

ภาคผนวกที่ 4

สำเนาเอกสารขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท เอ็นไวรอนเมนต์ รีเสิร์ช แอนด์ เทคโนโลยี จำกัด

ที่ อก ๐๓๑๐(๑)/ ๗ ๓ ๒๕



กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๒๙ กรกฎาคม ๒๕๖๕

เรื่อง ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท เอ็นไวรอนเมนต์ รีเสิร์ช แอนด์ เทคโนโลยี จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๓๐ มีนาคม ๒๕๖๔

- สิ่งที่ส่งมาด้วย ๑. รายชื่อผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๑ แผ่น
๒. รายชื่อเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๒ แผ่น
๓. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๑๒ แผ่น

ตามหนังสือที่อ้างถึง บริษัท เอ็นไวรอนเมนต์ รีเสิร์ช แอนด์ เทคโนโลยี จำกัด ขอต่ออายุ
หนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน 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. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๑๖ ราย ตามสิ่งที่ส่งมาด้วย ๑
ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๔๙ ราย ตามสิ่งที่ส่งมาด้วย ๒
ค. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย จำนวน ๒๗ รายการ น้ำใต้ดิน
จำนวน ๕๘ รายการ อากาศเสีย จำนวน ๒๖ รายการ สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน ๒๐ รายการ และ
ดิน จำนวน ๕๖ รายการ รวมทั้งสิ้นจำนวน ๑๘๗ รายการ ตามสิ่งที่ส่งมาด้วย ๓

หนังสือฉบับนี้จะหมดอายุในวันที่ ๑๘ พฤษภาคม ๒๕๖๗ หากประสงค์จะต่ออายุหนังสือ
รับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอต่อ
กรมโรงงานอุตสาหกรรมภายใน ๓๐ วัน ก่อนวันสิ้นอายุของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
ซึ่งคำขอต่ออายุดังกล่าวขอรับได้ที่กรมโรงงานอุตสาหกรรม

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นางจันทา เตชะธรรมา)

ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน
ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

กองวิจัยและเตือนภัยมลพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๒๐๒ ๔๐๐๒ ๐ ๒๒๐๒ ๔๑๔๖

โทรสาร ๐ ๒๓๕๔ ๓๔๑๕

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท เอ็นไวรอนเมนต์ รีเสิร์ช แอนด์ เทคโนโลยี จำกัด

เลขทะเบียน ว-๐๙๙

ที่ อก ๐๓๑๐(๑)/พ.๒๕

ลงวันที่ ๒๙ กรกฎาคม ๒๕๖๕

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๑๖ ราย

๑) นางสาวปณิชา พรหมชัย	ทะเบียนเลขที่ ว-๐๙๙-ค-๒๔๑๔
๒) นางณัฐรดา เลี้ยงรักษา	ทะเบียนเลขที่ ว-๐๙๙-ค-๓๐๐๒
๓) นายมงคล บุรภักดิ์	ทะเบียนเลขที่ ว-๐๙๙-ค-๕๕๐๐
๔) นางสาวธนิดา บุญรุ่งเรือง	ทะเบียนเลขที่ ว-๐๙๙-ค-๗๐๒๓
๕) นางสาวรมิตา แต่งไทย	ทะเบียนเลขที่ ว-๐๙๙-ค-๗๖๖๔
๖) นางสาวไรวินทร์ โพธิ์สิทธิ์	ทะเบียนเลขที่ ว-๐๙๙-ค-๗๖๖๕
๗) นางสาวณัฐนิชา เสริมมตังค์	ทะเบียนเลขที่ ว-๐๙๙-ค-๗๖๖๖
๘) นายณพลสิทธิ์ ทวีพรประดิษฐ์	ทะเบียนเลขที่ ว-๐๙๙-ค-๗๖๖๗
๙) นางสาวธิดารัตน์ ปุกกะ	ทะเบียนเลขที่ ว-๐๙๙-ค-๘๘๐๑
๑๐) นายอภิชาติ พูลพล	ทะเบียนเลขที่ ว-๐๙๙-ค-๘๘๐๒
๑๑) นายนิทัศน์ ศิริชาติ	ทะเบียนเลขที่ ว-๐๙๙-ค-๘๘๐๓
๑๒) นายสุทธิชาญ สังข์ทอง	ทะเบียนเลขที่ ว-๐๙๙-ค-๘๘๐๔
๑๓) นางสาวยุวดี ณ ระนอง	ทะเบียนเลขที่ ว-๐๙๙-ค-๘๘๐๕
๑๔) นางสาววาสนา ชันเงิน	ทะเบียนเลขที่ ว-๐๙๙-ค-๘๘๐๖
๑๕) นางสาวสุภาวรรณ สุวรรณภา	ทะเบียนเลขที่ ว-๐๙๙-ค-๘๘๐๗
๑๖) นางสาวนภาพร จรัส หมื่นวงศ์	ทะเบียนเลขที่ ว-๐๙๙-ค-๘๘๐๘

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท เอ็นไวรอนเม้นท์ รีเสิร์ช แอนด์ เทคโนโลยี จำกัด เลขทะเบียน ว-๐๙๙
ที่ อก ๐๓๑๐(๑)/ ลงวันที่

ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๔๙ ราย

๑) นางสาวเปรมวดี ปุริโธสง	ทะเบียนเลขที่	ว-๐๙๙-จ-๕๕๐๒
๒) นางสาวจิตตวรรณ ลิ้มสมบุญ	ทะเบียนเลขที่	ว-๐๙๙-จ-๗๐๒๖
๓) นางสาวธันชพร คนแรง	ทะเบียนเลขที่	ว-๐๙๙-จ-๗๐๒๙
๔) นางสาวสุตารัตน์ เขจรักษ์	ทะเบียนเลขที่	ว-๐๙๙-จ-๗๐๓๗
๕) นางสาวลิตา โพธิ์เจริญ	ทะเบียนเลขที่	ว-๐๙๙-จ-๗๐๔๒
๖) นางสาวรัชนิวรรณ ภูประเสริฐ	ทะเบียนเลขที่	ว-๐๙๙-จ-๗๐๔๔
๗) นายภาณุพล โพธิ์แดง	ทะเบียนเลขที่	ว-๐๙๙-จ-๗๐๔๕
๘) นายวันชนะ สีหามาตร	ทะเบียนเลขที่	ว-๐๙๙-จ-๗๐๕๐
๙) นายโสพล ป้อยแก้ว	ทะเบียนเลขที่	ว-๐๙๙-จ-๗๐๕๔
๑๐) นายอภิวัฒน์ ชำนาญเวช	ทะเบียนเลขที่	ว-๐๙๙-จ-๗๐๕๖
๑๑) นางสาวอชิรญาณ์ฐ์ อ่อนน้อม	ทะเบียนเลขที่	ว-๐๙๙-จ-๗๖๗๑
๑๒) นายวัชรางกูร กองแสง	ทะเบียนเลขที่	ว-๐๙๙-จ-๗๖๗๒
๑๓) นางสาวสุธาทิพย์ อิ่มน้อย	ทะเบียนเลขที่	ว-๐๙๙-จ-๗๖๗๓
๑๔) นายชยณัฐ บุญก้านตง	ทะเบียนเลขที่	ว-๐๙๙-จ-๗๖๗๕
๑๕) นางสาวพิชดา เขียวนรภัย	ทะเบียนเลขที่	ว-๐๙๙-จ-๗๖๗๖
๑๖) นางสาวสายใจ ลาดบัวขาว	ทะเบียนเลขที่	ว-๐๙๙-จ-๘๘๑๐
๑๗) นางสาวรัตนภรณ์ วงศ์ประโคน	ทะเบียนเลขที่	ว-๐๙๙-จ-๘๘๑๒
๑๘) นางสาวจารุวรรณ แป้นจำนงค์	ทะเบียนเลขที่	ว-๐๙๙-จ-๘๘๑๓
๑๙) นางสาวชมพูนุท กลิชีวิน	ทะเบียนเลขที่	ว-๐๙๙-จ-๘๘๑๕
๒๐) นางสาวรวีวรรณ สุขารมย์	ทะเบียนเลขที่	ว-๐๙๙-จ-๘๘๑๖
๒๑) นางสาวนัฐภรณ์ กันสุข	ทะเบียนเลขที่	ว-๐๙๙-จ-๘๘๑๗
๒๒) นางสาวอรอนงค์ นวนนุ้ม	ทะเบียนเลขที่	ว-๐๙๙-จ-๘๘๑๘
๒๓) นางสาวสรวรรณ พุดพินมาต	ทะเบียนเลขที่	ว-๐๙๙-จ-๘๘๑๙
๒๔) นางสาวกัญญาลักษณ์ กระทาง	ทะเบียนเลขที่	ว-๐๙๙-จ-๘๘๒๑
๒๕) นางสาวปิยธิดา ประแดงโค	ทะเบียนเลขที่	ว-๐๙๙-จ-๘๘๒๓
๒๖) นางสาวปวีตรา นาเหล็ก	ทะเบียนเลขที่	ว-๐๙๙-จ-๘๘๒๔
๒๗) นางสาวชนิดา นิลผาย	ทะเบียนเลขที่	ว-๐๙๙-จ-๘๘๒๕
๒๘) นางสาวพิยะดา จารุไชย	ทะเบียนเลขที่	ว-๐๙๙-จ-๘๘๒๖
๒๙) นางสาวทักษพร ไกรสิงห์	ทะเบียนเลขที่	ว-๐๙๙-จ-๘๘๒๗
๓๐) นางสาวฉวีวรรณ บุญจันทิก	ทะเบียนเลขที่	ว-๐๙๙-จ-๘๘๒๘
๓๑) นางสาวเบญจวรรณ คำหงษา	ทะเบียนเลขที่	ว-๐๙๙-จ-๘๘๒๙
๓๒) นางสาวพัชชา แก้วย้อย	ทะเบียนเลขที่	ว-๐๙๙-จ-๘๘๓๐
๓๓) นางสาวณัฐชา สัมฤทธิ์ดี	ทะเบียนเลขที่	ว-๐๙๙-จ-๘๘๓๑
๓๔) นางสาวอังคณา อุ่นตา	ทะเบียนเลขที่	ว-๐๙๙-จ-๘๘๓๓
๓๕) นางสาวบุศดี มุภาษา	ทะเบียนเลขที่	ว-๐๙๙-จ-๘๘๓๔

๓๖) นายรอมซี...

๓๖) นายรอมชี กาเต๊ะ	ทะเบียนเลขที่	ว-๐๙๙-จ-๘๘๓๕
๓๗) นายสุริยะ ชูทอง	ทะเบียนเลขที่	ว-๐๙๙-จ-๘๘๓๖
๓๘) นายศักรินทร์ นิภานันท์	ทะเบียนเลขที่	ว-๐๙๙-จ-๘๘๓๗
๓๙) นายอภิเดช ยาสมดี	ทะเบียนเลขที่	ว-๐๙๙-จ-๘๘๓๘
๔๐) นายฉันทวิทย์ เหลวกุล	ทะเบียนเลขที่	ว-๐๙๙-จ-๘๘๓๙
๔๑) นายศิวาวุธ ธรรมนิทา	ทะเบียนเลขที่	ว-๐๙๙-จ-๘๘๔๐
๔๒) นายณัฐพล สุทธิมล	ทะเบียนเลขที่	ว-๐๙๙-จ-๘๘๔๑
๔๓) นายอาทิตย์ นุชบุษบา	ทะเบียนเลขที่	ว-๐๙๙-จ-๘๘๔๒
๔๔) นายอนุวัฒน์ เรืองอ่อน	ทะเบียนเลขที่	ว-๐๙๙-จ-๘๘๔๔
๔๕) นายฉัตรชัย โยวะผุย	ทะเบียนเลขที่	ว-๐๙๙-จ-๘๘๔๕
๔๖) นายกลยุทธิ์ อินทร์คำ	ทะเบียนเลขที่	ว-๐๙๙-จ-๘๘๔๗
๔๗) นางสาวนันทชา เนื่อนวล	ทะเบียนเลขที่	ว-๐๙๙-จ-๘๘๔๘
๔๘) นางสาวพิไลวรรณ แปงทา	ทะเบียนเลขที่	ว-๐๙๙-จ-๙๕๒๑
๔๙) นางสาวจารุวรรณ กระจำพันธุ์	ทะเบียนเลขที่	ว-๐๙๙-จ-๙๕๒๒

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท เอ็นไวรอนเม้นท์ รีเสิร์ช แอนด์ เทคโนโลยี จำกัด เลขทะเบียน ว-๐๙๙
ที่ อก ๐๓๑๐(๑)/ ลงวันที่

ขอขยายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๑๘๗ รายการ

น้ำเสีย จำนวน 27 รายการ

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



(นางริกาญจน์ จิตรสกุลวงศ์)

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22 Temperature...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
22	Temperature	Laboratory and Field Methods ^[3]
23	Total Dissolved Solids	Dried at 180 °C ^[3]
24	Total Kjeldahl Nitrogen	1) Macro Kjeldahl Method ^[3] 2) Semi-Micro Kjeldahl Method ^[3]
25	Total Suspended Solids	Dried at 103-105 °C ^[3]
26	Trivalent Chromium	Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation ^[3]
27	Zinc	Digestion, Inductively Coupled Plasma Method ^[3]

น้ำใต้ดิน จำนวน 58 รายการ

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



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14 Chloroform...

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

31กค)

(นางวิภาณูจน์ อัครสกุลวิไล)

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32 Lead...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
32	Lead	1) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^[3] 2) Digestion, Inductively Coupled Plasma Method ^[3]
33	Manganese	Digestion, Inductively Coupled Plasma Method ^[3]
34	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[3]
35	Methyl Bromide	Purge and Trap Gas Chromatographic/ Mass spectrometric Method ^[3]
36	Methylene Chloride	Purge and Trap Gas Chromatographic/ Mass spectrometric Method ^[3]
37	Methyl Tert-Butyl Ether	Purge and Trap Gas Chromatographic/ Mass spectrometric Method ^[3]
38	Naphthalene	Purge and Trap Gas Chromatographic/ Mass spectrometric Method ^[3]
39	Nickel	Digestion, Inductively Coupled Plasma Method ^[3]
40	pH	Electrometric method ^[3]
41	Selenium	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[3] 2) Digestion, Inductively Coupled Plasma Method ^[3]
42	Silver	Digestion, Inductively Coupled Plasma Method ^[3]
43	Styrene	Purge and Trap Gas Chromatographic/ Mass spectrometric Method ^[3]
44	1,1,2,2-Tetrachloroethane	Purge and Trap Gas Chromatographic/ Mass spectrometric Method ^[3]
45	Tetrachloroethylene	Purge and Trap Gas Chromatographic/ Mass spectrometric Method ^[3]
46	Toluene	Purge and Trap Gas Chromatographic/ Mass spectrometric Method ^[3]
47	1,2,4-Trichlorobenzene	Purge and Trap Gas Chromatographic/ Mass spectrometric Method ^[3]
48	1,1,1-Trichloroethane	Purge and Trap Gas Chromatographic/ Mass spectrometric Method ^[3]
49	1,1,2-Trichloroethane	Purge and Trap Gas Chromatographic/ Mass spectrometric Method ^[3]

วิภา

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
50	Trichloroethylene	Purge and Trap Gas Chromatographic/ Mass spectrometric Method ^[3]
51	1,3,5-Trimethylbenzene	Purge and Trap Gas Chromatographic/ Mass spectrometric Method ^[3]
52	Vanadium	Digestion, Inductively Coupled Plasma Method ^[3]
53	Vinyl Chloride	Purge and Trap Gas Chromatographic/ Mass spectrometric Method ^[3]
54	m-Xylene	Purge and Trap Gas Chromatographic/ Mass spectrometric Method ^[3]
55	o-Xylene	Purge and Trap Gas Chromatographic/ Mass spectrometric Method ^[3]
56	p-Xylene	Purge and Trap Gas Chromatographic/ Mass spectrometric Method ^[3]
57	Xylene (Total)	Purge and Trap Gas Chromatographic/ Mass spectrometric Method ^[3]
58	Zinc	Digestion, Inductively Coupled Plasma Method ^[3]

อากาศเสีย (ปล่อยระบาย) จำนวน 26 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Antimony	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[4]
2	Arsenic	1) Isokinetic Sampling, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[4] 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[4]
3	Beryllium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[4]
4	Cadmium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[4]
5	Carbon Monoxide	Instrumental Analyzer Method ^[4]
6	Chlorine	1) Absorption Sampling, Ion Chromatographic Method ^[4] 2) Isokinetic Sampling, Ion Chromatographic Method ^[4]

วิมล

(นางวิภาญจน์ จิตรสกุลวิไล)

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7 Chromium...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
7	Chromium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[4]
8	Cobalt	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[4]
9	Copper	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[4]
10	Dioxin/Furans	Isokinetic Sampling ^[4]
11	Hydrogen Chloride	1) Absorption Sampling, Ion Chromatographic Method ^[4] 2) Isokinetic Sampling, Ion Chromatographic Method ^[4]
12	Hydrogen Fluoride	1) Absorption Sampling, Ion Chromatographic Method ^[4] 2) Isokinetic Sampling, Ion Chromatographic Method ^[4]
13	Hydrogen Sulfide	Absorption Sampling, Iodometric Method ^[4]
14	Lead	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ^[4] 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[4]
15	Manganese	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[4]
16	Mercury	Isokinetic Sampling, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[4]
17	Nickel	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[4]
18	Opacity	Ringelmann's Method ^[1]
19	Oxide of Nitrogen	1) Absorption Sampling, Phenoldisulfonic acid Method ^[4] 2) Instrumental Analyzer Method ^[4]
20	Selenium	1) Isokinetic Sampling, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[4] 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[4]

วิมล

(นางวิภาญจน์ ฉัตรสกุลวิไล)

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21 Sulfur...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
21	Sulfur Dioxide	1) Absorption Sampling, Barium-Thorin Titrimetric Method ^[4] 2) Isokinetic Sampling, Barium-Thorin Titrimetric Method ^[4] 3) Instrumental Analyzer Method ^[4]
22	Sulfuric Acid	Isokinetic Sampling, Barium-Thorin Titrimetric Method ^[4]
23	Tin	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[4]
24	Total Suspended Particulate	Isokinetic Sampling, Gravimetric Method ^[4]
25	Vanadium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[4]
26	Xylene	Adsorption Sampling, Gas Chromatographic Method ^[4]

สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน 20 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Antimony	Digestion, Inductively Coupled Plasma Method ^[5,8]
2	Arsenic	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[5,9] 2) Digestion, Inductively Coupled Plasma Method ^[5,8]
3	Barium	Digestion, Inductively Coupled Plasma Method ^[5,8]
4	Beryllium	Digestion, Inductively Coupled Plasma Method ^[5,8]
5	Cadmium	Digestion, Inductively Coupled Plasma Method ^[5,8]
6	Chromium	Digestion, Inductively Coupled Plasma Method ^[5,8]
7	Chromium (III)	Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation Method ^[5,6,8,10]
8	Chromium (VI)	Alkaline Digestion, Colorimetric Method ^[6,10]
9	Cobalt	Digestion, Inductively Coupled Plasma Method ^[5,8]
10	Copper	Digestion, Inductively Coupled Plasma Method ^[5,8]
11	Lead	Digestion, Inductively Coupled Plasma Method ^[5,8]
12	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[11]
13	Molybdenum	Digestion, Inductively Coupled Plasma Method ^[5,8]
14	Nickel	Digestion, Inductively Coupled Plasma Method ^[5,8]

วิมล

(นางวิภาญจน์ อัครสกุลวิไล)

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15 pH...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
15	pH	Electrometric Method ^[14]
16	Selenium	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[5,12] 2) Digestion, Inductively Coupled Plasma Method ^[5,8]
17	Silver	Digestion, Inductively Coupled Plasma Method ^[5,8]
18	Thallium	Digestion, Inductively Coupled Plasma Method ^[5,8]
19	Vanadium	Digestion, Inductively Coupled Plasma Method ^[5,8]
20	Zinc	Digestion, Inductively Coupled Plasma Method ^[5,8]

ดิน จำนวน 56 รายการ

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

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ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
14	Chloroform	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[7,13]
15	Chromium	Digestion, Inductively Coupled Plasma Method ^[5,8]
16	Chromium (III)	Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation Method ^[5,7,9,11]
17	Chromium (VI)	Alkaline Digestion, Colorimetric Method ^[7,11]
18	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[7,13]
19	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[7,13]
20	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[7,13]
21	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[7,13]
22	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[7,13]
23	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[7,13]
24	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[7,13]
25	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[7,13]
26	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[7,13]
27	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[7,13]
28	1,3-Dichloropropene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[7,13]
29	Ethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[7,13]
30	Hexachloro-1,3-butadiene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[7,13]
31	Lead	Digestion, Inductively Coupled Plasma Method ^[5,8]
32	Manganese	Digestion, Inductively Coupled Plasma Method ^[5,8]
33	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[11]

วิมล

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
34	Methyl Bromide	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[7,13]
35	Methylene Chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[7,13]
36	Methyl Tert-Butyl Ether	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[7,13]
37	Naphthalene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[7,13]
38	Nickel	Digestion, Inductively Coupled Plasma Method ^[5,8]
39	Selenium	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[5,12] 2) Digestion, Inductively Coupled Plasma Method ^[5,8]
40	Silver	Digestion, Inductively Coupled Plasma Method ^[5,8]
41	Styrene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[7,13]
42	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[7,13]
43	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[7,13]
44	Toluene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[7,13]
45	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[7,13]
46	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[7,13]
47	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[7,13]
48	Trichloroethylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[7,13]
49	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[7,13]
50	Vanadium	Digestion, Inductively Coupled Plasma Method ^[5,8]
51	Vinyl Chloride	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[7,13]

วิมล

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
52	m-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[7,13]
53	o-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[7,13]
54	p-Xylene	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[7,13]
55	Xylene (Total)	Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[7,13]
56	Zinc	Digestion, Inductively Coupled Plasma Method ^[5,8]

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และทะเบียนห้องปฏิบัติการ

ที่ อก ๐๓๑๐(๑)/ ๒๐๓ ๙



กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๑๐ กุมภาพันธ์ ๒๕๖๕

เรื่อง เปลี่ยนแปลงสารมลพิษที่วิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท เอ็นไวรอนเมนต์ รีเสิร์ช แอนด์ เทคโนโลยี จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๒๔ ธันวาคม ๒๕๖๔

สิ่งที่ส่งมาด้วย เอกสารแนบท้ายหนังสือเปลี่ยนแปลงสารมลพิษที่วิเคราะห์

บริษัท เอ็นไวรอนเมนต์ รีเสิร์ช แอนด์ เทคโนโลยี จำกัด จำนวน ๑ แผ่น

ตามหนังสือที่อ้างถึง บริษัท เอ็นไวรอนเมนต์ รีเสิร์ช แอนด์ เทคโนโลยี จำกัด ห้องปฏิบัติการ
วิเคราะห์เอกชน เลขทะเบียน ว-๐๙๙ สถานที่ตั้งเลขที่ ๒๕/๑๑๔ หมู่ที่ ๖ ซอยชินเขต ๑ ถนนงามวงศ์วาน
แขวงทุ่งสองห้อง เขตหลักสี่ กรุงเทพมหานคร ขอเปลี่ยนแปลงสารมลพิษที่วิเคราะห์ ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้วให้ บริษัท เอ็นไวรอนเมนต์ รีเสิร์ช แอนด์ เทคโนโลยี
จำกัด เพิ่มขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในดิน ตามสิ่งที่ส่งมาด้วย

อนึ่ง หนังสือฉบับนี้จะหมดอายุพร้อมหนังสือต่ออายุรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
ที่ อก ๐๓๑๐(๑)/๗๓๒๕ ลงวันที่ ๒๙ กรกฎาคม ๒๕๖๔ คือในวันที่ ๑๘ พฤษภาคม ๒๕๖๗ ทั้งนี้ สามารถยื่น
คำขอผ่านระบบอิเล็กทรอนิกส์ได้ที่หน้าเว็บไซต์กรมโรงงานอุตสาหกรรม ตาม QR Code ท้ายหนังสือฉบับนี้

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นางจันทา เตชะศรีนทร์)

ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน
ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม



ยื่นคำขอผ่านระบบอิเล็กทรอนิกส์

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 ออก ๐๓๑๐(๑)/ ๒๐๓๙

ลงวันที่ ๑๐ กุมภาพันธ์ ๒๕๖๕

ขอขยายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๓ รายการ

ดิน จำนวน 3 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	TPH (C ₅ – C ₈)	Purge and Trap, Gas Chromatographic Method ^[2,3]
2	TPH (C ₈ – C ₁₆)	Ultrasonic Extraction, Gas Chromatographic Method ^[1,3]
3	TPH (C ₁₆ – C ₃₅)	Ultrasonic Extraction, Gas Chromatographic Method ^[1,3]

เอกสารอ้างอิง

1. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. **Ultrasonic Extraction. SW-846 Method 3550C**, 2007.
2. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. **Closed System Purge and Trap and Extraction for Volatile Organics in Soil and Waste Sample. SW-846 Method 5035A**, 2002.
3. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. **Nonhalogenated Organics Using GC/FID. SW-846 Method 8015D**, 2003

ภาคผนวกที่ 5

เอกสารสอบเทียบเครื่องมือตรวจวัด

Calibration Report

Customer Name : Khon Kaen Sugar Power Plant Co., Ltd.
Address : 99/1 Moo 6, Lumlang, Boploy, Kanchanaburi 71160
Sampling Date : January - June, 2022

