Centre, Certificate No. PSL-T 0865-1/67.

The temperature scale in use of this laboratory is the International Temperature Scale of 1990.

Calibration Procedure :

The certifies the above equipment was calibrated according to procedure no. WI.CP.18.

Support Equipment :

Temperature & Humidity Controlled Chamber, Model : 9141-5110, S/N : 1205101

Adjustments : NONE

Request No. 22-67 / 0792

MTC No. PSL-H 0313 / 67

Results of Calibration :- (☒) Without Adjustment (☐) After Adjustment

Table : Temperature Measurement @ Wet Bulb

Average Measured Temperature (°C)	Average Displayed of UUC (°C)	Correction Measured of UUC (°C)	Expanded Uncertainty of Measurement (± °C)
29.9	30.5	-0.6	0.50
35.0	35.6	-0.6	0.50
40.0	40.4	-0.4	0.50

Table : Temperature Measurement @ Dry Bulb

Average Measured Temperature (°C)	Average Displayed of UUC (°C)	Correction Measured of UUC (°C)	Expanded Uncertainty of Measurement (± °C)
29.9	30.4	-0.5	0.50
35.0	35.5	-0.5	0.50
40.0	40.3	-0.3	0.50

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(66) 08 1889 6827

Request No. 22-67 / 0792

MTC No. PSL-H 0313 / 67

Results of Calibration :-**Table : Temperature Measurement @ Globe Bulb**

Average Measured Temperature (°C)	Average Displayed of UUC (°C)	Correction Measured of UUC (°C)	Expanded Uncertainty of Measurement (± °C)
30.0	30.3	-0.3	0.50
35.0	35.3	-0.3	0.50
40.0	40.2	-0.2	0.50

- Note :**
1. This calibration was done without removing reservoir cover, white plates and blackened copper sphere of the instrument.
 2. The calibration data for instrument in this report is reported within the condition existing at the time of measurement only.

...end of certificate...

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

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CALIBRATION LABORATORY Co., LTD.

2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



CERTIFICATE OF CALIBRATION FOR

NOMENCLATURE : HEAT STRESS MONITOR
MANUFACTURER : QUEST
MODEL / TYPE : QUESTemp^o32
SERIAL NO. : MCF010006
CLID. NO. : 232500058
JOB CONTROL NO. : 250109002352
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : ENVIRONMENT RESEARCH & TECHNOLOGY CO., LTD.
25/114 MOO 6 SOI CHINAKET 1, NGAMWONGWAN ROAD,
TOONGSONGHONG, LAKSI, BANGKOK 10210

DATE OF RECEIVED : 09 January 2025

DATE OF ISSUED : 15 January 2025

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Oranut Kamchatphai
Calibration Engineer

Approved By : Mongkol Yotsoontorn
Authorized Signatory
15 January 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. Q25002352

F3-011-05/12-23

page 1 of 3



@clccalibration

REPORT OF CALIBRATION FOR

NOMENCLATURE : **HEAT STRESS MONITOR**
MANUFACTURER : **QUEST**
MODEL / TYPE : **QUESTemp^o32**
SERIAL NO. : **MCF010006**
DATE OF CALIBRATION : **14 January 2025**

ENVIRONMENT CONDITIONS :

Temperature : $(23 \pm 2) ^\circ\text{C}$

Relative Humidity : $(55 \pm 10) \% \text{RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. **CLC-CPTH-11**. The calibration was performed by using Chilled Mirror Hygrometer which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

Chilled Mirror Hygrometer, Edgetech Model Dew Master S/N. 36151.

Temperature & Humidity Chamber, PGC Model 9141-5114 S/N.0802282.

TRACEABILITY :

The measurements are traceable to International System of Units (SI) , through Thunder Scientific Corporation.
Certificate No. 22212, Due Date 23 February 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)"

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CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

The table in the following gives the calibration results and associated measurement uncertainties of the measuring heat stress monitor.

CALIBRATION DATA

1. CORRECTION OF TEMPERATURE : WET

Test point (° C)	Actual Temperature (° C)	DUC Reading (° C)	Correction (° C)	Uncertainty ± (° C)
30.0	30.00	30.0	0.00	0.27
35.0	35.00	35.0	0.00	
40.0	40.00	40.0	0.00	

2. CORRECTION OF TEMPERATURE : DRY

Test point (° C)	Actual Temperature (° C)	DUC Reading (° C)	Correction (° C)	Uncertainty ± (° C)
30.0	30.00	30.1	-0.10	0.27
35.0	35.00	35.1	-0.10	
40.0	40.00	40.0	0.00	

3. CORRECTION OF TEMPERATURE : GLOBE

Test point (° C)	Actual Temperature (° C)	DUC Reading (° C)	Correction (° C)	Uncertainty ± (° C)
30.0	30.00	29.9	+0.10	0.27
35.0	35.00	35.1	-0.10	
40.0	40.00	40.1	-0.10	

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 013 Page 61 of 69

This report is valid for the above stated instrument/s only.

End of Certificate

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