Stack

Item	Equipment	Manufacturer	Model	Serial Number	Calibration Date
1	Console Meter	CAE Express	S-275	800 223-3927	January 17, 2022
2	Flue Gas Analyzer	Testo	TESTO 350NEW	62227989	March 24, 2021
3	UV-VIS Spectrophotometer	Perkin Elmer	LAMBDA 25	501S12101510	January 6, 2022
4	Electronic Balance	Ohaus	Scout Pro SP2001	B224021411	January 20, 2022

Calibration Report

Customer Name : Khon Kaen Sugar Power Plant Co., Ltd.
Address : 99/1 Moo 6, Lumlang, Boploy, Kanchanaburi 71160
Sampling Date : January - June, 2022

Ambient

Item	Equipment	Manufacturer	Model	Serial Number	Calibration Date
1	TSP High-volume No. A20	Thermo Scientific	HIVOL-BBCBE	2142	February 4, 2022
2	TSP High-volume No. A4	Thermo Andersen	HIVOL-BBCBE	2012-07	February 4, 2022
3	TSP High-volume No. A22	Thermo Scientific	HIVOL-BBCBE	2054	February 4, 2022
4	TSP High-volume No. A16	Thermo Andersen	HIVOL-BBCBE	2014-01	February 4, 2022
5	TSP High-volume No. A11	Thermo Andersen	HIVOL-BBCBE	2012-01	February 4, 2022
6	High-volume PM-10 No. 16	Andersen Instrument	HIVOL-BMBBE	2216	February 4, 2022
7	High-volume PM-10 No. 4	Thermo Andersen	HIVOL-BMBBE	B2012-04	February 4, 2022
8	High volume PM-10 No. 22	Thermo Scientific	HIVOL-BMBBE	2138	February 4, 2022
9	High volume PM-10 No. 20	Thermo Scientific	HIVOL-BMBBE	2140	February 4, 2022
10	High-volume PM-10 No. 7	Thermo Scientific	HIVOL-BMBBE	B0411-001	March 8, 2021
11	Orifice	TISCH Environmental	TE-5025A	3883	February 4, 2021
12	Electronic Balance	Mettler Toledo	AB204-S	1123103723	January 4, 2022
13	Semi-micro Balance	Sartorius	CP2252D	19308255	January 5, 2022
14	NOx Analyzer	HORIBA	APNA-370	NGABK8F2	February 3, 2022
15	NOx Analyzer	HORIBA	APNA-370	YCPL4HTM	February 3, 2022
16	NOx Analyzer	HORIBA	APNA-370	A4LUUFHB	February 3, 2022

Calibration Report

Customer Name : Khon Kaen Sugar Power Plant Co., Ltd.
Address : 99/1 Moo 6, Lumlang, Boploy, Kanchanaburi 71160
Sampling Date : January - June, 2022

Ambient

Item	Equipment	Manufacturer	Model	Serial Number	Calibration Date
17	NOx Analyzer	HORIBA	APNA-370	4VWFEBUK	February 3, 2022
18	SO ₂ Analyzer	HORIBA	APSA-370	ETSTKURU	February 3, 2022
19	SO ₂ Analyzer	HORIBA	APSA-370	E5KBWB08	February 3, 2022
20	SO ₂ Analyzer	HORIBA	APSA-370	JH9GS3FU	February 3, 2022
21	SO ₂ Analyzer	HORIBA	APSA-370	12E8X34P	February 3, 2022
22	WS/WD NO.16	Davis Instruments	Wizard III	WC40801A97	August 6, 2021
23	WS/WD NO.9	Davis Instruments	Wizard III	WE91016A07	February 8, 2020
24	WS/WD NO.13	Davis Instruments	Wizard III	WC20516A58	February 9, 2022
25	Sound Level Meter (NO.2)	BSWA TECH	BSWA 309	570108	February 6, 2022
26	Sound Level Meter (NO.5)	BSWA TECH	BSWA 309	570117	February 6, 2022
27	Sound Level Meter (NO.8)	BSWA TECH	BSWA 309	570123	February 6, 2022
28	Sound Level Meter (NO.12)	BSWA TECH	BSWA 309	590085	February 6, 2022
29	Acoustic Calibrator	BSWA	CA114	590047	May 10, 2021

Calibration Report

Customer Name : Khon Kaen Sugar Power Plant Co., Ltd.
Address : 99/1 Moo 6, Lumlang, Boploy, Kanchanaburi 71160
Sampling Date : January - June, 2022

Water

Item	Equipment	Manufacturer	Model	Serial Number	Calibration Date
1	pH Meter	Eutech	pH700	2732154	January 22, 202
2	Temperature Meter	HM Digital	COM-100	PONPE5851384	February 23, 2022
3	Electronic Balance	Mettler Toledo	MS204S	B334691537	January 19, 2022
4	Hot Air Oven	Memmert	UF 110	B414.0652	January 21, 2022
5	Incubator	ACCUPLUS	SMART i250	2059-0218-0002	December 15, 2021
6	Heating Block	Hanna	HI839800-02	05220025101	December 19, 2020
7	Electronic Balance	Mettler Toledo	MS204TS-00	B547728937	January 19, 2022

Calibration Report


Customer Name : Khon Kaen Sugar Power Plant Co., Ltd.
Address : 99/1 Moo 6, Lumlang, Boploy, Kanchanaburi 71160
Sampling Date : January - June, 2022

Workplace

Item	Equipment	Manufacturer	Model	Serial Number	Calibration Date
1	Sound Level Meter	Rion	NL-21	00610189	March 24, 2022
2	Sound Level Meter	Larson Davis	712	0331	June 20, 2022
3	Acoustic Calibrator	Larson Davis	CAL150	2317	June 30, 2021
4	Acoustic Calibrator	BSWA TECH	CA115	470205	January 10, 2022
5	Dry Cal	Bios International	DCL-ML Rev.1.08	4492	July 1, 2021
6	Heat Stress Monitor	Quest	QT - 32	TPI050015	July 6, 2021
7	Heat Stress Monitor	Quest	QT - 34	TEH070023	December 22, 2021


(Ms. Wassana Khunngoen)
Environmental Scientist




(Ms. Panicha Promchai)
Laboratory Supervisor

METHOD 5 PRE-TEST CONSOLE CALIBRATION
USING REFERENCE METER # WET TEST METER W-NK5A No. 540961
5-POINT METRIC UNIT

Meter Console Information	
Console Model Number	CAE Express
Console Serial Number	800 223-3927
DGM Model Number	S-275
DGM Serial Number	6828617

Calibration Conditions			
Date	Time	17-Jan-22	8:00 AM
Calibration Reference No.	HC65APE0018		
Barometric Pressure	756	mm Hg	
Calibration Meter Gamma	0.9980	unitless	

Factors/Conversions		
Std Temp	293	K
Std Press	760	mm Hg
K ₁	0.386	
Console Leak Check	PASS	

Calibration Data									
Run Time	Metering Console					Calibration Meter			
Elapsed	DGM Orifice	Volume	Volume	Outlet Temp	Outlet Temp	Volume	Volume	Outlet Temp	Outlet Temp
(t)	ΔH	Initial	Final	Initial	Final	Initial	Final	Initial	Final
(t)	(P _m)	(V _m)	(V _m)	(t _m)	(t _m)	(V _w)	(V _w)	(t _w)	(t _w)
min	mm H ₂ O	m ³	m ³	°C	°C	m ³	m ³	°C	°C
15.00	13.0	2.2311	2.4069	25	25	262.20170	262.37754	26	26
10.00	25.0	2.4632	2.6229	25	25	262.46354	262.62416	26	26
8.00	50.0	2.6585	2.8372	25	25	262.69305	262.87417	26	26
7.00	80.0	2.8714	3.0667	25	25	262.96066	263.15710	26	26
5.00	120.0	3.0976	3.2661	25	25	263.23165	263.40522	26	26

Standardized Data				Results				
Dry Gas Meter		Calibration Meter		Calibration Factor		Dry Gas Meter		
(V _m)	(Q _m)	(V _w)	(Q _w)	Value	Variation	Std & Corr	ΔH @	Variation
(m ³)	(m ³ /min)	(m ³)	(m ³ /min)	(Y)	(ΔY)	(Q _m)	(ΔH @)	(ΔΔH @)
						m ³ /min	mm H ₂ O	
0.172	0.011	0.171	0.011	0.994	-0.006	0.011	44.217	-2.015
0.156	0.016	0.156	0.016	0.998	-0.002	0.016	45.399	-0.832
0.176	0.022	0.176	0.022	1.003	0.003	0.022	45.923	-0.309
0.192	0.027	0.191	0.027	0.993	-0.007	0.027	48.101	1.870
0.167	0.033	0.169	0.034	1.013	0.013	0.034	47.517	1.286
				1.000	Y Average		46.231	ΔH @ Average

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_{or}, orifice pressure differential that equates to 0.75cfm (0.0212m³/min) at standard temperature and pressure, acceptable tolerance of individual values from the average is ± 0.2 inches (5.1mm) H₂O.

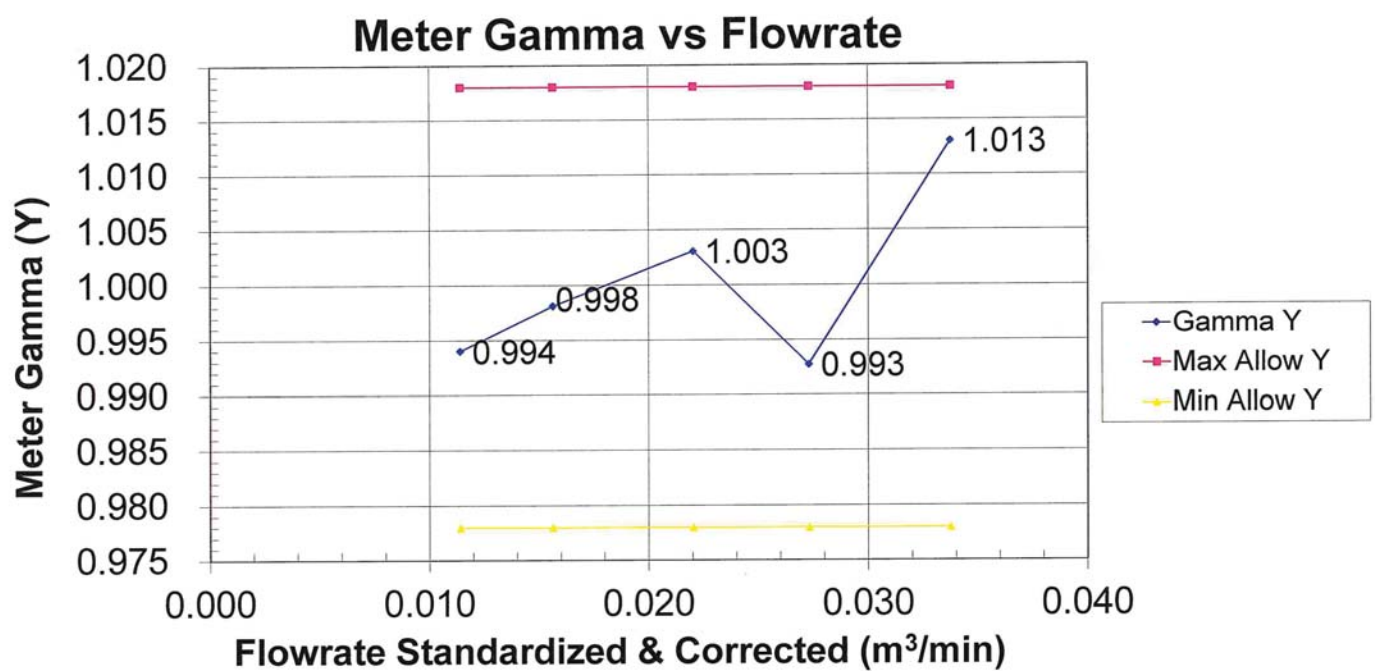
Signature 
(Sirichok Sansomsup)
Service Engineer

บริษัท สกิปอร์นแอสโซซิเอตส์ จำกัด
SITHIPORN ASSOCIATES COMPANY LIMITED

Date 19 / 1 / 2022

Calibration Date: 17-1-2022

Calibration Reference No: HC65APE0018



Console Serial: 800 223-3927

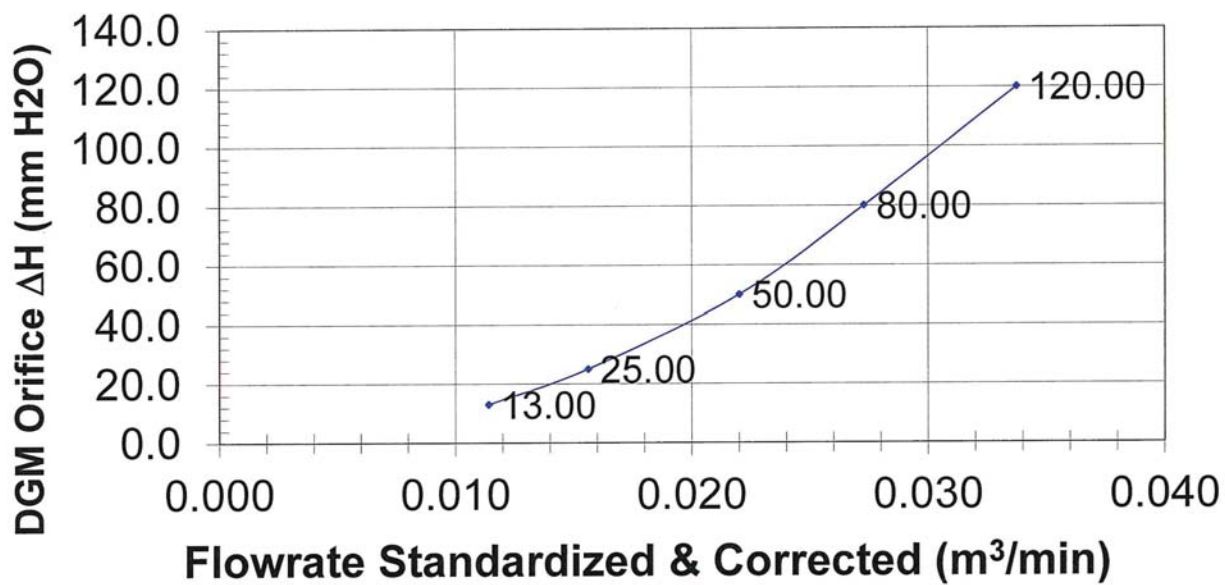
บริษัท สหบริพรแอสโซซิเอต จำกัด
SIMPORN ASSOCIATES COMPANY LIMITED

Console Model: CAE Express

Calibration Date: 17-1-2022

Calibration Reference No: HC65APE0018

Meter Pressure vs Flowrate



Console Serial: 800 223-3927

บริษัท สกทิพรแอสโซซิเอต จำกัด
SIMPON ASSOCIATES COMPANY LIMITED

Console Model: CAE Express

Certificate No: G 640126

Date of issue : 08-Mar-21

Instrument description : Flue gas Analyzer
Instrument model : Testo 350NEW
Instrument serial no. : 62227989
ID no. or control no. : -
Manufacturer : testo AG
Probe description : -
Probe model : -
Probe serial : -
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-210630
Receiving date. : 04-Mar-21
Parameter of calibration : Gas Calibration(Oxygen 2.501,10.00,21.00 %vol, Carbon Monoxide 80.23,301.4,1002 ppm, Nitric Oxide 150.2 ppm, Sulphur Dioxide 100.5 ppm, Nitrogen Dioxide 80.37 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. : 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.

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

Date of calibration : 05-Mar-21



Mr. Kwanchai Khamdoug

Calibration Technician



Mrs. Nongluck Wongsettee

Technical Manager

Standard References (Table 1)

Standard	Certificate No.	Vendor	Due date
Oxygen (O ₂) 2.501 % Vol	2431/19	Linde	16-Jul-23
Oxygen (O ₂) 10.00 % Vol	2453/19	Linde	18-Jul-23
Oxygen (O ₂) 21.00 % Vol	2426/19	Linde	16-Jul-23
Carbon monoxide (CO) 80.23 ppm	2396/19	Linde	15-Jul-21
Carbon monoxide (CO) 301.4 ppm	2397/19	Linde	16-Jul-21
Carbon monoxide (CO) 1002 ppm	2424/19	Linde	17-Jul-21
Nitric Oxide (NO) 150.2 ppm	2448/19	Linde	17-Jul-21
Sulphur Dioxide (SO ₂) 100.5 ppm	2400/19	Linde	18-Jul-21
Nitrogen Dioxide (NO ₂) 80.37 ppm	2379/19	Linde	14-Jul-21

Measured room conditions

Temperature : 24.6 °C Humidity : 48.3 %RH Pressure : 1013.3 mbar

Calibration conditions

Gas Temperature : 23 °C Flow rate : 1,200 ml/min Gas pressure : 1023.5 mbar

Calibration Results Before Adjustment (Table 2)

Parameter of Standard	Standard Values	Mean of UUC	Error	Uncertainty (±)
O ₂ (%Vol)	2.501	2.44	-0.061	0.20
O ₂ (%Vol)	10.00	9.88	-0.12	0.40
O ₂ (%Vol)	21.00	21.15	0.15	0.80
CO (ppm)	80.23	81	0.77	2.8
CO (ppm)	301.4	300	-1.4	11
CO (ppm)	1002	992	-10	34
*NO (ppm)	150.2	141	-9.2	5.0
*NO ₂ (ppm)	80.37	62.5	-17.87	5.0
*SO ₂ (ppm)	100.5	98	-2.5	5.0

Calibration Results After Adjustment (Table 3)

Parameter of Standard	Standard Values	Mean of UUC	Error	Uncertainty (\pm)
O ₂ (%Vol)	2.501	2.44	-0.061	0.20
O ₂ (%Vol)	10.00	9.88	-0.12	0.40
O ₂ (%Vol)	21.00	21.15	0.15	0.80
CO (ppm)	80.23	81	0.77	2.8
CO (ppm)	301.4	300	-1.4	11
CO (ppm)	1002	992	-10	34
*NO (ppm)	150.2	150	-0.2	5.0
*NO ₂ (ppm)	80.37	81.2	0.83	5.0
*SO ₂ (ppm)	100.5	98	-2.5	5.0

Remark : 1 cmol/mol = 1 %vol. , 1 μ mol/mol = 1 ppm.

* Calibrations marked Not TISI Accredited "in this Certificate have been included for completeness."



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert.No.: 22CHO5
Page.: 1 of 3

Certificate of Calibration

Equipment : UV-VIS Spectrophotometer
Manufacturer : Perkin Elmer
Model : LAMBDA 25
Serial No. : 501S12101510
ID No. : ERTC-L-In.-077
Condition As-Received: Used Item
Received Date : 05 January 2022
Calibration Date : 06 January 2022
Reference : 2201-0006ON-15
Submitted by : Environment Research & Technology Company Limited.
25/114 Moo 6, Soi Chinaket 1, Ngamwongwan Road,
Toongsonghong, Laksi, Bangkok 10210
Calibration Place : ห้องปฏิบัติการวิเคราะห์คุณภาพอากาศ
Ambient Temperature : (24.9 - 24.8) °C (On-Site)
Relative Humidity : (47 - 44) % (On-Site)
Calibration Procedure : In - house method :
CP-OCH4 based on ASTM E 275-01
Calibrated by : Uthen Kankawi

Approved by :

Malee

Approved Signatory

- (☒) Malee Butkruea
(☐) Saithip Meangmai
(☐) Warakorn Lerngagtrakul

Issue Date : 19 January 2022

The Uncertainties are for a confidence probability of approximately 95%

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

26-1-65

A 0036793



Cert. No. : 22CHO5

Page : 2 of 3

Condition of calibration result

1. Reference Standard Material :

<u>Material</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due date</u>
1. Absorbance Standard set	32589	85657	17 July 2022
2. Absorbance Standard set	32592	85658	17 July 2022
3. Absorbance Standard set	32593	85665	17 July 2022
4. Absorbance Standard set	32596	85666	17 July 2022
5. Wavelength Standard set	29829	94776	02 Sep 2023
6. Wavelength Standard set	29829	94777	02 Sep 2023
7. Stray Light Standard set	32629	107773	23 July 2022

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

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

- National Physical Laboratory (NPL), The United Kingdom of Great Britain and Northern Ireland
- National Institute of Standards and Technology (NIST), The United States of America

4. Spectral BandWidth : 1 nm
Scan Speed : 60 nm/min

Calibration Results : without adjustment

Wavelength Accuracy

Certified Values of Reference Material (nm)	UUC Reading (nm)	Uncertainty of Measurement (\pm nm)	Coverage Factor <i>k</i>
360.89	360.99	0.12	2.00
459.99	459.97	0.12	2.00
536.52	536.49	0.12	2.00
638.00	637.94	0.12	2.00
879.41	878.89	0.12	2.00

26-1-65

Malu.

a 1089958



Cert. No. : 22CHO5

Page : 3 of 3

Calibration Results : without adjustment

Photometric Accuracy

Wavelength (nm)	Certified Values of Reference Material (Abs)	UUC Reading (Abs)	Uncertainty of Measurement (\pm Abs)	Coverage Factor <i>k</i>
350.0	Zero	0.0000	0.0046	2.00
	0.4256	0.4235	0.0046	2.00
	Zero	0.0000	0.0050	2.00
	0.6411	0.6388	0.0050	2.00
546.1	Zero	0.0000	0.0028	2.00
	0.5267	0.5258	0.0028	2.00
	0.7000	0.6987	0.0028	2.00
	0.9837	0.9804	0.0028	2.00
635.0	Zero	0.0000	0.0028	2.00
	0.5685	0.5682	0.0028	2.00
	0.7650	0.7640	0.0028	2.00
	1.0761	1.0734	0.0028	2.00

Stray Light

* Straylight at 279.73 nm \pm 0.11 nm	Reading at 279.73 nm \pm 0.11 nm
Abs	2.0665
%T	0.8288

Remark

- The Potassium Dichromate filled cells are measured against a Perchloric acid blank.
- Each individual filter is measured against the empty filter holder (blank) used to zero the spectrophotometer
- Cut-off wavelength of stray light reference material (Potassium Iodide) = 279.73 nm \pm 0.11 nm
- Result = Pass, If Absorbance > 2.00 Abs and Transmission < 1.0 %T at Wavelength 279.73 nm \pm 0.11 nm
- * : Not NSC-ONSC Accredited

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-

26-1-65

Malu

a 1089957



INTRO TSC Company Limited

Calibration Center Measuring and Testing Instrument

46/155 Nualchan Rd., Nualchan, Bungkum, Bangkok 10230, Thailand

Tel : +66-2363-4417-21 Fax : +66-2363-4427 E-mail : info@intro.co.th



Certificate of Calibration

Certificate Number : MB2-021-2022

Page 1 of 2 Pages

Equipment : Electronic Balance

Manufacturer : Ohaus

Model : SCOUT PRO SP2001

Serial Number : B224021411

ID Number : Stack 2

Max Capacity : 2000 (g)

Resolution : 0.1 (g)

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor k , providing a level of confidence of approximately 95 %. The uncertainty evaluation has been carried out in accordance with UKAS M3003 requirements. This calibration certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI). This Certificate may not be reproduced other than in full except with the prior written approval of Calibration Center, Intro TSC Co., Ltd.

Customer Reference : F411

Customer : Environment Research & Technology Co., Ltd.

CSRS No.: CSRS01430122

25/114 Moo 6 Soi Chinaket 1, Ngamongwan Road.,

Date of Receipt : 20-Jan-22

Toongsonghong, Laksi, Bangkok 10210

Date of Calibration : 20-Jan-22

Location : Mass Calibration Laboratory

Condition of this result of calibration

1. Reference Standard instruments :

Instruments	Model	Serial No.	Certificate No.	Due Date
Standard Weight Set (1 g to 5000 g)	N/A	N/A	21M1065	15-Jun-22

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

- Technology Promotion Association (Thailand-Japan)

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

Method : Measurement In-house Method Calibration Procedure No. CP-CL-07 base on UKAS Publication Ref : Lab 14 : 2019

Environmental Conditions :

Temperature : (20 ± 2) °C

Humidity : (50 ± 15) %

Air Pressure : (1010 ± 10) mbar

Calibrated By : Mr. Montree Kaewlodla

Approved Signatory :

Date of Issued : 21-Jan-22

Mr. Panuchit Samart

FM-CL-11-05



INTRO TSC Company Limited

Calibration Center Measuring and Testing Instrument

46/155 Nualchan Rd., Nualchan, Bungkum, Bangkok 10230, Thailand

Tel : +66-2363-4417-21 Fax : +66-2363-4427 E-mail : info@intro.co.th

Certificate Number : MB2-021-2022

Page 2 of 2 Pages

Calibration Result (Weight) : Without Adjustment

1. Repeatability of Reading

Nominal Value (g)	Standard Deviation (g)	Maximum diff. Between successive (g)
2000	0.00	0.0

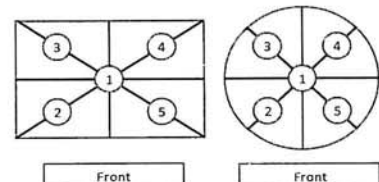
2. Error of indication from nominal value

Nominal Value (g)	Balance Reading (g)	Correction Value (g)	Uncertainty (\pm) (g)	factor k	Balance Reading Before Adjust (g)
Unload	0.0	0.0	0.082	2.00	-
200	200.0	0.0	0.082	2.00	-
400	400.0	0.0	0.082	2.00	-
600	600.0	0.0	0.082	2.00	-
800	800.0	0.0	0.082	2.00	-
1000	1000.0	0.0	0.082	2.00	-
1200	1198.9	1.1	0.095	2.00	-
1400	1399.1	0.9	0.095	2.00	-
1600	1599.4	0.6	0.095	2.00	-
1800	1799.8	0.2	0.095	2.00	-
2000	2000.2	-0.2	0.095	2.00	-

3. Eccentric or off-center loading

Nominal Value (g)	Reference Position				
	Position 1 (g)	Position 2 (g)	Position 3 (g)	Position 4 (g)	Position 5 (g)
1000	1000.0	998.6	998.7	1000.0	1000.0

Eccentric Error = 1.4 (g)



End of report

Pur

Calibration Data of NOx Analyzer

Analyzer Performance Test

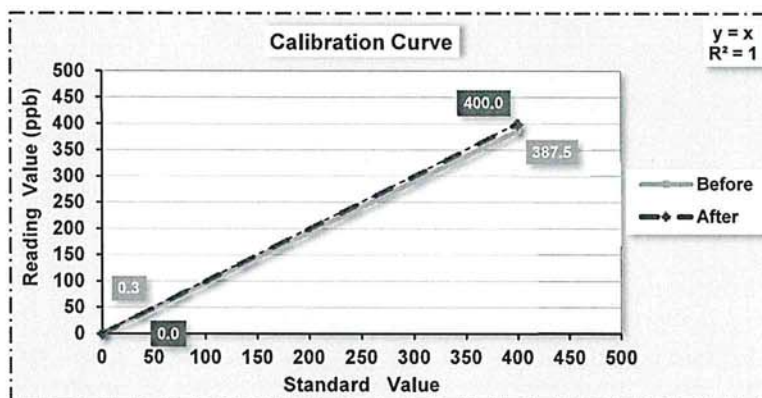
Equipment	Gas Analyzer (NOx)	Customer Name	โรงพยาบาลชลชนก (สาขาปทุม)
Manufacture	HORIBA	Location	Envi Research
Model	APNA-370	Scientist	Panupon
Serial No.	NGABK8F2	Calibration Date	January 31, 2022
Analyzer Unit	ppb	Time	1:50 PM

Instruments for Calibration

Instruments	Manufacture	Model	Serial Number
Zero Air Supply	Thermo Env.	111	0700419829
Dynamic Dilution Calibrator	Tanabyte	3011-GD	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	0.3	0.0	0.3	0.0	0.0	0.0	-	-	-
Span	400	397.5	400.0	387.5	400.0	10.0	0.0	-	-	3.1



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	0.5	0.8	Voltage of the measured NO value
Signal NOx	mV	7.9	7.5	Voltage of the measured NOx value
Detector	°C	39.9	39.8	43 °C ± 5 °C
Ambient	kPa	100.8	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	-	1.53140	1.71380	0.50000 - 2.0000
NOx Slope	-	1.46310	1.59250	0.50000 - 2.0000

Calibrate By :

(MR.PANUPON PODANG)
January 31, 2022



Checked By :

(MS.SUTATIP IM-NOI)
January 31, 2022

Calibration Data of NOx Analyzer

Analyzer Performance Test

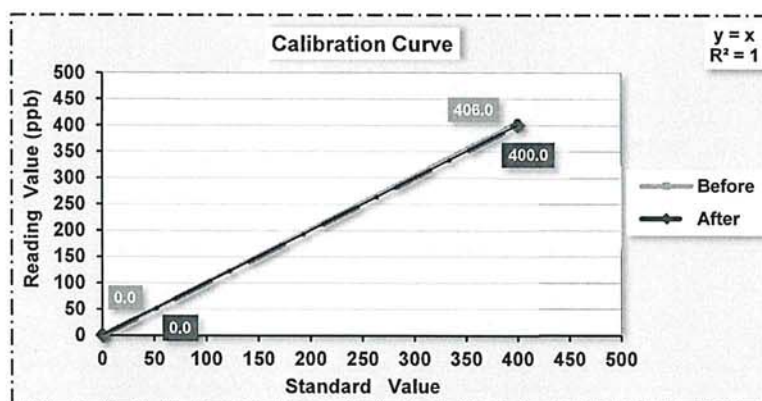
Equipment	Gas Analyzer (NOx)	Customer Name	โรงพยาบาลขอนแก่น (สาขาพลอย)
Manufacture	HORIBA	Location	Envi Research
Model	APNA-370	Scientist	Panupon
Serial No.	YCPL4HTM	Calibration Date	January 28, 2022
Analyzer Unit	ppb	Time	2:11 PM

Instruments for Calibration

Instruments	Manufacture	Model	Serial Number
Zero Air Supply	Thermo Env.	111	0700419829
Dynamic Dilution Calibrator	Tanabyte	3011-GD	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	-0.4	0.0	0.0	0.0	-0.4	0.0	-	-	-
Span	400	400.5	400.0	406.0	400.0	-5.5	0.0	-	-	1.5



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	1.0	0.9	Voltage of the measured NO value
Signal NOx	mV	15.8	16.2	Voltage of the measured NOx value
Detector	°C	40.2	40.1	43 °C ± 5 °C
Ambient	kPa	101.4	101.4	Current atmospheric pressure
DC 24V	V	23.5	23.5	24V ±0.5
DC 5V	V	5.0	5.0	5V ±0.5
NO Slope	-	1.00270	0.98790	0.50000 - 2.0000
NOx Slope	-	0.95060	0.94960	0.50000 - 2.0000

Calibrate By :

(MR.PANUPON PODANG)
January 28, 2022



Checked By :

(MS.SUTATIP IM-NOI)
January 28, 2022

Calibration Data of NOx Analyzer

Analyzer Performance Test

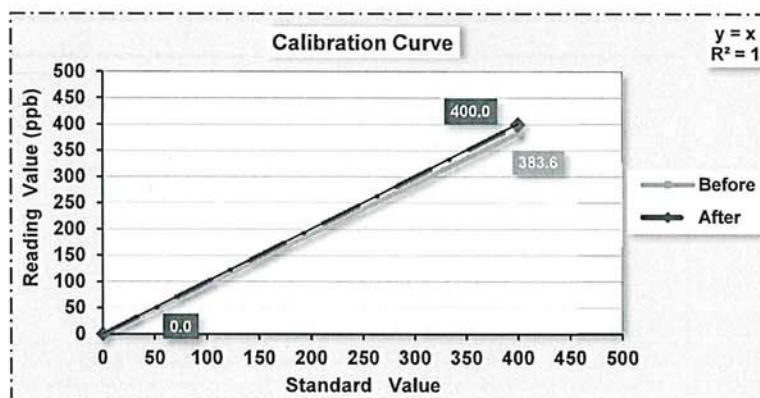
Equipment	Gas Analyzer (NOx)	Customer Name	โรงพยาบาลชลขอนแก่น (สาขาพลพล)
Manufacture	HORIBA	Location	Envi Research
Model	APNA-370	Scientist	Panupon
Serial No.	A4LUUFHB	Calibration Date	January 28, 2022
Analyzer Unit	ppb	Time	2:19 PM

Instruments for Calibration

Instruments	Manufacture	Model	Serial Number
Zero Air Supply	Thermo Env.	111	0700419829
Dynamic Dilution Calibrator	Tanabyte	3011-GD	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	-0.3	0.0	-0.1	0.0	-0.2	0.0	-	-	-
Span	400	384.1	400.0	383.6	400.0	0.5	0.0	-	-	4.1



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	2.9	4.7	Voltage of the measured NO value
Signal NOx	mV	33.9	42.3	Voltage of the measured NOx value
Detector	°C	41.4	41.4	43 °C ± 5 °C
Ambient	kPa	100.7	100.7	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	-	0.92290	0.96150	0.50000 - 2.0000
NOx Slope	-	0.88660	0.92290	0.50000 - 2.0000

Calibrate By :

(MR.PANUPON PODANG)
January 28, 2022



Checked By :

(MS.SUTATIP IM-NOI)

January 28, 2022

Calibration Data of NOx Analyzer

Analyzer Performance Test

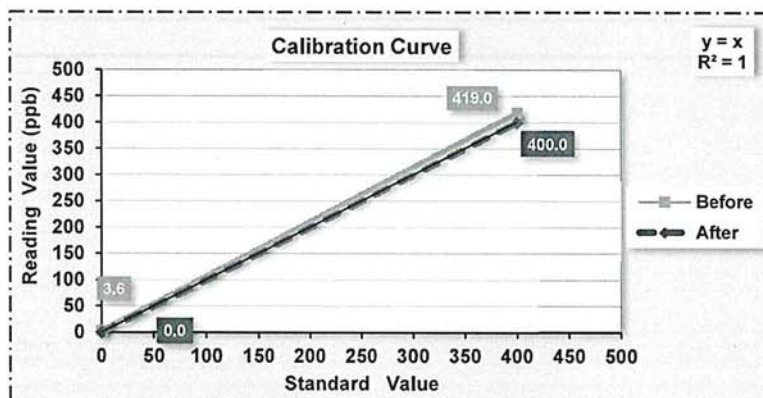
Equipment	Gas Analyzer (NOx)	Customer Name	โรงพยาบาลชลขอนแก่น (สาขาพลอย)
Manufacture	HORIBA	Location	Envi Research
Model	APNA-370	Scientist	Panupon
Serial No.	4VWFEBUK	Calibration Date	January 31, 2022
Analyzer Unit	ppb	Time	1:30 PM

Instruments for Calibration

Instruments	Manufacture	Model	Serial Number
Zero Air Supply	Thermo Env.	111	0700419829
Dynamic Dilution Calibrator	Tanabyte	3011-GD	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	3.1	0.0	3.6	0.0	-0.5	0.0	-	-	-
Span	400	422.1	400.0	419.0	400.0	3.1	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	1.9	1.4	Voltage of the measured NO value
Signal NOx	mV	0.9	6.6	Voltage of the measured NOx value
Detector	°C	5.6	40.5	43 °C ± 5 °C
Ambient	kPa	100.6	100.6	Current atmospheric pressure
DC 24V	V	23.9	23.9	24V ±0.5
DC 5V	V	5.0	5.0	5V ±0.5
NO Slope	-	1.87460	1.62840	0.50000 - 2.0000
NOx Slope	-	1.79550	1.55300	0.50000 - 2.0000

Calibrate By :

(MR.PANUPON PODANG)
January 31, 2022

Checked By :

(MS.SUTATIP IM-NOI)
January 31, 2022

Calibration Data of SO₂ Analyzer

Analyzer Performance Test

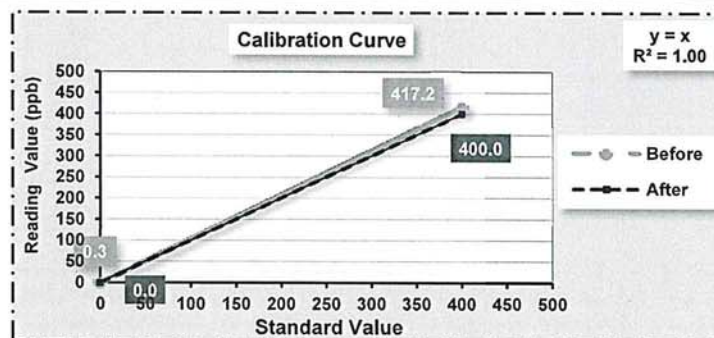
Equipment	Gas Analyzer (SO ₂)	Customer Name	โรงไฟฟ้าน้ำตาลขอนแก่น (สาขาบ่อพลอย)
Manufacture	Horiba	Location	Envi Research
Model	APSA-370	Scientist	Panupon
Serial No.	ETSTKURU	Calibration Date	January 31, 2022
Analyzer Unit	ppb	Time	1:18 PM

Instruments for Calibration

Instruments	Manufacture	Model	Serial Number
Zero Air Supply	Thermo Env.	111	0700419829
Dynamic Dilution Calibrator	Tanabyte	3011-GD	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 (ppb)		Stability		% Abs Error
		Before	After	Before	After	
Zero	0	0.3	0.0	-	-	-
Span	400	417.2	400.0	-	-	4.3



STATUS TEST AND VALIDATION OF SO₂ ANALYZER MODEL APSA-370

Parameter	Unit	Observed Value		Nominal Range
		Before Adjust	After Adjust	
Range	ppb	500	500	0 - 500 Standard
Signal (SO ₂)	mV	5	6	Voltage of the measured SO ₂ value
LAMP	mV	273	273	200 mV - 1200 mV
CELL	°C	36	36	Ambient temperature + 5 °C - 15 °C
PUMP	Kpa	45	45	65 kPa or less
AMBIENT	kPa	101	101	Current atmospheric pressure
DC 24V	V	23.9	23.9	24 V ±0.5 V
DC 5V	V	5.0	5.0	5 V ±0.5 V

Calibrate By :

(MR.PANUPON PODANG)
January 31, 2022



Checked By :

(MS.SUTATIP IM-NOI)
January 31, 2022

Calibration Data of SO₂ Analyzer

Analyzer Performance Test

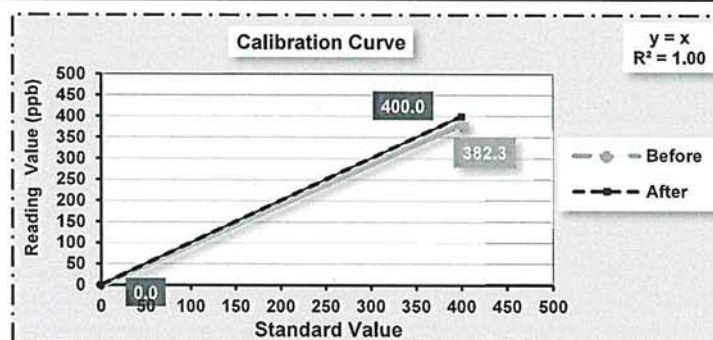
Equipment	Gas Analyzer (SO ₂)	Customer Name	โรงไฟฟ้าน้ำตาลขอนแก่น (สาขาปอพลอย)
Manufacture	Horiba	Location	Envi Research
Model	APSA-370	Scientist	Panupon
Serial No.	E5KBWB08	Calibration Date	January 28, 2022
Analyzer Unit	ppb	Time	1:33 PM

Instruments for Calibration

Instruments	Manufacture	Model	Serial Number
Zero Air Supply	Thermo Env.	111	0700419829
Dynamic Dilution Calibrator	Tanabyte	3011-GD	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 (ppb)		Stability		% Abs Error
		Before	After	Before	After	
Zero	0	-0.3	0.0	-	-	-
Span	400	382.3	400.0	-	-	4.4



STATUS TEST AND VALIDATION OF SO₂ ANALYZER MODEL APSA-370

Parameter	Unit	Observed Value		Nominal Range
		Before Adjust	After Adjust	
Range	ppb	500	500	0 - 500 Standard
Signal (SO ₂)	mV	8	8	Voltage of the measured SO ₂ value
LAMP	mV	539	539	200 mV - 1200 mV
CELL	°C	39	39	Ambient temperature + 5 °C - 15 °C
PUMP	Kpa	45	445	65 kPa or less
AMBIENT	kPa	101	101	Current atmospheric pressure
DC 24V	V	23.9	23.9	24 V ±0.5 V
DC 5V	V	5.0	5.0	5 V ±0.5 V

Calibrate By :

(MR.PANUPON PODANG)

January 28, 2022



Checked By :

(MS.SUTATIP IM-NOI)

January 28, 2022

Calibration Data of SO₂ Analyzer

Analyzer Performance Test

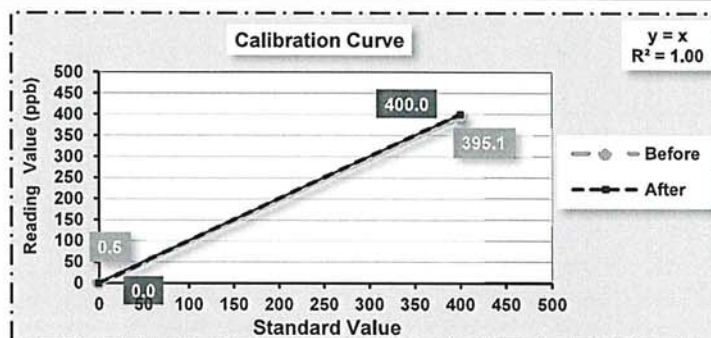
Equipment	Gas Analyzer (SO ₂)	Customer Name	โรงไฟฟ้าน้ำตาลขอนแก่น (สาขาปอพลอย)
Manufacture	Horiba	Location	Envi Research
Model	APSA-370	Scientist	Panupon
Serial No.	JH9GS3FU	Calibration Date	January 28, 2022
Analyzer Unit	ppb	Time	1:25 PM

Instruments for Calibration

Instruments	Manufacture	Model	Serial Number
Zero Air Supply	Thermo Env.	111	0700419829
Dynamic Dilution Calibrator	Tanabyte	3011-GD	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 (ppb)		Stability		% Abs Error
		Before	After	Before	After	
Zero	0	0.5	0.0	-	-	-
Span	400	395.1	400.0	-	-	1.2



STATUS TEST AND VALIDATION OF SO₂ ANALYZER MODEL APSA-370

Parameter	Unit	Observed Value		Nominal Range
		Before Adjust	After Adjust	
Range	ppb	500	500	0 - 500 Standard
Signal (SO ₂)	mV	8	8	Voltage of the measured SO ₂ value
LAMP	mV	278	277	200 mV - 1200 mV
CELL	°C	35	35	Ambient temperature + 5 °C - 15 °C
PUMP	Kpa	45	45	65 kPa or less
AMBIENT	kPa	102	102	Current atmospheric pressure
DC 24V	V	24.0	24.0	24 V ±0.5 V
DC 5V	V	4.9	4.9	5 V ±0.5 V

Calibrate By :

(MR.PANUPON PODANG)
January 28, 2022

Checked By :

(MS.SUTATIP IM-NOI)
January 28, 2022

Calibration Data of SO₂ Analyzer

Analyzer Performance Test

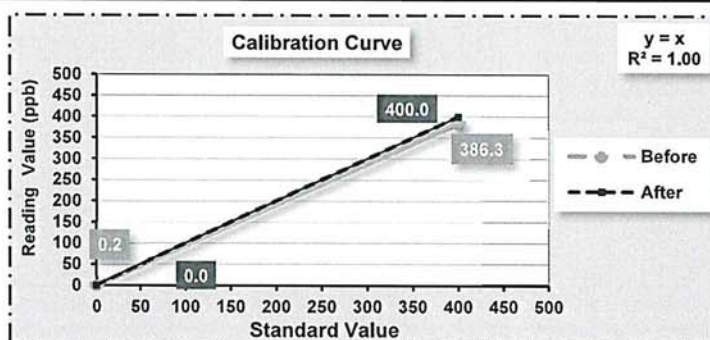
Equipment	Gas Analyzer (SO ₂)	Customer Name	โรงไฟฟ้าน้ำตาลขอนแก่น (สาขาบ่อพลอย)
Manufacture	Horiba	Location	Envi Research
Model	APSA-370	Scientist	Panupon
Serial No.	12E8X34P	Calibration Date	January 31, 2022
Analyzer Unit	ppb	Time	1:13 PM

Instruments for Calibration

Instruments	Manufacture	Model	Serial Number
Zero Air Supply	Thermo Env.	111	0700419829
Dynamic Dilution Calibrator	Tanabyte	3011-GD	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 (ppb)		Stability		% Abs Error
		Before	After	Before	After	
Zero	0	0.2	0.0	-	-	-
Span	400	386.3	400.0	-	-	3.4



STATUS TEST AND VALIDATION OF SO₂ ANALYZER MODEL APSA-370

Parameter	Unit	Observed Value		Nominal Range
		Before Adjust	After Adjust	
Range	ppb	500	500	0 - 500 Standard
Signal (SO ₂)	mV	4	5	Voltage of the measured SO ₂ value
LAMP	mV	325	325	200 mV - 1200 mV
CELL	°C	35	35	Ambient temperature + 5 °C - 15 °C
PUMP	Kpa	45	45	65 kPa or less
AMBIENT	kPa	101	101	Current atmospheric pressure
DC 24V	V	23.9	23.9	24 V ±0.5 V
DC 5V	V	4.9	4.9	5 V ±0.5 V

Calibrate By :

(MR.PANUPON PODANG)
January 31, 2022

Checked By :

(MS.SUTATIP IM-NOI)
January 31, 2022

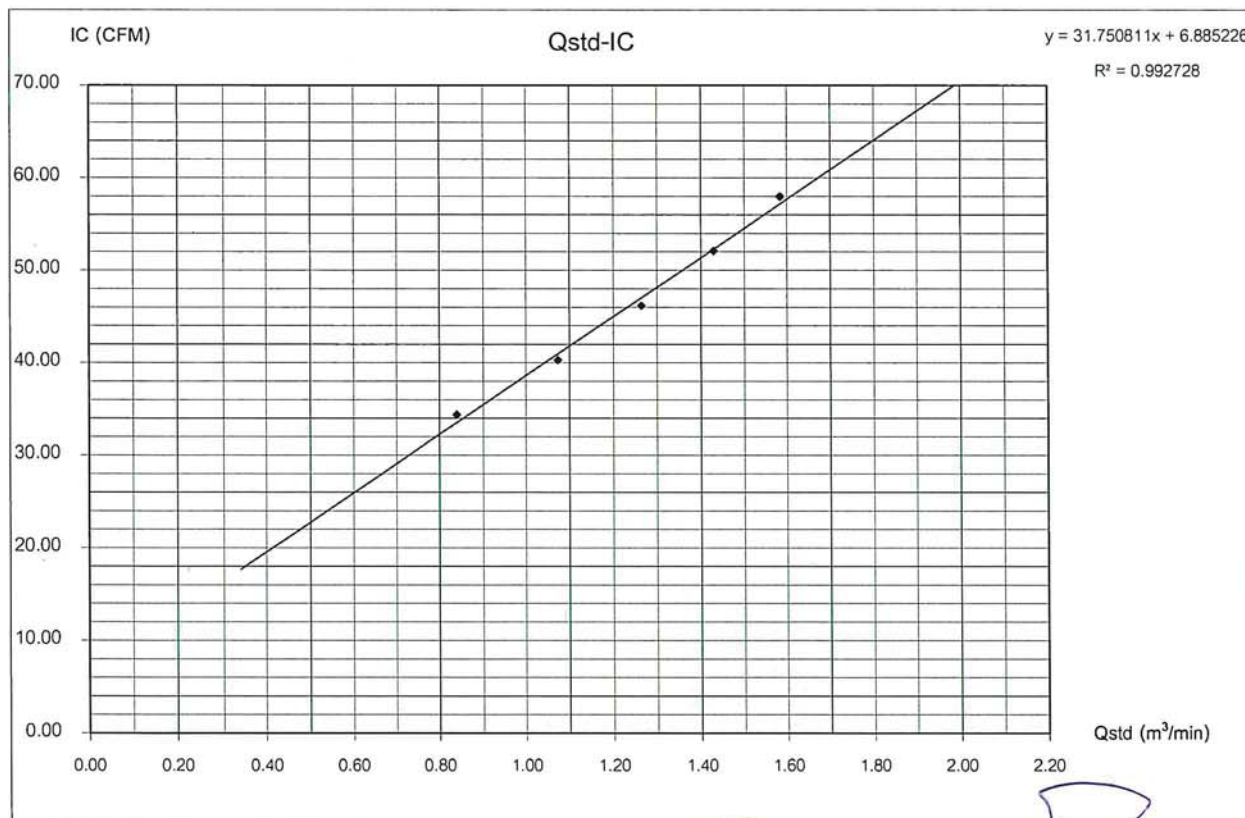
PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Sampler Location				Date	February 4, 2022
โรงเรียนบ้านหนองหญ้า				Start Time	12:50 PM
Sampler Number	PM-10 No.16	Transfer Standard Type	Orifice	Stop Time	1:00 PM
Instrument Model	HIVOL-BMBBE	Calibrator Model	TE-5025A	Calibrated By	Mr.Nuttapol Nanta
Motor Serial Number	2066	Calibrator Serial Number	3883		
Recorder Serial Number	2216				

Plate No.	(Delta H)			(A)	(X)	(I)	(Y)	Temperature	Barometric Pressure	Start Meter	Stop Meter
	Pressure Drop Across Orifice (inH ₂ O)			$[\Delta H \cdot O(Pa/P_{std})(T_{std}/Ta)]^{1/2}$	$Q_{std} = (1/m)[(A \cdot b)]$ (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	1.5	1.6	3.1	1.73056	0.83993	35.0	34.40	304.0	749.0		
7	2.5	2.6	5.1	2.21968	1.07340	41.0	40.30	304.0	749.0		
10	3.5	3.6	7.1	2.61899	1.26400	47.0	46.20	304.0	749.0		
13	4.5	4.6	9.1	2.96501	1.42916	53.0	52.09	304.0	749.0		
18	5.6	5.6	11.2	3.28938	1.58399	59.0	57.99	304.0	749.0		
Linear Regression Y ON X : Y = mX + b							Average	304.0	749.0		
1	Slope (m)			2.09503	Linear Equation			r ²	0.992728	Pstd(mmHg)	760.0
2	Intercept (b)			-0.02913	Set Point Flow Rate (X) (m ³ /min)		1.133	r	0.9963574	T _{NTP}	298.0
3	Correlation Coefficient (r)			0.99999	Final Set Flow Rate = (I)		0	(Pa/Pstd)*(Tstd/Ta)		0.966075139	
Result								C=(Pa/Pstd)*(Tstd/Ta)^0.5		0.982891214	

COMMENT

Andersen Instruments, Inc.



Checked By

Praym.
(Mr. Prayun Detkla)
Technician

Approved By

(Mr. Panupon Podang)
Environmental Scientist

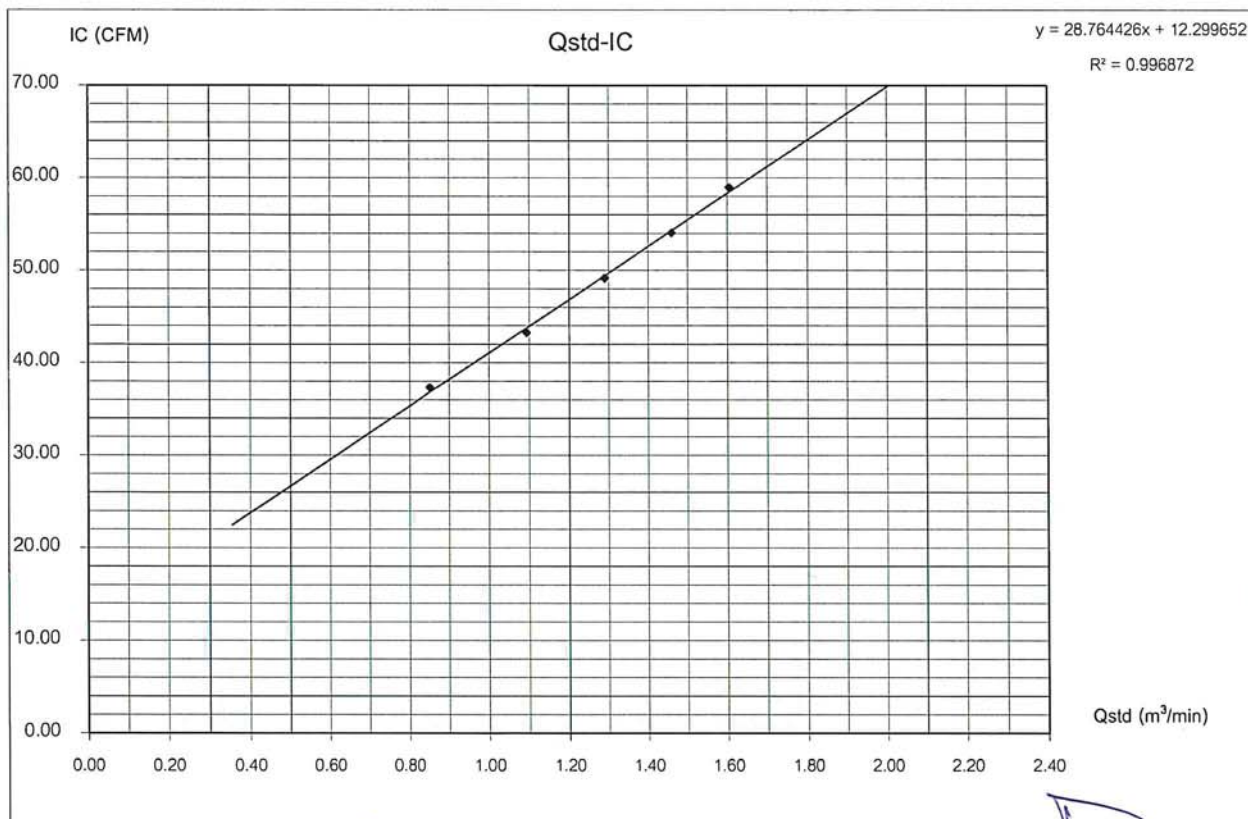
TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Sampler Location				Date	February 4, 2022
โรงเรียนบ้านหนองหนู				Start Time	12:39 PM
Sampler Number	TSP No.A20	Transfer Standard Type	Orifice	Stop Time	12:49 PM
Instrument Model	HIVOL-BBCBE	Calibrator Model	TE-5025A	Calibrated By	Mr.Nuttapol Nanta
Motor Serial Number	2442	Calibrator Serial Number	3883		
Recorder Serial Number	2397				

Plate No.	(Delta H)			(A)	(X)	(I)	(Y)	Temperature	Barometric Pressure	Start Meter	Stop Meter
	Pressure Drop Across Orifice (inH ₂ O)			$[\Delta H \cdot O(Pa/P_{std})(T_{std}/Ta)]^{1/2}$	$Qstd = (1/m)[(A-b)]$ (m ³ /min)	ample Flow Rate Indicatio (ft ³ /min)	$IC = I[(Pa/P_{std})(T_{std}/Ta)]^{1/2}$	(°K = °C+273)	(mmHg)		
	Positive	Negative	ΔH ₂ O								
5	1.6	1.6	3.2	1.75825	0.85315	38.0	37.35	304.0	749.0		
7	2.6	2.7	5.3	2.26279	1.09398	44.0	43.25	304.0	749.0		
10	3.7	3.7	7.4	2.67375	1.29014	50.0	49.14	304.0	749.0		
13	4.7	4.8	9.5	3.02947	1.45993	55.0	54.06	304.0	749.0		
18	5.7	5.8	11.5	3.33315	1.60488	60.0	58.97	304.0	749.0		
Linear Regression Y ON X : Y= mX + b							Average	304.0	749.0		
1	Slope (m)			2.09503	Linear Equation			r ²	0.996872	Pstd(mmHg)	760.0
2	Intercept (b)			-0.02913	Set Point Flow Rate (X) (m ³ /min)		1.133	r	0.9984348	T _{NTP}	298.0
3	Correlation Coefficient (r)			0.99999	Final Set Flow Rate = (I)		0	(Pa/Pstd)*(Tstd/Ta)		0.966075139	
Result								C=(Pa/Pstd)*(Tstd/Ta)^0.5		0.982891214	

COMMENT

Andersen Instruments, Inc.



Checked By

Praym
(Mr. Prayun Detkla)
Technician

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(Mr. Panupon Podang)
Environmental Scientist

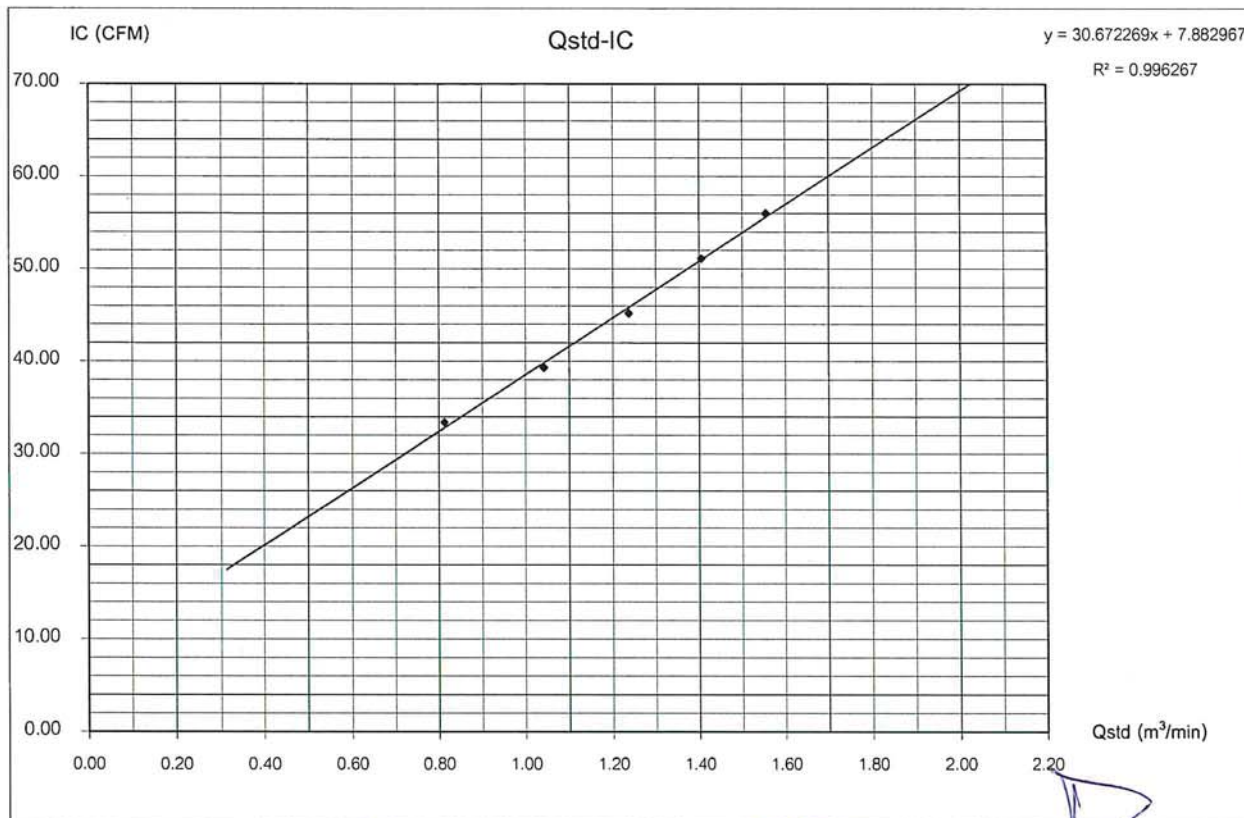
PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Sampler Location				Date	February 4, 2022
โรงเรียนชุมชนบ้านหลุมวัง				Start Time	11:10 AM
Sampler Number	PM-10 No.4	Transfer Standard Type	Orifice	Stop Time	11:20 AM
Instrument Model	HIVOL-BMBBE	Calibrator Model	TE-5025A	Calibrated By	Mr.Nuttapol Nanta
Motor Serial Number	2012-09	Calibrator Serial Number	3883		
Recorder Serial Number	2132				

Plate No.	(Delta H)			(A)	(X)	(I)	(Y)	Temperature	Barometric	Start	Stop
	Pressure Drop Across Orifice (inH ₂ O)	Positive	Negative	$[\Delta H \cdot O(Pa/P_{std})(T_{std}/T_a)]^{1/2}$	$Q_{std} = (1/m)[(A-b)]$ (m ³ /min)	Sample Flow Rate Indicator (ft ³ /min)	$IC = I[(Pa/P_{std})(T_{std}/T_a)]^{1/2}$	(°K = °C+273)	Pressure (mmHg)	Meter	Meter
5		1.4	1.5	2.9	1.67380	0.81284	34.0	33.42	304.0	749.0	
7		2.4	2.4	4.8	2.15341	1.04177	40.0	39.32	304.0	749.0	
10		3.4	3.4	6.8	2.56307	1.23731	46.0	45.21	304.0	749.0	
13		4.4	4.4	8.8	2.91573	1.40564	52.0	51.11	304.0	749.0	
18		5.4	5.4	10.8	3.23011	1.55570	57.0	56.02	304.0	749.0	
Linear Regression Y ON X : Y= mX + b								Average	304.0	749.0	
1	Slope (m)			2.09503	Linear Equation			r ²	0.996267	Pstd(mmHg)	760.0
2	Intercept (b)			-0.02913	Set Point Flow Rate (X) (m ³ /min)		1.133	r	0.9981318	T _{NTP}	298.0
3	Correlation Coefficient (r)			0.99999	Final Set Flow Rate = (I)		0	(Pa/Pstd)*(Tstd/Ta)		0.966075139	
Result								C=(Pa/Pstd)*(Tstd/Ta)^0.5		0.982891214	

COMMENT

Andersen Instruments, Inc.



Checked By

Praym.
(Mr. Prayun Detkla)
Technician



Approved By

(Mr. Panupon Podang)
Environmental Scientist

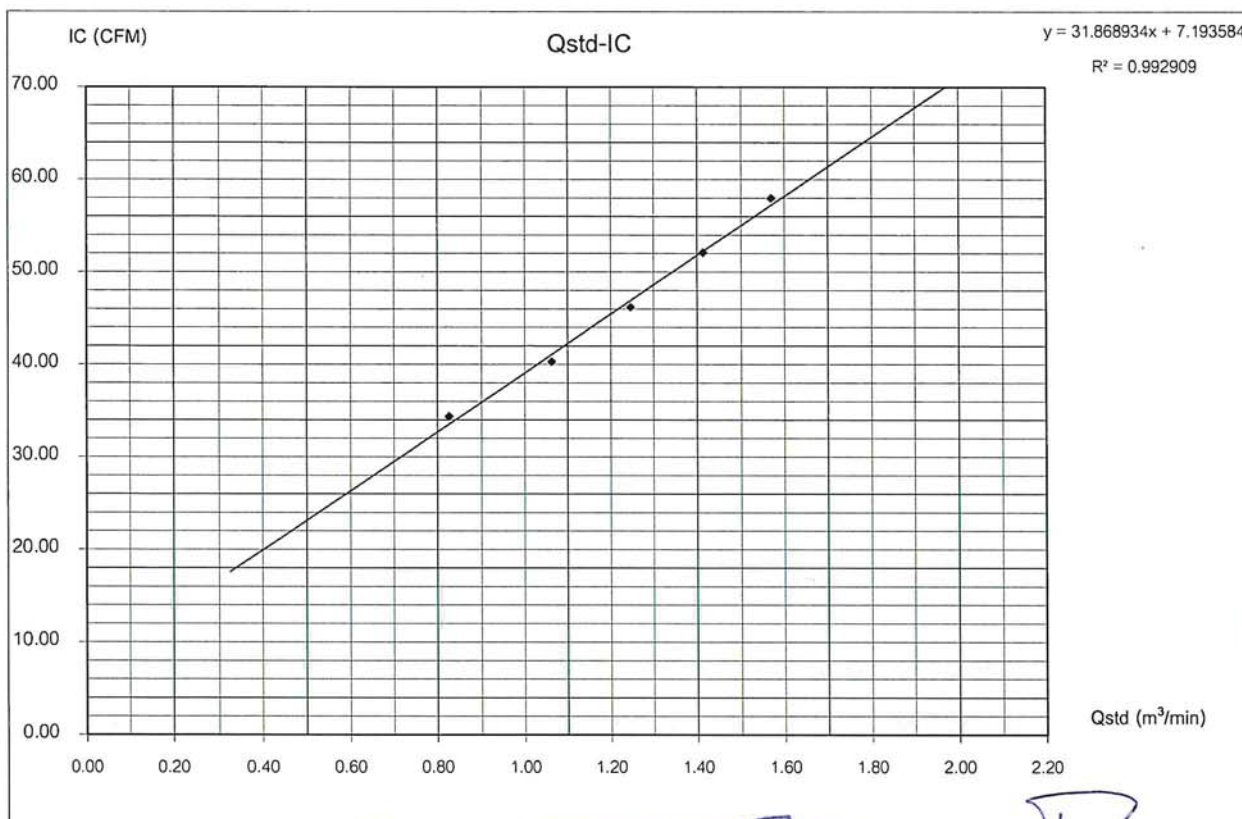
TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Sampler Location โรงเรียนชุมชนบ้านหมื่นวัง				Date	February 4, 2022
Sampler Number				Start Time	11:20 AM
TSP No.A4		Transfer Standard Type	Orifice	Stop Time	11:30 AM
Instrument Model		HIVOL-BBCBE	Calibrator Model	TE-5025A	Calibrated By Mr.Nuttapol Nanta
Motor Serial Number		2012-07	Calibrator Serial Number	3883	
Recorder Serial Number		31604			

Plate No.	(Delta H)			(A)	(X)	(I)	(Y)	Temperature	Barometric	Start	Stop
	Pressure Drop Across Orifice (inH ₂ O)			$[\Delta H \cdot O(Pa/P_{std})(T_{std}/Ta)]^{1/2}$	$Q_{std} = (1/m)[(A-b)]$	Sample Flow Rate Indicator	$IC = I[(Pa/P_{std})(T_{std}/Ta)]^{1/2}$				
	Positive	Negative	ΔH ₂ O		(m ³ /min)	(ft ³ /min)		(°K = °C+273)	Pressure (mmHg)	Meter	Meter
5	1.5	1.5	3.0	1.70242	0.82650	35.0	34.40	304.0	749.0		
7	2.5	2.5	5.0	2.19781	1.06296	41.0	40.30	304.0	749.0		
10	3.4	3.5	6.9	2.58184	1.24627	47.0	46.20	304.0	749.0		
13	4.4	4.5	8.9	2.93225	1.41352	53.0	52.09	304.0	749.0		
18	5.5	5.5	11.0	3.25988	1.56991	59.0	57.99	304.0	749.0		
Linear Regression Y ON X : Y= mX + b							Average	304.0	749.0		
1	Slope (m)			2.09503	Linear Equation			r ²	0.992909	Pstd(mmHg)	760.0
2	Intercept (b)			-0.02913	Set Point Flow Rate (X) (m ³ /min)		1.133	r	0.9964482	T _{NTP}	298.0
3	Correlation Coefficient (r)			0.99999	Final Set Flow Rate = (I)		0	(Pa/Pstd)*(Tstd/Ta)		0.966075139	
Result								C=(Pa/Pstd)*(Tstd/Ta)^0.5		0.982891214	

COMMENT

Andersen Instruments, Inc.



Checked By

(Mr. Prayun Detkla)
Technician



Approved By

(Mr. Panupon Podang)
Environmental Scientist

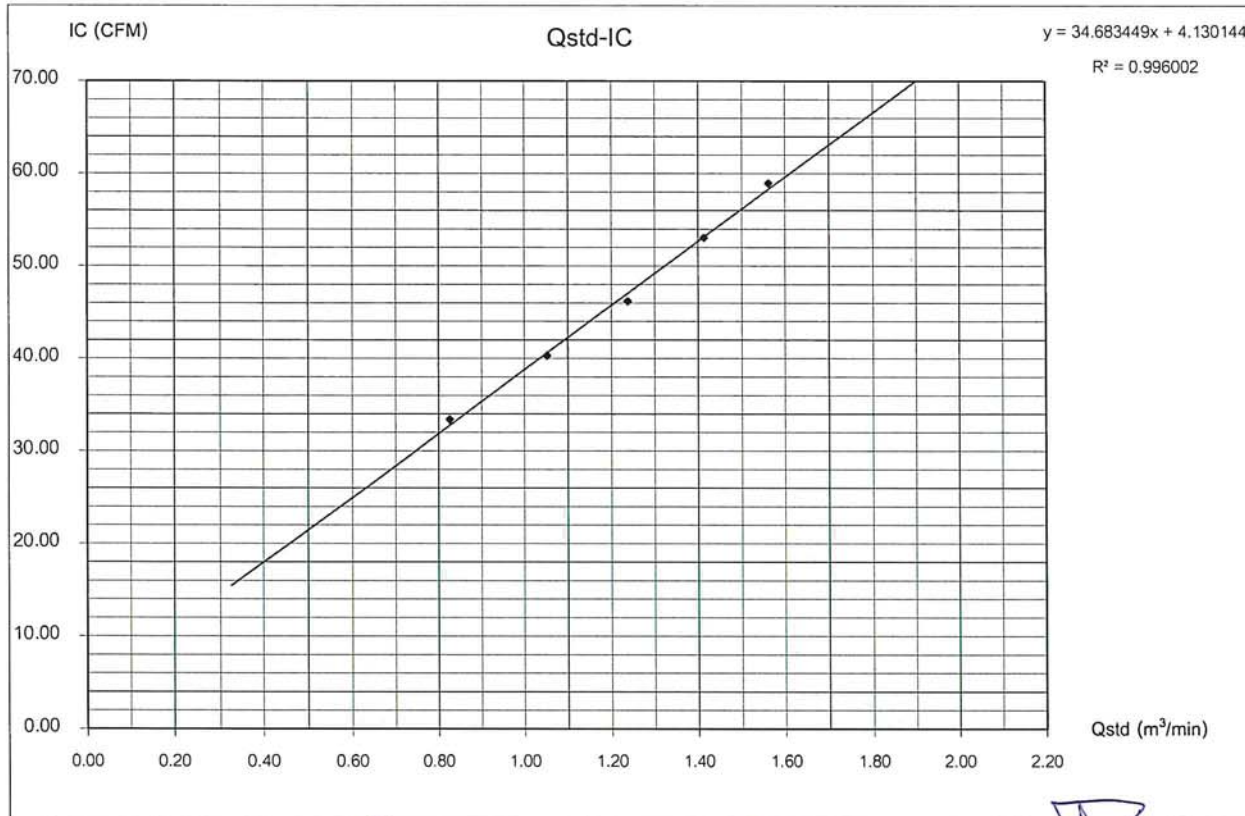
PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Sampler Location				Date	February 4, 2022
โรงเรียนโพธิ์รัฐ				Start Time	10:40 AM
Sampler Number	PM-10 No.22	Transfer Standard Type	Orifice	Stop Time	10:50 AM
Instrument Model	HIVOL-BMBBE	Calibrator Model	TE-5025A	Calibrated By	Mr.Nuttapoi Nanta
Motor Serial Number	2138	Calibrator Serial Number	3883		
Recorder Serial Number	2389				

Plate No.	(Delta H)			(A)	(X)	(I)	(Y)	Temperature	Barometric Pressure	Start Meter	Stop Meter	
	Pressure Drop Across Orifice (inH ₂ O)			$[\Delta H_{2}O(Pa/P_{std})(T_{std}/Ta)]^{1/2}$	Qstd = (1/m)[(A-b)] (m ³ /min)	ample Flow Rate Indicato (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	1.70242	0.82650	34.0	33.42	304.0	749.0			
7	2.4	2.5	4.9	2.17572	1.05242	41.0	40.30	304.0	749.0			
10	3.4	3.4	6.8	2.56307	1.23731	47.0	46.20	304.0	749.0			
13	4.4	4.5	8.9	2.93225	1.41352	54.0	53.08	304.0	749.0			
18	5.4	5.5	10.9	3.24503	1.56282	60.0	58.97	304.0	749.0			
Linear Regression Y ON X : Y= mX + b							Average	304.0	749.0			
1	Slope (m)			2.09503	Linear Equation			r ²	0.996002	Pstd(mmHg)	760.0	
2	Intercept (b)			-0.02913	Set Point Flow Rate (X) (m ³ /min)		1.133	r	0.997999	T _{NTP}	298.0	
3	Correlation Coefficient (r)			0.99999	Final Set Flow Rate = (I)		0	(Pa/Pstd)*(Tstd/Ta)			0.966075139	
Result									C=(Pa/Pstd)*(Tstd/Ta)^0.5			0.982891214

COMMENT

Andersen Instruments, Inc.



Checked By

Prayun.
(Mr. Prayun Detkla)
Technician



Approved By

(Mr. Panupon Podang)
Environmental Scientist

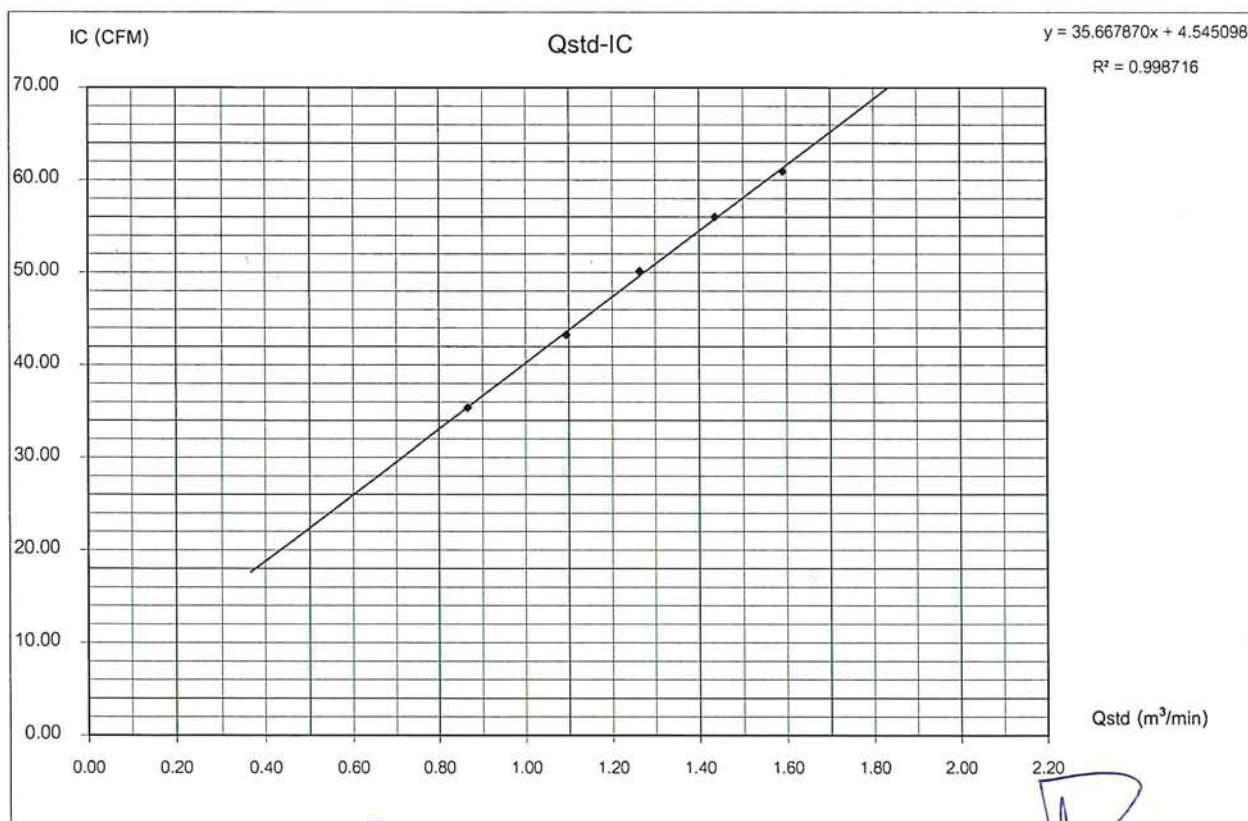
TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Sampler Location				Date	February 4, 2022
โรงเรียนไทยรัฐ				Start Time	10:30 AM
Sampler Number	TSP No.A22	Transfer Standard Type	Orifice	Stop Time	10:40 AM
Instrument Model	HIVOL-BBCBE	Calibrator Model	TE-5025A	Calibrated By	Mr.Nuttapol Nanta
Motor Serial Number	2054	Calibrator Serial Number	3883		
Recorder Serial Number	2187				

Plate No.	(Delta H)			(A)	(X)	(I)	(Y)	Temperature	Barometric Pressure	Start Meter	Stop Meter
	Pressure Drop Across Orifice (inH ₂ O)			$[\Delta H_o(Pa/P_{std})(T_{std}/Ta)]^{1.2}$	$Qstd = (1/m)[(A-b)]$ (m ³ /min)	sample Flow Rate Indicator (l ³ /min)	$IC = I[(Pa/P_{std})(T_{std}/Ta)]^{1.2}$	(°K = °C+273)	(mmHg)		
	Positive	Negative	ΔH ₂ O								
5	1.6	1.7	3.3	1.78551	0.86616	36.0	35.38	304.0	749.0		
7	2.6	2.7	5.3	2.26279	1.09398	44.0	43.25	304.0	749.0		
10	3.5	3.6	7.1	2.61899	1.26400	51.0	50.13	304.0	749.0		
13	4.6	4.6	9.2	2.98126	1.43692	57.0	56.02	304.0	749.0		
18	5.6	5.7	11.3	3.30404	1.59099	62.0	60.94	304.0	749.0		
Linear Regression Y ON X : Y= mX + b							Average	304.0	749.0		
1	Slope (m)			2.09503	Linear Equation			r ²	0.998716	Pstd(mmHg)	760.0
2	Intercept (b)			-0.02913	Set Point Flow Rate (X) (m ³ /min)		1.133	r	0.9993578	T _{NTP}	298.0
3	Correlation Coefficient (r)			0.99999	Final Set Flow Rate = (I)		0	(Pa/Pstd)*(Tstd/Ta)		0.966075139	
Result								C=(Pa/Pstd)*(Tstd/Ta)^0.5		0.982891214	

COMMENT

Andersen Instruments, Inc.



Checked By

Praym.

(Mr. Prayun Detkla)
Technician



Approved By

Mr. Panupong Podang

(Mr. Panupong Podang)
Environmental Scientist

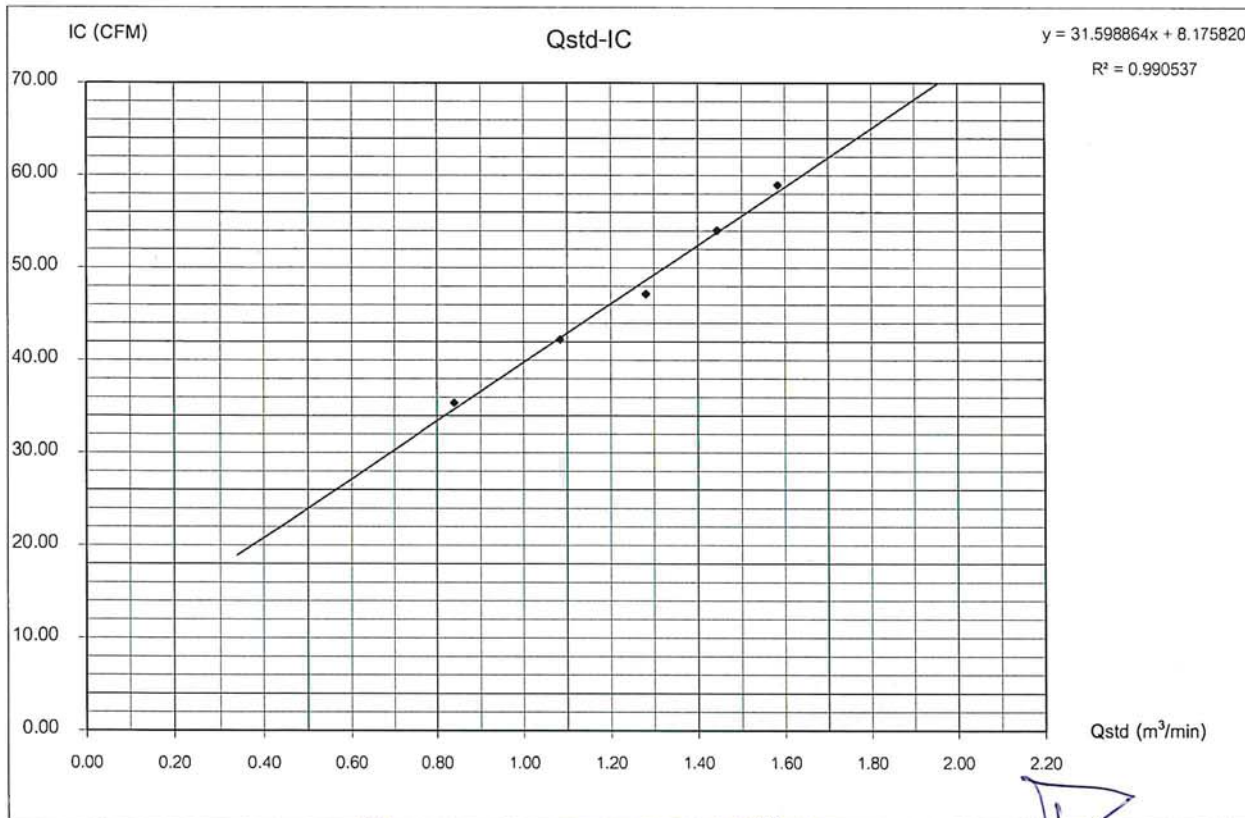
PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Sampler Location				Date	February 4, 2022
บ้านน้อยเที่ยง				Start Time	12:02 PM
Sampler Number	PM-10 No.20	Transfer Standard Type	Orifice	Stop Time	12:12 PM
Instrument Model	HIVOL-BMBBE	Calibrator Model	TE-5025A	Calibrated By	Mr.Nuttapol Nanta
Motor Serial Number	2140	Calibrator Serial Number	3883		
Recorder Serial Number	2393				

Plate No.	(Delta H)			(A)	(X)	(I)	(Y)	Temperature	Barometric	Start	Stop	
	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 Indicator (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	1.5	1.6	3.1	1.73056	0.83993	36.0	35.38	304.0	749.0			
7	2.6	2.6	5.2	2.24134	1.08374	43.0	42.26	304.0	749.0			
10	3.6	3.7	7.3	2.65563	1.28149	48.0	47.18	304.0	749.0			
13	4.6	4.7	9.3	2.99742	1.44463	55.0	54.06	304.0	749.0			
18	5.6	5.6	11.2	3.28938	1.58399	60.0	58.97	304.0	749.0			
Linear Regression Y ON X : Y= mX + b							Average	304.0	749.0			
1	Slope (m)			2.09503	Linear Equation			r ²	0.990537	Pstd(mmHg)	760.0	
2	Intercept (b)			-0.02913	Set Point Flow Rate (X) (m ³ /min)		1.133	r	0.9952573	T _{NTP}	298.0	
3	Correlation Coefficient (r)			0.99999	Final Set Flow Rate = (I)		0	(Pa/Pstd)*(Tstd/Ta)			0.966075139	
Result									C=(Pa/Pstd)*(Tstd/Ta)^0.5			0.982891214

COMMENT

Andersen Instruments, Inc.



Checked By

Prayun.
(Mr. Prayun Detkla)
Technician

Approved By

(Mr. Panupon Podang)
Environmental Scientist

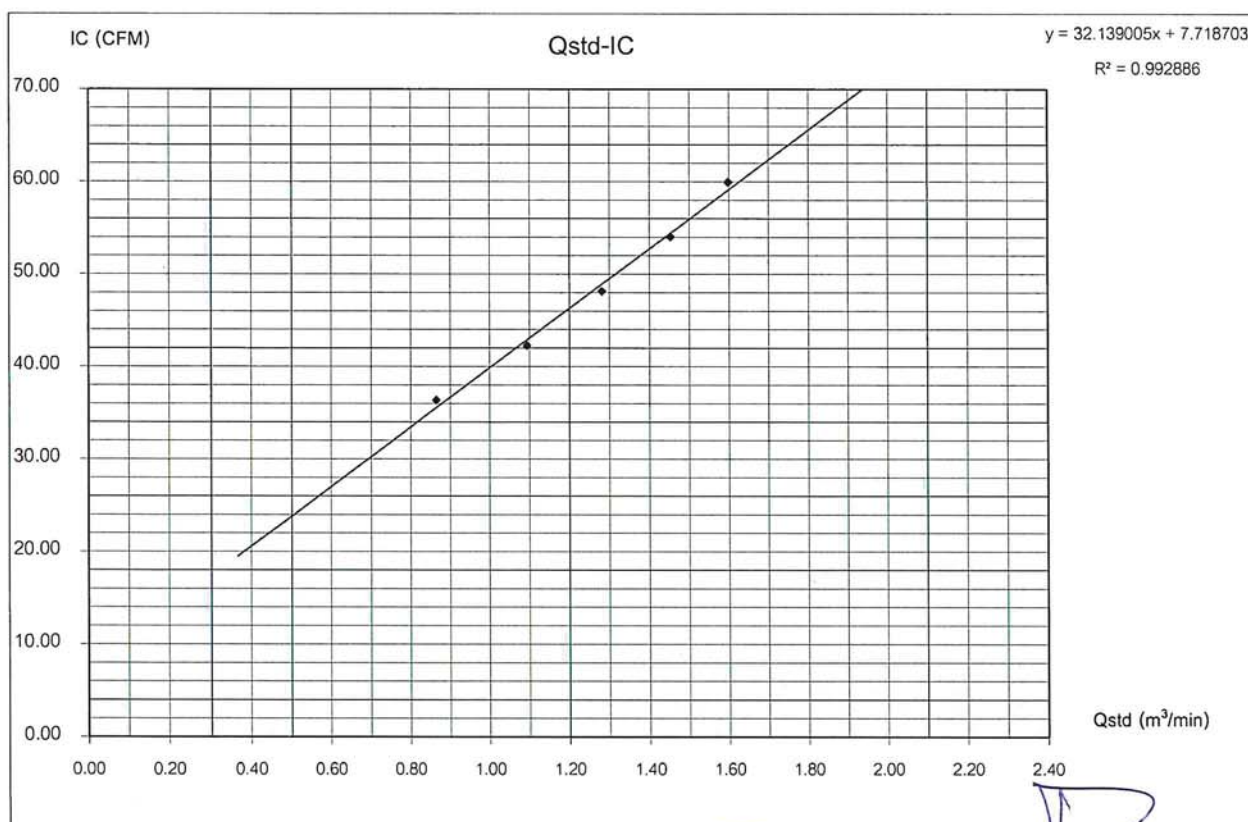
TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Sampler Location				Date	February 4, 2022
บ้านป้อเพียง				Start Time	11:51 AM
Sampler Number	TSP No.A16	Transfer Standard Type	Orifice	Stop Time	12:01 PM
Instrument Model	HIVOL-BBCBE	Calibrator Model	TE-5025A	Calibrated By	Mr.Nuttapol Nanta
Motor Serial Number	2214	Calibrator Serial Number	3883		
Recorder Serial Number	7363				

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	1.6	1.7	3.3	1.78551	0.86616	37.0	36.37	304.0	749.0		
7	2.6	2.7	5.3	2.26279	1.09398	43.0	42.26	304.0	749.0		
10	3.6	3.7	7.3	2.65563	1.28149	49.0	48.16	304.0	749.0		
13	4.7	4.7	9.4	3.01349	1.45230	55.0	54.06	304.0	749.0		
18	5.7	5.7	11.4	3.31862	1.59795	61.0	59.96	304.0	749.0		
Linear Regression Y ON X : Y= mX + b							Average	304.0	749.0		
1	Slope (m)			2.09503	Linear Equation			r ²	0.992886	Pstd(mmHg)	760.0
2	Intercept (b)			-0.02913	Set Point Flow Rate (X) (m ³ /min)		1.133	r	0.9964367	T _{NTP}	298.0
3	Correlation Coefficient (r)			0.99999	Final Set Flow Rate = (I)		0	(Pa/Pstd)*(Tstd/Ta)			0.966075139
Result								C=(Pa/Pstd)*(Tstd/Ta)^0.5			0.982891214

COMMENT

Andersen Instruments, Inc.



Checked By

Prayun
(Mr. Prayun Detkla)
Technician

Approved By

Panupong
(Mr. Panupong Podang)
Environmental Scientist



RECALIBRATION

DUE DATE:

February 24, 2022

Certificate of Calibration

Calibration Certification Information

Cal. Date: February 24, 2021 Rootsmeter S/N: 438320 Ta: 294 °K
Operator: Jim Tisch Pa: 750.1 mm Hg
Calibration Model #: TE-5025A Calibrator S/N: 3883

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.4470	3.2	2.00
2	3	4	1	1.0230	6.4	4.00
3	5	6	1	0.9140	8.0	5.00
4	7	8	1	0.8730	8.8	5.50
5	9	10	1	0.7210	12.8	8.00

Data Tabulation

Vstd (m3)	Qstd (x-axis)	$\sqrt{\Delta H \left(\frac{Pa}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)}$ (y-axis)	Va	Qa (x-axis)	$\sqrt{\Delta H \left(\frac{Ta}{Pa} \right)}$ (y-axis)
0.9961	0.6884	1.4145	0.9957	0.6881	0.8854
0.9918	0.9695	2.0004	0.9915	0.9692	1.2521
0.9897	1.0828	2.2365	0.9893	1.0824	1.3999
0.9886	1.1324	2.3456	0.9883	1.1320	1.4683
0.9833	1.3638	2.8289	0.9829	1.3633	1.7708
QSTD	m=	2.09503	QA	m=	1.31187
	b=	-0.02913		b=	-0.01823
	r=	0.99999		r=	0.99999

Calculations

Vstd=	$\Delta Vol((Pa-\Delta P)/Pstd)(Tstd/Ta)$	Va=	$\Delta Vol((Pa-\Delta P)/Pa)$
Qstd=	Vstd/ΔTime	Qa=	Va/ΔTime
For subsequent flow rate calculations:			
Qstd= $1/m \left(\left(\sqrt{\Delta H \left(\frac{Pa}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)} \right) - b \right)$		Qa= $1/m \left(\left(\sqrt{\Delta H \left(\frac{Ta}{Pa} \right)} \right) - b \right)$	

Standard Conditions

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

RECALIBRATION

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



PLAY SOLUTION

PLAY SOLUTION TECHNOLOGY COMPANY LIMITED

179/75 Nawong Pracha Pattana Road, Sikan, Donmuang, Bangkok 10210

Tel.: +66 2 011 0505, Fax: +66 2 010 7700

www.playsotec.com



CERTIFICATE OF CALIBRATION

Customer

Certificate no. PST-0001-22

Page no. 1 of 3

Company : ENVIRONMENT RESEARCH & TECHNOLOGY CO.,LTD.
Address : 25/114 Moo 6 Soi Chinaket 1, Ngamwongwan Road, Toongsonghong,
City / Province : Laksi, Bangkok
Zip/Postal : 10210

Device

Equipment : Electronic Balance Capacity : 220 g
Manufacturer : METTLER TOLEDO Readability : 0.0001 g
Model : AB204-S ID No. : ERTC-L-In-0048
Serial No. : 1123103723

Environment Conditions

Location of Calibration : Calibration Laboratory at Play Solution Technology Co.,Ltd
Ambient Temperature : 25.9 (°C)
Relative Humidity : 53.1 (%RH)
Barometric Pressure : 1011.5 (mba)
Calibration Procedure : This Calibration was conducted by using In-House calibration procedure number CP-M-001 base on "UKAS LAB 14"
Comment :

Date of Receipt : January 4, 2022

Date of Calibration : January 4, 2022

Issue Date : January 4, 2022

Calibrated by : Kittichai R.
(Kittichai Rattanatham)
Calibrator

Approved by : K. R.
(Kittichai Rattanatham)
Approved Signature

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

This Certificate is issued in accordance with the conditions of accreditation granted by Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and is traceability to recognize national standards and to the unit of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval prior written approval of the calibration center, Play Solution Technology Co.,Ltd



PLAY SOLUTION

PLAY SOLUTION TECHNOLOGY COMPANY LIMITED

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CERTIFICATE OF CALIBRATION

Result of Calibration : Without Adjustment

Certificate no. PST-0001-22

Page no. 2 of 3

1. Repeatability

Weighing Rang 1 (g)	Norminal Value (g)	Standard Deviation (g)
Max.capacity 220	200	0.00005

Weighing Rang 2 (g)	Norminal Value (g)	Standard Deviation (g)
Max.capacity		

2. Linearity, Departure of Indication from nominal value

Weighing Range 1

Normal Value (g)	Standard Value (g)	Indication (g)	Error of Indication (g)	Expanded Uncertainty (g)	Factor k
0.001	0.00100	0.0010	0.0000	0.00011	2.07
0.01	0.01000	0.0100	0.0000	0.00011	2.07
0.1	0.10001	0.1000	0.0000	0.00011	2.07
1	1.00001	1.0000	0.0000	0.00011	2.06
5	5.00002	5.0000	0.0000	0.00011	2.06
10	10.00001	10.0000	0.0000	0.00011	2.05
50	50.00003	50.0000	0.0000	0.00013	2.03
100	100.00004	100.0001	0.0001	0.00018	2.00
150	150.00007	150.0001	0.0000	0.00024	2.00
200	200.00006	200.0002	0.0001	0.00031	2.00

Weighing Range 2

Normal Value (g)	Standard Value (g)	Indication (g)	Error of Indication (g)	Expanded Uncertainty (g)	Factor k

The given extended measurement uncertainty is the standard uncertainty of the measurement multiplied by cover factor ,k as per listed in table above, which corresponds to a confidene level of about 95%



PLAY SOLUTION

PLAY SOLUTION TECHNOLOGY COMPANY LIMITED

179/75 Nawong Pracha Pattana Road, Sikan, Donmuang, Bangkok 10210

Tel.: +66 2 011 0505, Fax: +66 2 010 7700

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CERTIFICATE OF CALIBRATION

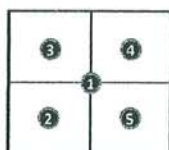
Result of Calibration

Certificate no. PST-0001-22

Page no. 3 of 3

3. Eccentricity

Test load at least 1/3 of the maximum capacity, typically placed between 1/2 and 1/3 of the distance from the centre of the load receptor to the edge.



Weighing Range 1

Test Load : 100 (g)

Position	Indication (g)
1	100.0001
2	100.0001
3	100.0002
4	100.0001
5	100.0002
Max.Deviation	0.0001

Weighing Range 2

Test Load : (g)

Position	Indication (g)
Max.Deviation	

Standard methode

The calibration was performed by using calibration laboratory's in-house calibration methode : CP-M-001 based on "UKAS LAB 14 : Calibration of weighing machine" : edition 6 | October 2019

Reference standards instrument

Instrument	OIML Class	S/N	Certificate No.	Due Date
Standard Weight Set	E2	4000021952	MM-0183-20	December 8, 2022
Standard Weight Set	-	-	-	-
Standard Weight Set	-	-	-	-
Standard Weight Set	-	-	-	-

Measurement Uncertainty

The given measurement uncertainty is the standard of the measurement multiplied by an extension factor k which corresponds to a confidence level of about 95% for a normal distribution. The standard uncertainty was calculated according to M3003

Traceability : The measurement is traceable to national standard, which realize the physical unit of measurement (SI)

- National institute of Metrology (Thailand) through Calibration Laboratory

END OF REPORT

Sartorius (Thailand) Co., Ltd.

129 Rama 9 Road, Huaykwang, Huaykwang, Bangkok 10310

Tel: +66 2643 8361-6, e-mail: service.thailand@sartorius.com

SARTORIUS

Certificate

of Calibration

Model Number : **CP225D**
Description : **Semi-micro Balance**
Serial Number : **19308255**
Manufacturer : **Sartorius**

Certificate No. : **22BNA0013**
Issued Date : **Thursday, January 27, 2022**
Reference No. : **178333**
Page No. : **1 Of 3**

Customer Name : **Environment Research & Technology Co., Ltd.**
25/114 Moo 6, Soi Chinnaket 1, Ngamwongwan Rd., Tungsohong, Laksi, Bangkok 10210.

Calibrated Place : **Weighing Room.**

Calibrated By : **Mr. Nathapol Aeimjangpun**
Calibration Date : **Wednesday, January 26, 2022**

Calibration
Procedure No. : **This calibration was conducted by**
Using in-house calibration procedure number (WI-003)
Based on UKAS LAB 14

Metrological data :

Capacity : **80 / 220** g Readability : **0.01/0.1** mg

Ambients Conditions:

Temperature : **20.0 °C** \pm **5.0 °C**

Humidity : **55.5 % RH** \pm **10.0 % RH**

Pressure : **—** \pm **—**

Reasons for calibration

☐ New Installation ☐ Service / Repaired ☒ Re-calibration/ Maintenance

Equipment Condition: ☒ Good Operate ☐ Fair

Measurement Method UKAS Publication Ref : Lab 14

The measurement uncertainty stated is the expended uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor ($k=2$) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM). The calibration certificate documents the traceability to National Standards, which realise the unit of measurement according to the International Standard System of Units (SI). Report of Tolerance came form list of Sartorius Metrological Specifications.

Traceability:

Model Number	Description	Traceability	Certificate No.	Due Date
YCS011-612-00	Sartorius weight set 1mg - 1kg E2, YCS011-612-00	SPC-RT	C02203547	21-Sep-2022
608H1	Thermo-Hygrometer, Testo 608-H1	SPC-RT	C19210657	14-Dec-2022

This certificate relate and apply this equipment only.

This certificate may not be reproduced other than in full except with the prior written approval of the Verification Operation Division Sartorius (Thailand) Co., Ltd.

ISO17025-RF-15 26/03/2020 R2

Mr. Chonchai Inthana (Technical Manager)

S
T
A
M
P



5-1-65

Certificate

of Calibration

Model Number : CP225D

Description : Semi-micro Balance

Serial Number : 19308255

Manufacturer : Sartorius

Certificate No. : 22BNA0013

Issued Date : Thursday, January 27, 2022

Reference No. : 178333

Page No. : 2 of 3

Calibration Results : Without Adjustment

Repeatability

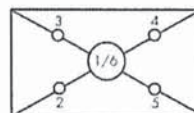
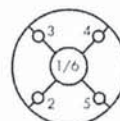
The reproducibility is the ability of a weighing instrument to display nearly identical readouts under constant test conditions when the same load within a measurement series is placed repeatedly on the weighing pan in the same manner. The standard deviation is used to express reproducibility quantitatively.

Nominal Value : (Low Load)	5.00000	49.99998
5 g	5.00001	49.99998
Tolerance	5.00000	49.99996
0.0001 g	4.99998	49.99998
	4.99997	49.99999
Nominal Value : (High Load)	4.99997	50.00000
50 g	4.99998	49.99997
Tolerance	4.99999	49.99996
0.0001 g	5.00001	49.99997
	4.99998	49.99997
Standard Deviation	0.000015	0.000013

Eccentricity (Off-center loading error)

The off-center loading error is yielded by the difference between the readout of the load, i.e. 1/3 or 1/4 of maximum capacity, placed in the middle of the weighing pan and between each of four additional measurement points (positions defined according to OIML R76).

Nominal value : 50 g
Tolerance 0.00015 g



	Difference
1	-
2	0.00001
3	0.00002
4	-0.00002
5	-0.00005
6	-

Linearity

The linearity, also called linearity error. Describes the deviation of the characteristic curve of a weighing instrument from the linear slope.

Tolerance 0.0001 g

Nominal Value (g)	Conventional Mass Value (g)	Displayed Value (g)	Deviation (g)	Uncertainty (g)
0.01	0.01000	0.01002	0.00002	0.000066
0.1	0.10000	0.10000	0.00000	0.000066
1	1.00001	1.00000	-0.00001	0.000067
2	2.00001	1.99998	-0.00003	0.000067
5	4.99999	4.99997	-0.00002	0.000068
10	10.00000	9.99998	-0.00002	0.000070
20	19.99997	20.00000	0.00003	0.000074
50	49.99999	49.99999	0.00000	0.000093
60	59.99998	60.00000	0.00002	0.00015
70	69.99996	69.99998	0.00002	0.00015

Certificate

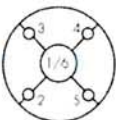
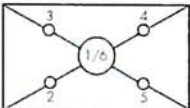
of Calibration

Model Number : **CP225D**
 Description : **Semi-micro Balance**
 Serial Number : **193082255**
 Manufacturer : **Sartorius**

Certificate No. : **22BNA0013**
 Issued Date : **Thursday, January 27, 2022**
 Reference No. : **178333**
 Page No. : **3 of 3**

Calibration Results : Without Adjustment

Repeatability		
<i>The reproducibility is the ability of a weighing instrument to display nearly identical readouts under constant test conditions when the same load within a measurement series is placed repeatedly on the weighing pan in the same manner. The standard deviation is used to express reproducibility quantitatively.</i>		
Nominal Value : (Low Load)		199.9999
g		199.9998
Tolerance		199.9998
0.0001	g	199.9998
		199.9998
Nominal Value : (High Load)		199.9998
200	g	199.9998
Tolerance		199.9998
0.0001	g	199.9997
		199.9998
Standard Deviation		0.00005

Eccentricity (Off-center loading error)		
<i>The off-center loading error is yielded by the difference between the readout of the load, i.e. 1/3 or 1/4 of maximum capacity, placed in the middle of the weighing pan and between each of four additional measurement points (positions defined according to OIML R76).</i>		
Nominal value :	50	g
Tolerance	0.00015	g
		
		
	Difference	
1	-	
2	-	
3	-	
4	-	
5	-	
6	-	

Linearity

The linearity, also called linearity error. Describes the deviation of the characteristic curve of a weighing instrument from the linear slope.

Tolerance 0.0002 g

Nominal Value (g)	Conventional Mass Value (g)	Displayed Value (g)	Deviation (g)	Uncertainty (g)
90	90.0000	90.0001	0.0001	0.00018
100	100.0000	100.0000	0.0001	0.00018
110	109.9999	110.0000	0.0001	0.00026
120	119.9999	119.9999	0.0000	0.00026
150	149.9999	149.9999	0.0000	0.00026
160	159.9999	159.9999	0.0000	0.00026
170	169.9999	169.9999	0.0000	0.00026
180	179.9999	179.9999	0.0000	0.00027
190	189.9999	189.9998	-0.0001	0.00028
200	199.9999	199.9999	0.0000	0.00031

End of Report.



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 6 August, 2021

Certification No. 371/21

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 1009.3 hPa

NATIONAL STANDARD WIND TUNNEL :

: Thermal Anemometer 642 S/N 91563

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

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

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

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION

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. 371/21

6 August, 2021

Page : 2 of 2

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure inches	Vacumm inches	Pressure hPa	Velocity m/sec	Correction m/sec
1.00	-	-	-	0.9	0.10
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	-	-	-	14.3	0.71
17.02	-	-	-	16.5	0.52
20.02	-	-	-	19.3	0.72

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



Sound Level Meter Calibration Report

Support Equipment Type	: Sound Level Calibrator
Manufacture	: BSWA
Model	: CA114
Serial No.	: 590047
Range of Calibrator	
- Sound Pressure Level	: 94.1 dB.
- Frequency	: 1,000 Hz.
Calibrated By	: Mr.Apiwat Chamnanweeh
Calibration Date	: February 6, 2022
Customer Name	: Khon Kaen Sugar Power Plant Co., Ltd.

[illegible]

Checked By

Prayun.
Mr. Prayun Detkla
Technician

Approved By

Ms.Sutatip Im-noi
Environmental Scientist



Calibration Chart

BSWA-IV-C021-03-0048A

Sound Calibrator model CA11A
Serial Number 590047
Appearance OK
Power Supply 1.5V LR6 (AA battery) x2
Sound Pressure Level 94.08 / - dB
Frequency 999.6 / - Hz
THD (@1000Hz) 0.54 / - %

Copying and using select parts, or tampering with this document without the permission of BSWA is forbidden!

BSWA Technology Ltd.

www.bswa-tech.com

This equipment was calibrated at the following ambient conditions:

Temperature: 20 °C
Humidity: 40 %RH
Pressure: 1025 hPa

This equipment is qualified!

C. Z.
Calibrated



2021-5-10

Date

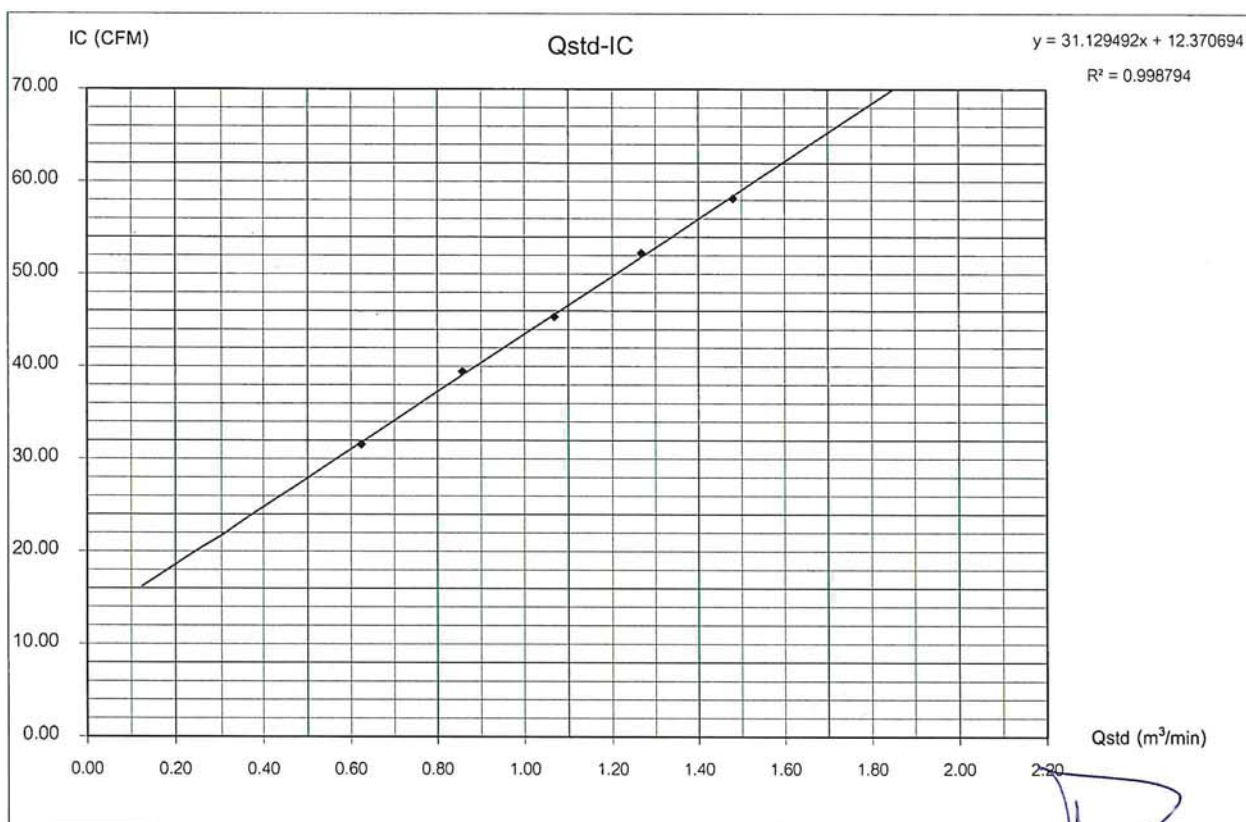
PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Sampler Location				Date	March 24, 2022
Project Site				Start Time	12:33 PM
Sampler Number	PM-10 No.7	Transfer Standard Type	Orifice	Stop Time	12:43 PM
Instrument Model	HIVOL-BMBBE	Calibrator Model	TE-5025A	Calibrated By	Mr.Satitkoon Maitreegit
Motor Serial Number	B0411-001	Calibrator Serial Number	2716		
Recorder Serial Number	R0411-001				

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)	ample Flow Rate Indicato (ft ³ /min)	$IC = I[(Pa/P_{std})(T_{std}/Ta)]^{1/2}$	(°K = °C+273)	(mmHg)		
	Positive	Negative	ΔH ₂ O								
5	0.7	0.7	1.4	1.16648	0.62386	32.0	31.55	305.0	756.0		
7	1.3	1.3	2.6	1.58964	0.85738	40.0	39.43	305.0	756.0		
10	2.0	2.0	4.0	1.97171	1.06822	46.0	45.35	305.0	756.0		
13	2.8	2.8	5.6	2.33295	1.26757	53.0	52.25	305.0	756.0		
18	3.8	3.8	7.6	2.71781	1.47995	59.0	58.17	305.0	756.0		
Linear Regression Y ON X : Y= mX + b							Average	305.0	756.0		
1	Slope (m)			1.81211	Linear Equation			r ²	0.998794	Pstd(mmHg)	760.0
2	Intercept (b)			0.03597	Set Point Flow Rate (X) (m ³ /min)		1.133	r	0.9993968	T _{NTP}	298.0
3	Correlation Coefficient (r)			0.99999	Final Set Flow Rate = (I)		0	(Pa/Pstd)*(Tstd/Ta)		0.971906816	
Result								C=(Pa/Pstd)*(Tstd/Ta)^0.5		0.985853344	

COMMENT

Andersen Instruments, Inc.



Checked By

(Mr. Prayun Detkla)
Technician

Approved By

(Mr. Panupon Podang)
Environmental Scientist

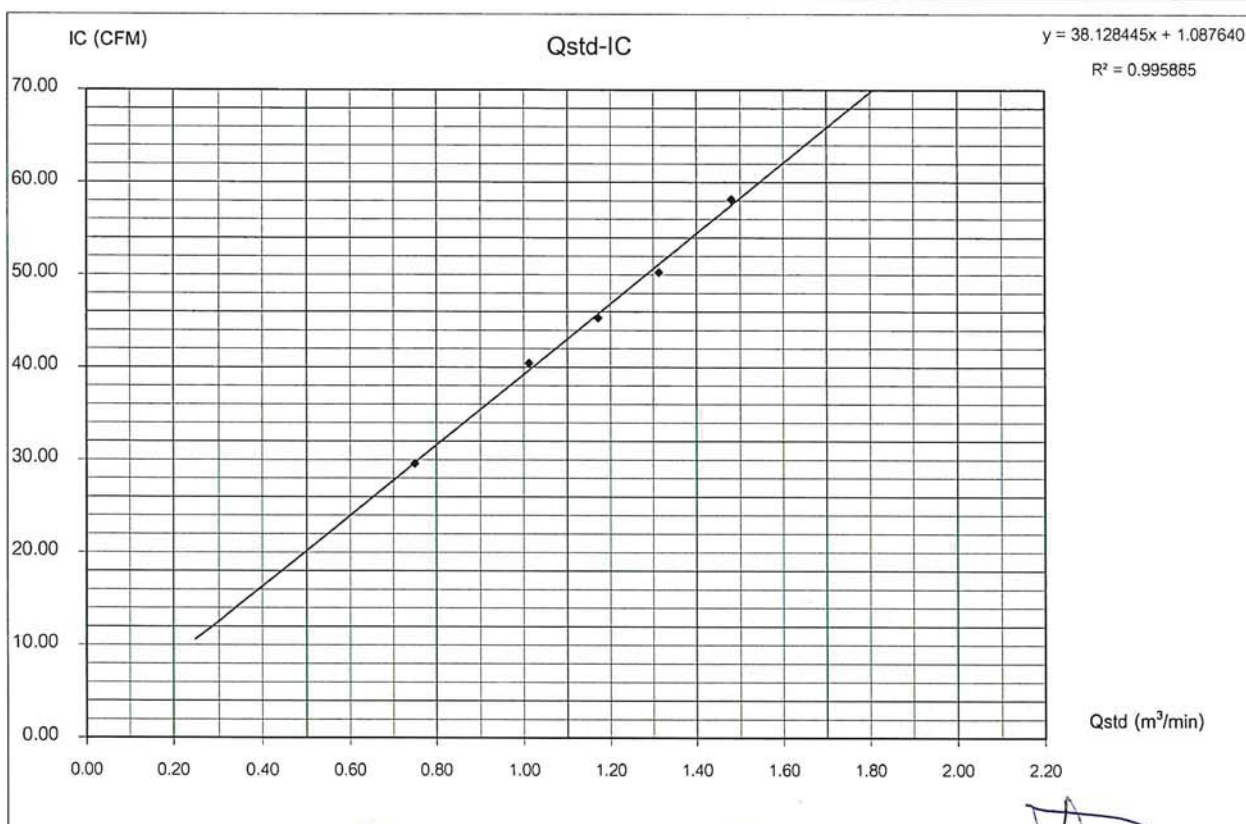
TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Sampler Location				Date	March 24, 2022
Project Site				Start Time	12:21 PM
Sampler Number	TSP No.A11	Transfer Standard Type	Orifice	Stop Time	12:31 PM
Instrument Model	HIVOL-BBCBE	Calibrator Model	TE-5025A	Calibrated By	Mr.Satlikoon Maitreegit
Motor Serial Number	610-650	Calibrator Serial Number	2716		
Recorder Serial Number	102930701				

Plate No.	(Delta H)			(A)	(X)	(I)	(Y)	Temperature	Barometric	Start	Stop
	Pressure Drop Across Orifice (inH ₂ O)			$[\Delta H_{2}O(Pa/P_{std})(T_{std}/Ta)]^{1/2}$	Qstd = (1/m)[(A-b)] (m ³ /min)	ample Flow Rate Indicato (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	1.0	1.0	2.0	1.39421	0.74953	30.0	29.58	305.0	756.0		
7	1.8	1.8	3.6	1.87053	1.01239	41.0	40.42	305.0	756.0		
10	2.4	2.4	4.8	2.15990	1.17207	46.0	45.35	305.0	756.0		
13	3.0	3.0	6.0	2.41484	1.31276	51.0	50.28	305.0	756.0		
18	3.8	3.8	7.6	2.71781	1.47995	59.0	58.17	305.0	756.0		
Linear Regression Y ON X : Y= mX + b							Average	305.0	756.0		
1	Slope (m)			1.81211	Linear Equation			r ²	0.995885	Pstd(mmHg)	760.0
2	Intercept (b)			0.03597	Set Point Flow Rate (X) (m ³ /min)		1.133	r	0.9979404	T _{NTP}	298.0
3	Correlation Coefficient (r)			0.99999	Final Set Flow Rate = (I)		0	(Pa/Pstd)*(Tstd/Ta)		0.971906816	
Result								C=(Pa/Pstd)*(Tstd/Ta)*0.5		0.985853344	

COMMENT

Andersen Instruments, Inc.



Checked By

Prayun
(Mr. Prayun Detkha)
Technician

Approved By

(Mr. Panupon Podang)
Environmental Scientist

Certificate of Calibration

Calibration Certification Information			
Cal. Date: February 8, 2022	Rootsmeter S/N: 438320	Ta: 294 °K	
Operator: Jim Tisch		Pa: 750.1 mm Hg	
Calibration Model #: TE-5025A	Calibrator S/N: 2716		

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.3090	3.2	2.00
2	3	4	1	0.9160	6.4	4.00
3	5	6	1	0.8140	7.9	5.00
4	7	8	1	0.7760	8.8	5.50
5	9	10	1	0.6380	12.8	8.00

Data Tabulation					
Vstd (m3)	Qstd (x-axis)	$\sqrt{\Delta H \left(\frac{Pa}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)}$ (y-axis)	Va	Qa (x-axis)	$\sqrt{\Delta H \left(\frac{Ta}{Pa} \right)}$ (y-axis)
0.9961	0.7609	1.4145	0.9957	0.7607	0.8854
0.9918	1.0828	2.0004	0.9915	1.0824	1.2521
0.9898	1.2160	2.2365	0.9895	1.2156	1.3999
0.9886	1.2740	2.3456	0.9883	1.2735	1.4683
0.9833	1.5412	2.8289	0.9829	1.5407	1.7708
QSTD	m=	1.81211	QA	m=	1.13472
	b=	0.03597		b=	0.02252
	r=	0.99999		r=	0.99999

Calculations	
Vstd= $\Delta Vol((Pa-\Delta P)/Pstd)(Tstd/Ta)$	Va= $\Delta Vol((Pa-\Delta P)/Pa)$
Qstd= $Vstd/\Delta Time$	Qa= $Va/\Delta Time$
For subsequent flow rate calculations:	
Qstd= $1/m \left(\left(\sqrt{\Delta H \left(\frac{Pa}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)} \right) - b \right)$	Qa= $1/m \left(\left(\sqrt{\Delta H \left(\frac{Ta}{Pa} \right)} \right) - b \right)$

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

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



PLAY SOLUTION

PLAY SOLUTION TECHNOLOGY COMPANY LIMITED

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NSC-TISI-TIS17025
CALIBRATION 0378

CERTIFICATE OF CALIBRATION

Customer

Certificate no. PST-0001-22

Page no. 1 of 3

Company : ENVIRONMENT RESEARCH & TECHNOLOGY CO.,LTD.
Address : 25/114 Moo 6 Soi Chinaket 1, Ngamwongwan Road, Toongsonghong,
City / Province : Laksi, Bangkok
Zip/Postal : 10210

Device

Equipment : Electronic Balance Capacity : 220 g
Manufacturer : METTLER TOLEDO Readability : 0.0001 g
Model : AB204-S ID No. : ERTC-L-In-0048
Serial No. : 1123103723

Environment Conditions

Location of Calibration : Calibration Laboratory at Play Solution Technology Co.,Ltd
Ambient Temperature : 25.9 (°C)
Relative Humidity : 53.1 (%RH)
Barometric Pressure : 1011.5 (mba)
Calibration Procedure : This Calibration was conducted by using In-House calibration procedure number CP-M-001 base on "UKAS LAB 14"
Comment :

Date of Receipt : January 4, 2022

Date of Calibration : January 4, 2022

Issue Date : January 4, 2022

Calibrated by : Kittichai R.
(Kittichai Rattanatham)
Calibrator

Approved by : K. R.
(Kittichai Rattanatham)
Approved Signature

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

This Certificate is issued in accordance with the conditions of accreditation granted by Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and is traceability to recognize national standards and to the unit of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval prior written approval of the calibration center, Play Solution Technology Co.,Ltd



PLAY SOLUTION

PLAY SOLUTION TECHNOLOGY COMPANY LIMITED

179/75 Nawong Pracha Pattana Road, Sikan, Donmuang, Bangkok 10210

Tel.: +66 2 011 0505, Fax: +66 2 010 7700

www.playsotec.com



CERTIFICATE OF CALIBRATION

Result of Calibration : Without Adjustment

Certificate no. PST-0001-22

Page no. 2 of 3

1. Repeatability

Weighing Rang 1 (g)	Norminal Value (g)	Standard Deviation (g)
Max.capacity 220	200	0.00005

Weighing Rang 2 (g)	Norminal Value (g)	Standard Deviation (g)
Max.capacity		

2. Linearity, Departure of Indication from nominal value

Weighing Range 1

Normal Value (g)	Standard Value (g)	Indication (g)	Error of Indication (g)	Expanded Uncertainty (g)	Factor k
0.001	0.00100	0.0010	0.0000	0.00011	2.07
0.01	0.01000	0.0100	0.0000	0.00011	2.07
0.1	0.10001	0.1000	0.0000	0.00011	2.07
1	1.00001	1.0000	0.0000	0.00011	2.06
5	5.00002	5.0000	0.0000	0.00011	2.06
10	10.00001	10.0000	0.0000	0.00011	2.05
50	50.00003	50.0000	0.0000	0.00013	2.03
100	100.00004	100.0001	0.0001	0.00018	2.00
150	150.00007	150.0001	0.0000	0.00024	2.00
200	200.00006	200.0002	0.0001	0.00031	2.00

Weighing Range 2

Normal Value (g)	Standard Value (g)	Indication (g)	Error of Indication (g)	Expanded Uncertainty (g)	Factor k

The given extended measurement uncertainty is the standard uncertainty of the measurement multiplied by cover factor ,k as per listed in table above, which corresponds to a confidene level of about 95%



PLAY SOLUTION

PLAY SOLUTION TECHNOLOGY COMPANY LIMITED

179/75 Nawong Pracha Pattana Road, Sikan, Donmuang, Bangkok 10210

Tel.: +66 2 011 0505, Fax: +66 2 010 7700

www.playsotec.com



CERTIFICATE OF CALIBRATION

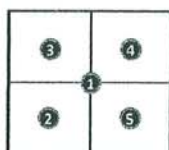
Result of Calibration

Certificate no. PST-0001-22

Page no. 3 of 3

3. Eccentricity

Test load at least 1/3 of the maximum capacity, typically placed between 1/2 and 1/3 of the distance from the centre of the load receptor to the edge.



Weighing Range 1

Test Load : 100 (g)

Position	Indication (g)
1	100.0001
2	100.0001
3	100.0002
4	100.0001
5	100.0002
Max.Deviation	0.0001

Weighing Range 2

Test Load : (g)

Position	Indication (g)
Max.Deviation	

Standard methode

The calibration was performed by using calibration laboratory's in-house calibration methode : CP-M-001 based on "UKAS LAB 14 : Calibration of weighing machine" : edition 6 | October 2019

Reference standards instrument

Instrument	OIML Class	S/N	Certificate No.	Due Date
Standard Weight Set	E2	4000021952	MM-0183-20	December 8, 2022
Standard Weight Set	-	-	-	-
Standard Weight Set	-	-	-	-
Standard Weight Set	-	-	-	-

Measurement Uncertainty

The given measurement uncertainty is the standard of the measurement multiplied by an extension factor k which corresponds to a confidence level of about 95% for a normal distribution. The standard uncertainty was calculated according to M3003

Traceability : The measurement is traceable to national standard, which realize the physical unit of measurement (SI)

- National institute of Metrology (Thailand) through Calibration Laboratory

END OF REPORT



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 14 June, 2022

Certification No. 213/22

Page : 1 of 2

Object : Wind speed and wind direction

Manufacturer : Davis Instruments Inc.

Type : Weather Wizard III Product No. 7425

Serial No. : WE91016A07 ID No. : No.9

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 1008.8 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

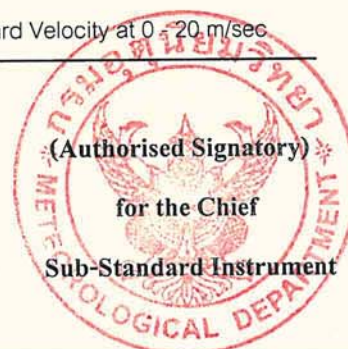
Calibrated by :

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. 213/22

14 June, 2022

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	-	-	-	4.5	0.50
7.04	-	-	-	6.7	0.34
9.02	-	-	-	8.5	0.52
11.01	-	-	-	10.7	0.31
13.01	-	-	-	13.0	0.01
15.01	-	-	-	14.8	0.21
17.02	-	-	-	17.0	0.02
20.02	-	-	-	19.8	0.22

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 :

Watanapong

Mr. Watcharapol 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 9 February, 2022

Certification No. 040/22

Page : 1 of 2

Object : Wind speed and wind direction

Manufacturer : Davis Instruments Inc.

Type : Weather Wizard III Product No. 7425

Serial No. : WC20516A58 ID No. : No.13

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 1012.9 hPa

NATIONAL STANDARD WIND TUNNEL :

: Thermal Anemometer 642 S/N 91563

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

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

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

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION

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. 040/22

9 February, 2022

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	-	-	-	12.1	0.91
15.01	-	-	-	14.7	0.31
17.02	-	-	-	16.1	0.92
20.02	-	-	-	19.7	0.32

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



Meteorological Instruments Bureau

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
Calibrated By : Mr.Suttichan Sangthong
Calibration Date : March 23, 2022
Customer Name : Khon Kaen Sugar Power Plant Co., Ltd.

Item	Personal Pump Serial Number	High Flow/ Low Flow	First Time	Second Time	Third Time	Average	Uncertainty
1	ERTC68: 20051103006	1.7 L/min	1.733	1.731	1.734	1.733	±0.0015
2	ERTC080: 17657	1.7 L/min	1.736	1.738	1.741	1.738	±0.0025
3	ERTC88: 20080803049	1.7 L/min	1.736	1.743	1.731	1.737	±0.0060
4	ERTC117: 12159	1.7 L/min	1.726	1.734	1.724	1.728	±0.0053
5	ERTC136: 13705	1.7 L/min	1.718	1.715	1.720	1.718	±0.0025
6	ERTC143: 15575	1.7 L/min	1.701	1.718	1.712	1.710	±0.0086
7	ERTC162: 20121102008	1.7 L/min	1.713	1.724	1.707	1.715	±0.0086
8	ERTC163: 20121102009	1.7 L/min	1.724	1.711	1.721	1.719	±0.0068
9							
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13							
14							
15							
16							
17							
18							
19							
20							

Checked By

Mr. Prayun Detkla
Technician



Approved By

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.23-64/0644

MTC.No.23-64/0644

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 : 21 July 2021

Condition of measured item : Normal

Calibration date : 1 August 2021

Standard :

Standard	Certificate No.	Date due	Traceability
Digital Thermometer with RTD Sensor	PSL-T 336/63	6-Apr-22	TISTR
MassFlowTerminal/PressureTransducer	MP-0013-21	25-Jan-23	NIMT
Bios Met Lab ML-800 S/N 117982	MW-0011-21	8-Apr-23	NIMT
Bios Met Lab ML-800 S/N 119521	MW-0012-21	31-Mar-23	NIMT

Calibrated by : Terasak Panna

(Mr.Terasak Panna)

Approved by : Kirana Luanghirun

(Ms.Kirana Luanghirun)

Director

Mechanical Engineering Standards Laboratory

Ref. 2013264072103161001

Issued Date 6 August 2021

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

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

Request No.23-64/0644

2/2

MTC.No.23-64/0644

Calibration point : (0.2, 1.0, 2.5) l/min

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

Atmospheric pressure (1010 ± 13) mbar

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 (%)
0.2011	0.21103	24.298	1002.91	-4.72	0.99
1.006	1.0250	24.592	1004.84	-1.89	0.87
2.500	2.5314	24.618	1007.67	-1.24	0.87

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.

TSS

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E-mail : sumalee@tistr.or.th

Request No. 22-64 / 0711

MTC No. PSL-H 297 / 64

Certificate of Calibration

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

Equipment : Thermo-Hygrometer (Thermal Environment Monitor)

Model /Type : QUESTemp°32

Serial Number : TPI050015

Maker : QUEST Technologies

Date of Request : 28 June 2021

Date of Calibration : 6 July 2021

This certificate is traceable to International System of Units (SI Units) through Photometry and Temperature Standards Laboratory, Industrial Metrology and Testing Service Centre, Thailand Institute of Scientific and Technology Research (TISTR), NSC-ONSC accredited Calibration No. 0015.

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 : 2012264062802782003

Issued Date : 29 July 2021

Page 1 of 4

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E-mail : sumalee@tistr.or.th

Request No. 22-64 / 0711

MTC No. PSL-H 297 / 64

Description of Unit Under Calibration :

Customer : Environment Research & Technology Company Limited
Address : 25/114 Moo 6, Soi Chinaket 1, Ngamwongwan Rd., Laksi, Bangkok
Equipment : Thermo-Hygrometer (Thermal Environment Monitor)
Serial Number : TPI050015
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 1114/63.

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 : 9145-5116-00AA, S/N : 1403041

Adjustments : NONE

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Request No. 22-64 / 0711

MTC No. PSL-H 297 / 64

Results of Calibration :-

Table : Temperature Measurement @ Wet 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
40.1	39.9	0.2	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)
30.0	30.3	-0.3	0.50
35.0	35.3	-0.3	0.50
40.1	40.2	-0.1	0.50

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Request No. 22-64 / 0711

MTC No. PSL-H 297 / 64

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	30.2	-0.2	0.50
35.0	35.1	-0.1	0.50
40.1	40.0	0.1	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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E-mail : sumalee@tistr.or.th

Support Equipment Type	: Sound Level Calibrator
Manufacture	: Larson Davis
Model	: CAL150B
Serial No.	: 2317
Range of Calibrator	
- Sound Pressure Level	: 113.8 dB.
- Frequency	: 1,000 Hz.
Calibrated By	: Mr.Suttichan Sangthong
Calibration Date	: March 24, 2022
Customer Name	: Khon Kaen Sugar Power Plant Co., Ltd.

[illegible]

Praym.
Mr. Prayun Detkla
Technician


Ms. Sutatip Imnoi
Environmental Scientist

Request No. 21-64/0668

MTC No. EEL. BP. 113/0664

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 : CAL150
Serial No. : 2317

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 Bruel&Kjaer 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 : 28 Jun. 2021

Date of Calibration : 30 Jun. 2021

1 / 3 

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FM.BL.MTC.002 Rev.4

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-64/0668

MTC No. EEL. BP. 113/0664

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&Kjaer4180	93.81	-0.19	± 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&Kjaer4180	1000.0	0.0	± 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&Kjaer4180	1.56	± 0.50	$\pm 4.0\%$

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 : 30 Jun. 2021

2 / 3

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FM.BL.MTC.002 Rev.4

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-64/0668

MTC No. EEL. BP. 113/0664

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 2
1/2 inch Bruel&Kjaer 4180	113.81	-0.19	± 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	1000.3	0.3	± 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	0.40	± 0.50	$\pm 4.0\%$

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)
Acting Director

Date of Calibration : 30 Jun. 2021

Date of Issue : 5 Jul. 2021

Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Ref : 2011264062802787003

End of Certificate

3 / 3

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FM.BL.MTC.002 Rev.4

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
Calibrated By	: Mr.Konlayu t Inkum
Calibration Date	: June 20, 2022
Customer Name	: Khon Kaen Sugar Power Plant Co., Ltd.

[illegible]

Mr. Prayun Detkla
Technician

Ms. Sutatip Imnoi
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.23-64/0644

MTC.No.23-64/0644

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 : 21 July 2021

Condition of measured item : Normal

Calibration date : 1 August 2021

Standard :

Standard	Certificate No.	Date due	Traceability
Digital Thermometer with RTD Sensor	PSL-T 336/63	6-Apr-22	TISTR
MassFlowTerminal/PressureTransducer	MP-0013-21	25-Jan-23	NIMT
Bios Met Lab ML-800 S/N 117982	MW-0011-21	8-Apr-23	NIMT
Bios Met Lab ML-800 S/N 119521	MW-0012-21	31-Mar-23	NIMT

Calibrated by : Terasak Panna

(Mr.Terasak Panna)

Approved by : Kirana Luanghirun

(Ms.Kirana Luanghirun)

Director

Mechanical Engineering Standards Laboratory

Ref. 2013264072103161001

Issued Date 6 August 2021

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FM.BL.MTC.002 Rev.4

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

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

Request No.23-64/0644

2/2

MTC.No.23-64/0644

Calibration point : (0.2, 1.0, 2.5) l/min

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

Atmospheric pressure (1010 ± 13) mbar

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 (%)
0.2011	0.21103	24.298	1002.91	-4.72	0.99
1.006	1.0250	24.592	1004.84	-1.89	0.87
2.500	2.5314	24.618	1007.67	-1.24	0.87

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.

TSS

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E-mail : sumalee@tistr.or.th

Request No. 22-65 / 0151

MTC No. PSL-H 0042 / 65

Certificate of Calibration

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

Equipment : Thermo-Hygrometer (Thermal Environment Monitor)

Model /Type : QUESTemp^o34

Serial Number : TEH070023

Maker : QUEST Technologies

Date of Request : 26 November 2021

Date of Calibration : 22 December 2021

This certificate is traceable to International System of Units (SI Units) through Photometry and Temperature Standards Laboratory, Industrial Metrology and Testing Service Centre, Thailand Institute of Scientific and Technology Research (TISTR), NSC-ONSC accredited Calibration No. 0015.

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 :

Panit T.

(Ms. Panit Thummasri)

Approved by :

Kamchai Singhapiwat

(Mr. Kamchai Singhapiwat)

Director

Photometry and Temperature Standards Laboratory

Ref. No : 2012264112604950002

Issued Date : 28 December 2021

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.4

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E-mail : sumalee@tistr.or.th

Request No. 22-65 / 0151

MTC No. PSL-H 0042 / 65

Description of Unit Under Calibration :

Customer : Environment Research & Technology Company Limited
Address : 25/114 Moo 6, Soi Chinaket 1, Ngamwongwan Rd., Laksi, Bangkok
Equipment : Thermo-Hygrometer (Thermal Environment Monitor)
Serial Number : TEH070023
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 1081/64.

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 : 9145-5116-00AA, S/N : 1403041

Adjustments : NONE

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Request No. 22-65 / 0151

MTC No. PSL-H 0042 / 65

Results of Calibration :-

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	35.0	0.0	0.50
40.0	40.1	-0.1	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	29.9	0.0	0.50
35.0	35.1	-0.1	0.50
40.0	40.1	-0.1	0.50

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Request No. 22-65 / 0151

MTC No. PSL-H 0042 / 65

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)
29.9	29.9	0.0	0.50
35.0	34.9	0.1	0.50
40.0	40.1	-0.1	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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Factory Calibration Certificate

Instrument information

Name	WET BULB GLOBE TEMPERATURE (WBGT) METER
Series No	3522210169
Type	JT2011-E2A

Integrity check of instrument

Appearance	✓
Parts integrity	✓
Screen display or touch	✓
Instrument button	✓
Power supply	✓
battery	✓
Data storage and export	✓
Deviation degree of comparison test with standard instrument	✓

Calibration Results

UUC Sensor	Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (±°C)
WET	25.0	25.1	-0.1	0.2
	30.0	29.9	0.1	0.2
	35.0	34.9	0.1	0.2
	40.0	40.2	-0.2	0.2
	45.0	44.9	0.1	0.2
DRY	25.0	24.8	0.2	0.2
	30.0	29.8	0.2	0.2
	35.0	35.2	-0.2	0.2
	40.0	40.1	-0.1	0.2
	45.0	44.8	0.2	0.2
GLOBE	25.0	24.9	0.1	0.2
	30.0	30.1	-0.1	0.2
	35.0	34.8	0.2	0.2
	40.0	39.8	0.2	0.2
	45.0	44.9	0.1	0.2

Environmental conditions: temperature: 26 °C±2°C, relative humidity: 30% RH±10RH%

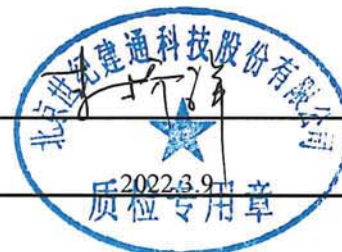
Reference Standard : Standard Mercury Thermometers, Manufacturer: BGRI, Model: STA, SN: 2-56,

Calibrated Date: 30 March 2021, Calibration Certificate No. : RA21H-AB1000009

This Certificate is traceable to NCMT North China, Certificate No.: RA20J-AK000073

Calibration Engineer: _____

Date: _____



Sound Level Meter Calibration Report

Support Equipment Type	: Sound Level Calibrator
Manufacture	: BSWA TECH
Model	: CA115
Serial No.	: 470205
Range of Calibrator	
- Sound Pressure Level	: 114.0 dB.
- Frequency	: 1,000 Hz.
Calibrated By	: Mr.Konlayut Inkum
Calibration Date	: June 20, 2022
Customer Name	: Khon Kaen Sugar Power Plant Co., Ltd.

[illegible]

Checked By

Mr. Prayun Detkla
Technician

Approved By

Ms.Sutatip Im-noi
Environmental Scientist

Request No. 21-65/0209

MTC No. EEL. BP. 131/1264

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 : Acoustic Calibrator

Manufacturer : BSWA TECH

Model : CA115

Serial No. : 470205

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 Keithley 2015-P S/N 4106495.
7. Condenser Microphone Bruel&Kjaer 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 : 29 Dec. 2021

Date of Calibration : 10 Jan. 2022

1 / 2

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0209

MTC No. EEL. BP. 131/1264

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 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	114.02	0.02	± 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	999.9	-0.1	± 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	0.80	± 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)

Acting Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 10 Jan. 2022

Date of Issue : 11 Jan. 2022

Ref : 2011264122905422004

End of Certificate

2 / 2

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FM.BL.MTC.002 Rev.4

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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. 0-2717-3000-27 FAX. 0-2719-9484



Cert.No.: 22CHO8

Page.: 1 of 2

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Eutech
Model : pH 700
Serial No. : 2732154
ID No. : ERTC-L-In.-155
Condition As-Received: Used Item
Received Date : 05 January 2022
Calibration Date : 07 January 2022
Reference : 2201-0006ON-17
Submitted by : Environment Research & Technology Company Limited.
25/114 Moo 6, Soi Chinaket 1, Ngamwongwan Road,
Toongsonghong, Lakki, Bangkok 10210
Calibration Place : ห้องเตรียมสารงานอากาศ
Ambient Temperature : (26.5 - 24.1) °C
Relative Humidity : (50 - 52) %
Calibration Procedure : In - house method :
- CP-OCH2 by direct measurement with standard
voltage calibrator and direct measurement
with certified reference material (CRM)

Calibrated by : Uthen Kankawi

Approved by :

Approved Signatory

- (✓) Malee Butkruea
() Saithip Meangmai
() Warakorn Lernagtrakul

Issue Date : 19 January 2022

The Uncertainties are for a confidence probability of approximately 95%

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

26-1-65

A 0036795



Cert. No.: 22CHO8

Page.: 2 of 2

Condition of this calibration result

1. Reference Standard Instrument : -

<u>Instrument</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Document Process Calibrator	46530031	130RC098	21E3245	07 Oct 2022
2) Digital Thermometer	-	130RC017	21T686	08 Apr 2022

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

- Traceable to National Institute of Metrology (Thailand), NIMT

2. Certified Reference Materials : 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	766820	23 Sep 2023
pH 6.982	CPA chem	761017	02 Aug 2022
pH 10.015	CPA chem	761018	02 Aug 2022

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

Calibration Results**Function : mV Measurement**

Performing standard curve by Fluke at pH (4,7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (\pm mV)	Coverage factor k
	pH	mV	mV	pH		
pH Meter S/N.: 2732154	4.00	177.48	177.5	4.00	0.058	2.00
	7.00	0.00	0.0	7.00	0.058	2.00
	10.00	-177.48	-177.5	10.00	0.058	2.00

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.: 2970016	4.008	4.00	177.3	0.010	2.11
	6.982	6.98	2.9	0.011	2.00
	10.015	10.04	-171.0	0.019	2.15

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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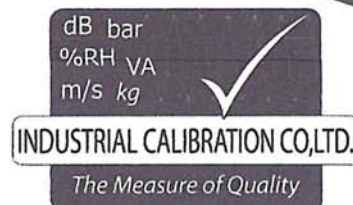
26-1-65

a 1089955

Industrial Calibration Co., Ltd.

38/41 Moo. 3, Lum Luk Ka Road., Khu Khot Subdistrict,
Lam Luk Ka District, Phatum Thani 12130 Thailand.

Tel : +66 (02) 991 0440
Fax : +66 (02) 531 6294
Email : info@industrial.co.th



CERTIFICATE No.CAL02055-22..... PAGE1..... OF2.....

Certificate of Calibration

Equipment : EC/ TDS/ TEMPERATURE METER

Manufacture : HM DIGITAL

Model / Type : COM-100

Serial No. : PONPE5851384

ID No. : N/A

Customer : Environment Research & Technology Co., Ltd.


25/114 Moo 6, Soi Chinnaket 1, Ngamwongwan Road.,Tungsonghong, Laksi, Bangkok 10210

Environment: 25 +/- 3°C (IN-HOUSE); 50 +/- 20%RH

Date Of Receipt : FEB 23, 2022

Date Of Calibration : FEB 23, 2022

Calibration By : CHICHAWADEE CHANTAKHAD

Approved By : 
(CHINNAWAT DUMPUT)

Date of Issue : FEB 23, 2022

MEASUREMENT UNCERTAINTY :

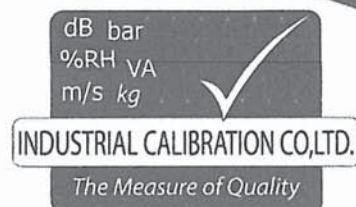
THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR $k = 2$, WHICH EFFECTIVE DEGREE OF FREEDOM $V_{eff} > 100$ CORRESPONDS A LEVEL OF CONFIDENCE OF APPROXIMATELY 95 %

This certificate may not be reproduced other than in full except with the prior written approval of industrial calibration laboratory.

Industrial Calibration Co., Ltd.

38/41 Moo. 3, Lum Luk Ka Road., Khu Khot Subdistrict,
Lam Luk Ka District, Phatum Thani 12130 Thailand.

Tel : +66 (02) 991 0440
Fax : +66 (02) 531 6294
Email : info@industrial.co.th



CERTIFICATE No.CAL02055-22..... PAGE2..... OF2.....

Calibration Report

ORDER No. 2009-054

RECEIVED DATE : FEB 23, 2022

CALIBRATION DATE : FEB 23, 2022

DESCRIPTION: EC/ TDS/ TEMPERATURE METER		MANUFACTURER: HM DIGITAL	
MODEL: COM-100	SERIAL No. PONPE5851384	IDENTIFICATION No: N/A	MADE IN : N/A
CALIBRATION METHOD : THIS INSTRUMENT WAS CALIBRATED BY COMPARISON WITH STANDARD BUFFER SOLUTION IN-HOUSE METHOD			
REFERENCE STANDARD :			
DESCRIPTION : STANDARD BUFFER SOLUTION	MODEL ECCON1413BT	S/N No. 01X211207	CERTIFICATE No. 060/01

TRACEABILITY:

THE CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT: NIST
-NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

RANGE : 1413 μ S

RESOLUTION : 1 μ S

FUNTION : CONDUCTIVITY MEASUREMENT

CALIBRATION	STANDARD	UUC*	UUC*	UNCERTAINTY
POINT	SETTING CONDUCTIVITY	READING	CORRECTION	MASUREMENT
(μ S)	(μ S)	(μ S)	(μ S)	(μ S)
1413	1413	1420	-7	12

REMARK : UUC* UNIT UNDER CALIBRATION

- END OF CERTIFICATE -

Mettler-Toledo (Thailand) Ltd.
846/4 - 846/5 Lasalle Rd., Bangna Tai Sub-District
Bangna District, Bangkok 10260
+66 2723 0382
MT-TH.ServiceSupport@mt.com



Accuracy Calibration Certificate

Customer

Company: ENVIRONMENT RESEARCH&TECHNOLOGY CO., LTD.
Address: 25/114 Moo 6, Soi Chinaket 1, Ngamwongwan Rd., Toongsongho
City: Laksi Contact: Ramita Taengthai
Zip / Postal: 10210
State / Province: Bangkok
Order Number: 
* 0 3 3 2 3 2 8 2 5 2 *

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 (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: 23.9 °C	End: 24.2 °C	Start: 45.8 %	End: 54.8 %

As Found Calibration Date: 19-Jan-2022
As Left Calibration Date: N/A
Issue Date: 20-Jan-2022

Calibrator:


Suwicha Choykamchu

Approved Signatory:


☒ Kassakorn Tassanachaisakul
☐ Santi Jitniyom
☐ Surachet Sukkate

Measurement Results

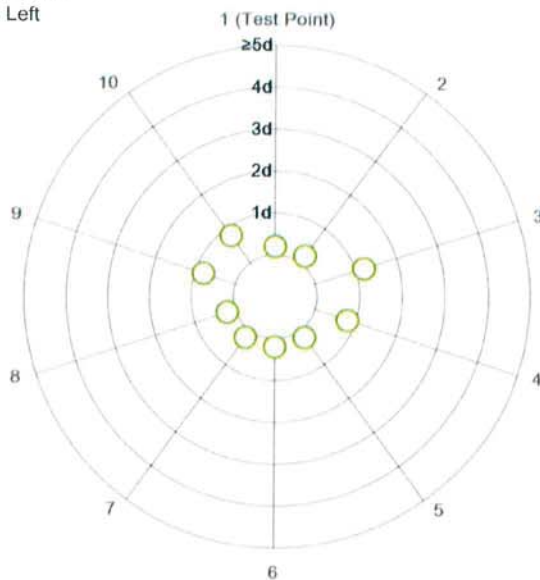
Repeatability

Test Load: 100 g

	As Found	As Left
1	99.9998 g	N/A
2	99.9998 g	N/A
3	99.9997 g	N/A
4	99.9999 g	N/A
5	99.9998 g	N/A
6	99.9998 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	0.00006 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.

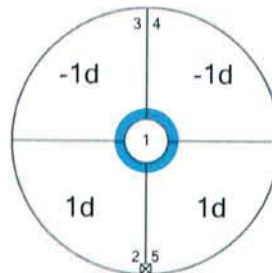
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

Test Load: 100 g

Position	As Found	As Left
1	99.9998 g	N/A
2	99.9999 g	N/A
3	99.9997 g	N/A
4	99.9997 g	N/A
5	99.9999 g	N/A

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



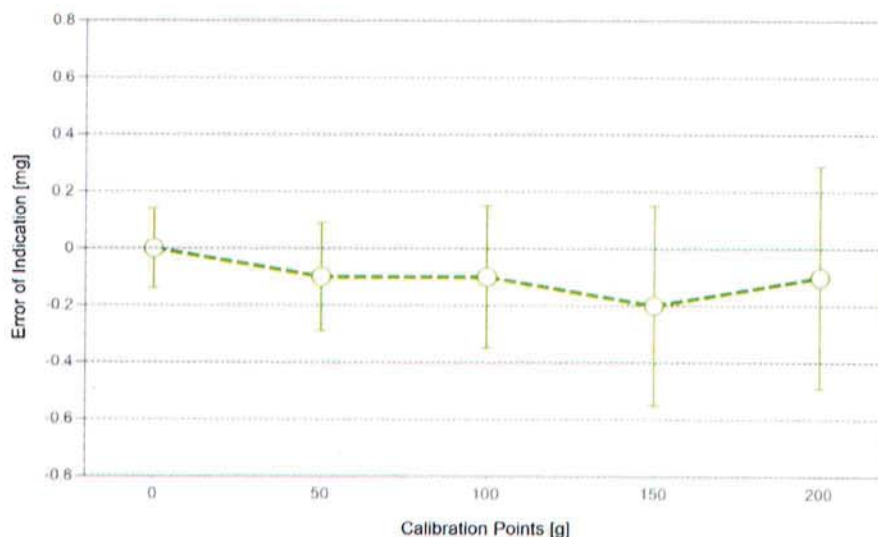
As Found

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	0.14 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	50.0000 g	49.9999 g	-0.0001 g	0.19 mg	2
9	99.9999 g	99.9998 g	-0.0001 g	0.25 mg	2
10	149.9999 g	149.9997 g	-0.0002 g	0.35 mg	2
11	199.9999 g	199.9998 g	-0.0001 g	0.39 mg	2



○ As Found

◆ As Left

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

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

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

Test Equipment

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

Weight Set 1: OIML E2

Weight Set No.:	WS03	Date of Issue:	21-Sep-2021
Certificate Number:	175498	Calibration Due Date:	14-Mar-2023

Thermo Hygrometer

Equipment No.:	IN281	Date of Issue:	25-May-2021
Certificate Number:	21H1100	Calibration Due Date:	10-May-2022

26-1-65

Remarks

FACT adjustment functionality activated
Equipment condition: Good
Next calibration according to customer's procedure

End of Accredited Section

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

26-1-65

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: 4 K

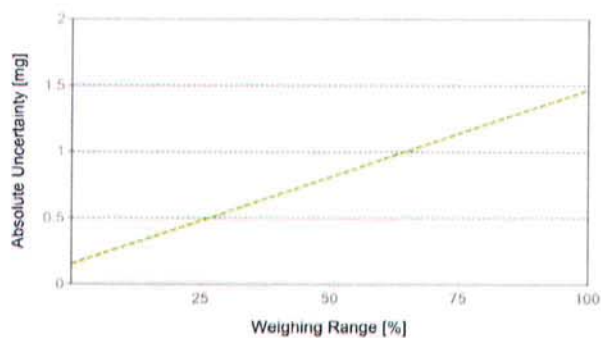
Linearization of Uncertainty Equation

Range			As Found	As Left
	d	Max		
1	0.0001 g	220 g	$U_1 = 0.15 \text{ mg} + 0.00599 \text{ mg/g} \cdot R$	N/A

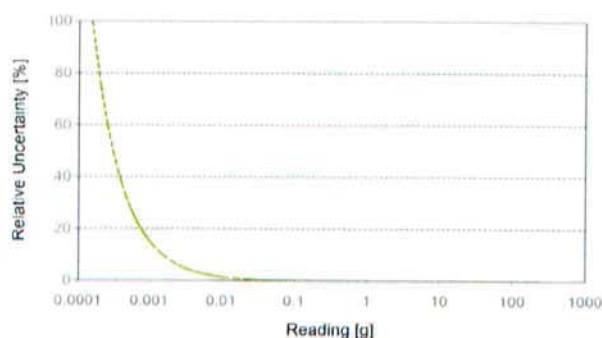
To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

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	0.0074%	N/A	N/A
22.0000 g	0.28 mg	0.0013%	N/A	N/A
220.0000 g	1.5 mg	0.00067%	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.

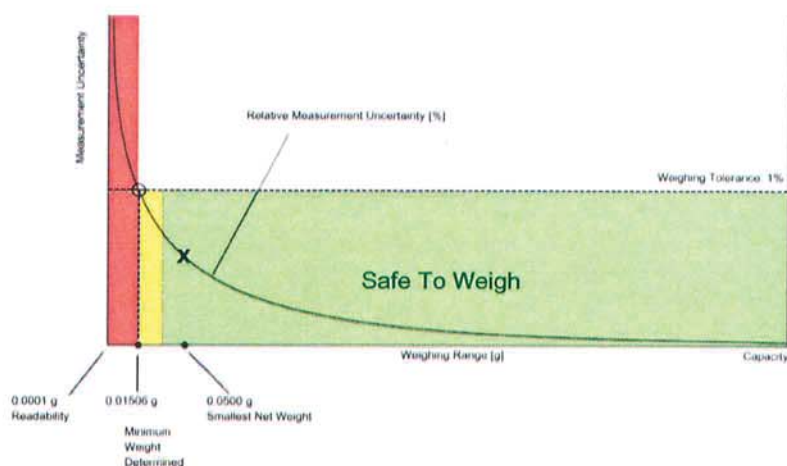
Process Requirements

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.

26-1-65

Minimum Weight

As Found Minimum Weight Table

Minimum weights for different weighing tolerances and safety factors					
Tolerance	Safety Factor				
	1	2	3	5	10
0.1%	0.15146 g	0.30476 g	0.45993 g	0.77601 g	1.60147 g
0.2%	0.07550 g	0.15146 g	0.22788 g	0.38211 g	0.77601 g
0.5%	0.03015 g	0.06037 g	0.09066 g	0.15146 g	0.30476 g
1%	0.01506 g	0.03015 g	0.04525 g	0.07550 g	0.15146 g
2%	0.00753 g	0.01506 g	0.02260 g	0.03770 g	0.07550 g
5%	0.00301 g	0.00602 g	0.00904 g	0.01506 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					
Tolerance	Safety Factor				
	1	2	3	5	10
0.1%	0.15146 g	0.30476 g	0.45993 g	0.77601 g	1.60147 g
0.2%	0.07550 g	0.15146 g	0.22788 g	0.38211 g	0.77601 g
0.5%	0.03015 g	0.06037 g	0.09066 g	0.15146 g	0.30476 g
1%	0.01506 g	0.03015 g	0.04525 g	0.07550 g	0.15146 g
2%	0.00753 g	0.01506 g	0.02260 g	0.03770 g	0.07550 g
5%	0.00301 g	0.00602 g	0.00904 g	0.01506 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.



26-1-65

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.

26-1-65

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	-0.0001 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	-0.0002 g	0.0750 g	0.1500 g	0.3750 g	0.7500 g	1.5000 g	3.7500 g
199.9999 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	-0.0001 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	-0.0002 g	0.0750 g	0.1500 g	0.3750 g	0.7500 g	1.5000 g	3.7500 g
199.9999 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.



26-1-65

Service Date: 2022-01-19
Document Number: TH2065-165-011922-LABBalanceHR
ENVIRONMENT RESEARCH&TECHNOLOGY CO., LTD
25/114 Moo 6, Soi Chinaket 1, Ngamwongwan Rd., Toongsongho ต.จางหวงวาน, Laksi, Bangkok 10210
Ramita Taengthai

METTLER TOLEDO

Balance Health Report

Device Details

System Details			
Manufacturer:	Mettler Toledo	Accessory 1:	
Model:	MS204S	Accessory 2:	
Serial number:	B334691537	Weight set for routine testing:	Yes /
Firmware:	1.74		

History

Device History		Service History	
Instrument in use:	Yes	Last preventive maintenance:	< 1 year
Instrument age:	> 10 years	Last instrument calibration:	< 1 year
Spare parts available:	Yes	Last minimum weight determination:	
Regulations:	ISO		
Process tolerance in %:	1%	Routine testing performed:	Yes
Smallest sample net weight:	0.05g		

Check List

Environmental Conditions		General & Functional Checks	
Room temperature fluctuation	✓	Levelling	✓
Exposure to direct sun	✓	Cleanliness	✓
Vibrations	✓	Completeness - missing parts see additional remarks	✓
Draft	✓	Settings optimized for operating environment	✓
Dirt or dust	✓	Other - objections noted as additional remarks	—
Static	✓	Electrical Component Checks	
Mechanical Component Checks		Power supply	✓
Draft shield	✓	Sliding door drive	—
Weighing pan position	✓	Internal weight drive	✓
Housing	✓	Display	✓
Other - objections noted as additional remarks	—	Other - objections noted as additional remarks	—

Recommendations

Measurement Result Quality		Process Efficiency	
Instrument calibration		Uninstall instrument	
Identify safe weighing range		Replace instrument	
GWP verification / risk assessment		Replace / add parts (see additional remarks)	
Preventive maintenance		Onsite repair	
Perform routine testing with test weights		Depot repair	
User training		Use of accessories (see additional remarks)	

Contact	Name: Ramita Taengthai	Position: N/A	Phone: 0866334490	Email: ramita@enviresearch.co.th
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Additional Remarks & Recommendations		Engineer Details	
		Date:	19-Jan-2022
		Name:	Suwicha Choykamchu
		Signature:	

This is not a certificate.

It should not be used to interpret final results for the testing of these devices.

Legend:



Good/Pass



Needs Attention



Bad/Fail



Not Applicable

26-1-65



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert. No.: 22TM152

Page.: 1 of 3

Certificate of Calibration

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 : Laboratory (ERTC)

Received Order : 5 January 2022

Calibration Date : 5 January 2022

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

Calibrated by : Man Pattanapongpaiboon

Approved by :

Approved Signatory

- () Pornthippa Tameyakul
(☒) Malee Butkruea
() Suwit Imjai

Issue Date : 21 January 2022

The Uncertainties are for a confidence probability of approximately 95%

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

26-1-65

A 0036819



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2201-0006ON-3
Procedure Used :-

Cert. No.: 22TM152

Page.: 2 of 3

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

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Data Acquisition	34970A	MY44031769	21LM12	02 Sep 2022

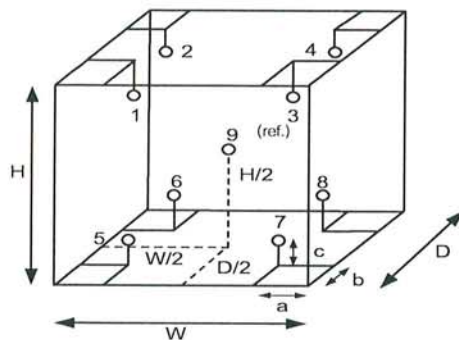
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



Environment during calibration		
	Beginning	Finished
Temp. (°C)	27	27
REL.Humid. (%)	54	58
AC Supply (Volt)	219	222

Ref. Std. ID No.: @ Calibration Point		
Position :	(180) °C	(104) °C
1	20-09TC-01	9RTD-2/1
2	20-09TC-02	9RTD-2/2
3	20-09TC-03	9RTD-2/3
4	20-09TC-04	9RTD-2/4
5	20-09TC-05	9RTD-2/5
6	20-09TC-06	9RTD-2/6
7	20-09TC-07	9RTD-2/7
8	20-09TC-08	9RTD-2/8
9 (ref.)	20-09TC-09	9RTD-2/9

Probe Installation Details :		Dimension of Chamber :	
a =	5.0 cm	D =	0.40 m
b =	5.0 cm	W =	0.56 m
c =	5.0 cm	H =	0.48 m
Capacity =			0.11 m ³

Signature

Male

26-1-65



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2201-0006ON-3
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 22TM152

Page.: 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (± °C)	Coverage Factor <i>k</i>
104.0	104.0	104.0	0.11	1.0	1.9	0.42	2
180.0	180.0	180.0	0.51	2.3	4.2	1.2	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
104.0	105.219	103.394	103.908	104.133	104.348	104.096	103.878	104.103	104.360
180.0	182.291	178.691	178.879	180.031	180.761	180.026	180.572	180.044	180.253

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-


26-1-65



a 1090217



CRYSTAL CALIBRATION SALES AND SERVICE CO., LTD.

45/48 Soi Salathammasop31, Salathammasop Rd.,

Salathammasop, Thawewatthana, Bangkok 10170 Thailand

Tel : 0-2408-8474-5 Fax : 0-2408-8477 Email : info@crystalcal.com www.crystalcal.com



CERTIFICATE OF CALIBRATION

Certificate No. : 21-1224-004

Issue Date : 28 December 2021

Work Order No. : 21/1224

Customer Name : Environment research & Technogy Co., Ltd.
25/114 Moo6 Soi Chinaket1, Ngamwongwan Road,
Toongsonghong, Laksi, Bangkok 10210

Date of Received : 15 December 2021

Date of Calibration : 15 December 2021

Instrument Details : Description : Temperature Controlled Enclosures [Incubator]
Manufacturer : Accuplus
Model : Smart i250
Serial No. : 2059-0218-0002
ID No. : ERTC-L-IN-143
Resolution : 0.1 °C
Location : Laboratory

Calibration Method : This instrument was calibrated by insert standard thermometer into the chamber according to calibration procedure no. CWI-T-10 follow up to TLAS G-20-1/02-08 (E) : Guidelines for Calibration and Checks of Temperature Controlled Enclosures.

Environmental Conditions :

Temperature : Area Monitoring between 15°C to 40°C


Humidity : Area Monitoring between 30%RH to 85%RH

Line Voltage : Area Monitoring 220 VAC \pm 10%

Traceability of Measurement :

This certificate of calibration documents the traceability to national standard, which realize the unit of measurement according to the International system of Units (SI) and The temperature scale in use at this laboratory is The International Temperature scale of 1990.

Calibrated by : Mr. Sitthisak Tonglim
Calibration Engineer

Approved by : 
(Mr. Anuwat Yaklermjit)
Laboratory Manager

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Crystal Calibration Sales and Service Co., Ltd.

45/48 Salathammasop 31, Salathammasop Rd., Salathammasop, Thawewatthana, Bangkok 10170

Phone : 0-2408-8474 Fax : 0-2408-8477 http://www.crystalcal.com Email : info@crystalcal.com



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CRYSTAL CALIBRATION SALES AND SERVICE CO., LTD.

45/48 Soi Salathammasop31, Salathammasop Rd.,

Salathammasop, Thawewatthana, Bangkok 10170 Thailand

Tel : 0-2408-8474-5 Fax : 0-2408-8477 Email : info@crystalcal.com www.crystalcal.com



CERTIFICATE OF CALIBRATION

Certificate No. : 21-1224-004

Issue Date : 28 December 2021

Work Order No. : 21/1224

Details of Calibration

1. Reference Standards Instrument

Instrument	Model	Serial No./Ins No.	Certificate No.	Due Date
Data Acquisition unit	34972A	MY57006241	21-719-014	03 September 2022
Sensor type	RTD	RTD# 101-109	21-719-014	03 September 2022

2. Certificate traceable

: This certificate traceable to The International System of Unit refer to
Crystal Calibration Sales and Service Co., Ltd. , NAC Calibration No. 0260

3. Condition of item

: Used

4. Calibration site

: On - Site

5. Result of Calibration

: Without adjustment

6. Evaluate Condition

: Time Constant : - Hour 50 Minute At cal. point 20 °C
Air vent : Off
Fan speed status : Fixed Fan Speed

7. Calibration note

: The results reported in this certificate refer to the condition of instrument on
the process into the steady state of chamber

8. Sensors Installation Diagram

: When ; Sensor installation location in Chamber @ Working Space
A = Distance between sensor and wall of chamber is 5 cm

9. Dimensions of chamber

: W = 0.5 m ; D = 0.5 m ; H = 0.9 m

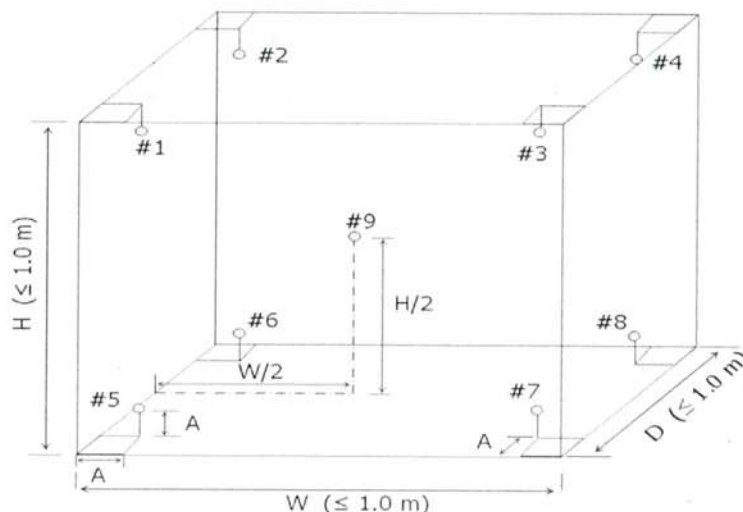


Diagram of Chamber



CRYSTAL CALIBRATION SALES AND SERVICE CO., LTD.

45/48 Soi Salathammasop31, Salathammasop Rd.,

Salathammasop, Thawewatthana, Bangkok 10170 Thailand

Tel : 0-2408-8474-5 Fax : 0-2408-8477 Email : info@crystalcal.com www.crystalcal.com



CERTIFICATE OF CALIBRATION

Certificate No. : 21-1224-004

Issue Date : 28 December 2021

Work Order No. : 21/1224

Result of Temperature Distribution and Performance Check

Table1 : Reporting of Temperature Distribution

Calibration point (°C)	Average Measured Temperature (°C) @ Sensor No. (Sensor No.9 is REF)									Uncertainty ± (°C)
	#1	#2	#3	#4	#5	#6	#7	#8	#9	
20.0	20.26	20.08	20.22	20.11	20.18	20.12	20.09	20.16	19.91	0.60

Table 2 : Reporting of Performance check

Indicator Set Point (°C)	Indicator Reading (°C)			Stability ± (°C)	Uniformity (°C)	Overall variation (°C)
	MAX	MIN	Average			
20.0	20.0	19.6	19.9	0.39	0.58	1.03

Note

Customer would like to find internal temperature in chamber and this report customer request and accepted in certificate

The reference sensor is preferably located of the geometric center of chamber

The measured temperature data readout by software "Benchlink Datalogger 3"

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

Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.

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 time.

Indicating Temperature - the average reading of indicating device that forms the integral part of the enclosure.

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

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

--END--

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Inctech Metrological Center Co.Ltd.

39/1 Soi 82, Sukhapiban 5 Rd., O ngoen,
Saimai, Bangkok 10220, Thailand

Tel. (662) 909-8820 (Auto 10 lines) www.imcinstrument.com



Calibration Cert. # 3884.01
ISO/IEC 17025

Certificate of Calibration

Certificate No. : MT22-1359

Page : 1 of 4

Customer : Environment Research & Technology Co.,Ltd.

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

Description : Heating Block

Manufacturer : Hanna

Model : HI 839800-02

Serial No. : 05220025101

Identification No. : ERTC-L-In-165

Calibration Place : Temperature Laboratory

Order No. : 0149/22

Received date : Jan 14, 2022

Calibration date : Jan 18, 2022

Environment Condition :

Temperature : (23+/-3) °C

Humidity : (50+/-15) %RH

Calibration Method : Calibration were conducted using In-house calibration procedure *CP-MT-009* According to comparison with LXI Data Acquisition Switch Unit.

Reference Standard Instruments :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
LXI Data Acquisition Switch Unit with RTD Sensor	34972A	MY57003222	MT21-5866	Oct 11, 2022

This result of calibration 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 uncertainty of measurement was base on standard uncertainty multiplied by coverage factor $k = 2$,
providing a level of confidence of not less than 95%



Calibrated by : Miss Jarunee Tubsay

Issue date : Jan 18, 2022

Approved by : (Mr.Panuwat Phuklan)

This calibration certificate shall not be reproduced other than in full except with the prior written
approval of Inctech Metrological Center Co.,Ltd

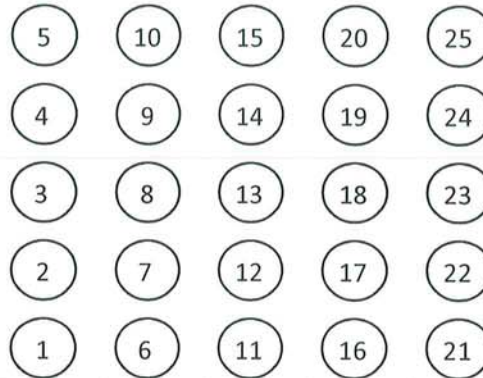
25-1-65



Certificate No. : MT22-1359

Page : 2 of 4

Position



Top view

Function : Temperature measurement (Cont.)
Calibration point : 105, 150 °C
Immersion depth : 50 mm.

Result : Without adjustment

Position No.	UUC* setting (°C)	Standard reading (°C)	UUC* correction (°C)	Uncertainty of measurement (+/- °C)
1	105	104.622	-0.378	0.17
2	105	104.536	-0.464	0.17
3	105	104.661	-0.339	0.17
4	105	104.742	-0.258	0.17
5	105	104.488	-0.512	0.17
6	105	104.392	-0.608	0.17
7	105	104.551	-0.449	0.17
8	105	104.532	-0.468	0.17
9	105	104.448	-0.552	0.17
10	105	104.395	-0.605	0.17
11	105	104.530	-0.470	0.17
12	105	104.648	-0.352	0.17
13	105	105.110	0.110	0.17
14	105	105.241	0.241	0.17
15	105	105.109	0.109	0.17

UUC* = Unit under calibration

25-1-65



Certificate No. : MT22-1359

Page : 3 of 4

Function : Temperature measurement

Result : Without adjustment

Calibration point : 105, 150 °C

Immersion depth : 50 mm.

Position No.	UUC* setting (°C)	Standard reading (°C)	UUC* correction (°C)	Uncertainty of measurement (+/- °C)
16	105	104.521	-0.479	0.17
17	105	104.633	-0.367	0.17
18	105	105.114	0.114	0.17
19	105	105.228	0.228	0.17
20	105	104.821	-0.179	0.17
21	105	104.648	-0.352	0.17
22	105	104.652	-0.348	0.17
23	105	104.533	-0.467	0.17
24	105	104.482	-0.518	0.17
25	105	104.421	-0.579	0.17

Function : Temperature measurement (Cont.)

Result : Without adjustment

Calibration point : 105, 150 °C

Immersion depth : 50 mm.

Position No.	UUC* setting (°C)	Standard reading (°C)	UUC* correction (°C)	Uncertainty of measurement (+/- °C)
1	150	149.354	-0.646	0.17
2	150	149.542	-0.458	0.17
3	150	149.368	-0.632	0.17
4	150	149.554	-0.446	0.17
5	150	149.635	-0.365	0.17
6	150	149.582	-0.418	0.17
7	150	149.688	-0.312	0.17
8	150	149.624	-0.376	0.17
9	150	149.522	-0.478	0.17
10	150	149.501	-0.499	0.17
11	150	150.114	0.114	0.17
12	150	150.201	0.201	0.17
13	150	150.118	0.118	0.17
14	150	150.109	0.109	0.17
15	150	150.111	0.111	0.17

UUC* = Unit under calibration

**Inctech Metrological Center Co.Ltd.**

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Saimai, Bangkok 10220, Thailand

Tel. (662) 909-8820 (Auto 10 lines) www.imcinstrument.comCalibration Cert. # 3884.01
ISO/IEC 17025

Certificate No. : MT22-1359

Page : 4 of 4

Function : Temperature measurement

Result : Without adjustment

Calibration point : 105, 150 °C

Immersion depth : 50 mm.

Position No.	UUC* setting (°C)	Standard reading (°C)	UUC* correction (°C)	Uncertainty of measurement (+/- °C)
16	150	149.902	-0.098	0.17
17	150	149.745	-0.255	0.17
18	150	149.702	-0.298	0.17
19	150	149.828	-0.172	0.17
20	150	149.741	-0.259	0.17
21	150	149.822	-0.178	0.17
22	150	149.836	-0.164	0.17
23	150	149.878	-0.122	0.17
24	150	149.802	-0.198	0.17
25	150	149.798	-0.202	0.17

UUC* = Unit under calibration

-oOo-

25-1-65

Mettler-Toledo (Thailand) Ltd.
846/4 - 846/5 Lasalle Rd., Bangna Tai Sub-District
Bangna District, Bangkok 10260
+66 2723 0382
MT-TH.ServiceSupport@mt.com



Accuracy Calibration Certificate

Customer

Company: ENVIRONMENT RESEARCH&TECHNOLOGY CO., LTD.
Address: 25/114 Moo 6, Soi Chinaket 1, Ngamwongwan Rd., Toongsongho
City: Laksi Contact: Ramita Taengthai
Zip / Postal: 10210
State / Province: Bangkok
Order Number: 
* 0 3 3 2 3 2 8 2 5 2 *

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 (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: 23.8 °C	End: 24.5 °C	Start: 49.7 %	End: 55.1 %

As Found Calibration Date: 19-Jan-2022 Calibrator: 
As Left Calibration Date: N/A
Issue Date: 20-Jan-2022
Approved Signatory: 
☒ Kassakorn Tassanachaisakul
☐ Santi Jitniyom
☐ Surachet Sukkate

Measurement Results

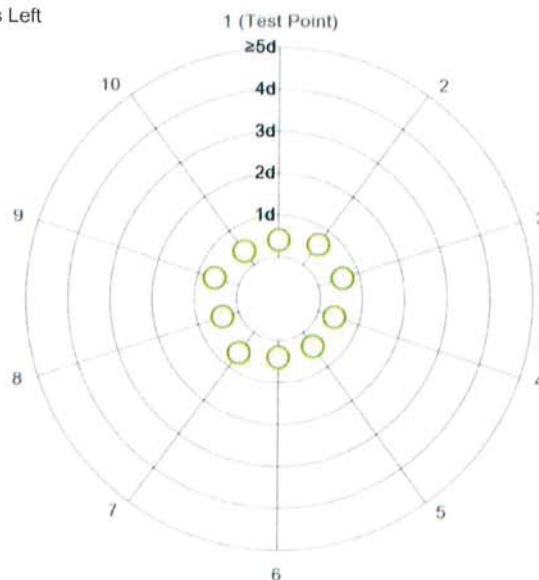
Repeatability

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	99.9999 g	N/A
5	99.9999 g	N/A
6	99.9999 g	N/A
7	99.9998 g	N/A
8	99.9999 g	N/A
9	99.9998 g	N/A
10	99.9999 g	N/A

Standard Deviation	0.00005 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.

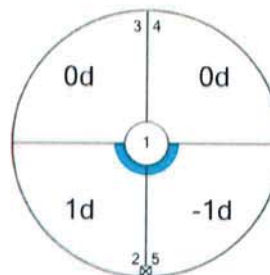
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

Test Load: 100 g

Position	As Found	As Left
1	99.9998 g	N/A
2	99.9999 g	N/A
3	99.9998 g	N/A
4	99.9998 g	N/A
5	99.9997 g	N/A

Maximum Deviation	0.0001 g	N/A
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As Found

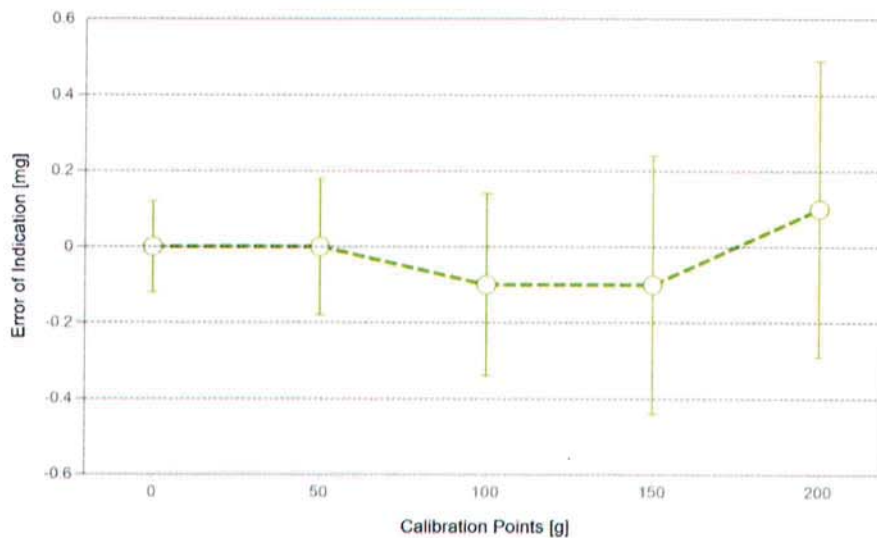
The "d" in the graph represents the readability of the range/interval in which the test was performed.



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	0.13 mg	2
5	1.0000 g	1.0000 g	0.0000 g	0.13 mg	2
6	5.0000 g	5.0000 g	0.0000 g	0.14 mg	2
7	10.0000 g	10.0000 g	0.0000 g	0.14 mg	2
8	50.0000 g	50.0000 g	0.0000 g	0.18 mg	2
9	99.9999 g	99.9998 g	-0.0001 g	0.24 mg	2
10	149.9999 g	149.9998 g	-0.0001 g	0.34 mg	2
11	199.9999 g	200.0000 g	0.0001 g	0.39 mg	2



○ As Found

◆ As Left

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

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

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

Test Equipment

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

Weight Set 1: OIML E2

Weight Set No.:	WS03	Date of Issue:	21-Sep-2021
Certificate Number:	175498	Calibration Due Date:	14-Mar-2023

Thermo Hygrometer

Equipment No.:	IN281	Date of Issue:	25-May-2021
Certificate Number:	21H1100	Calibration Due Date:	10-May-2022

Remarks

FACT adjustment functionality activated

Equipment condition: Good

Next calibration according to customer's procedure

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: 4 K

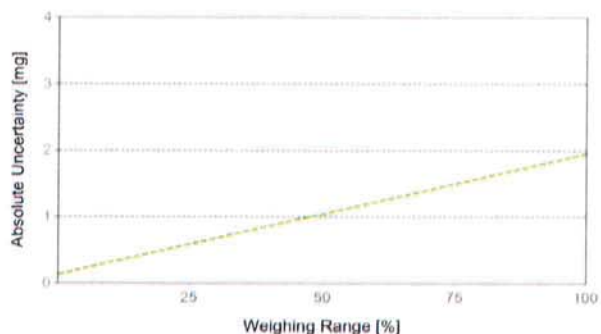
Linearization of Uncertainty Equation

Range			As Found	As Left
	d	Max		
1	0.0001 g	220 g	$U_1 = 0.13 \text{ mg} + 0.00828 \text{ mg/g} \cdot R$	N/A

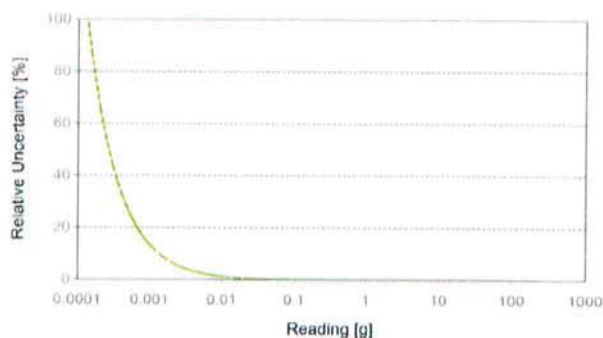
To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

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	0.15 mg	0.0067%	N/A	N/A
22.0000 g	0.31 mg	0.0014%	N/A	N/A
220.0000 g	2.0 mg	0.00089%	N/A	N/A



As Found



As Left

26-1-65

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.

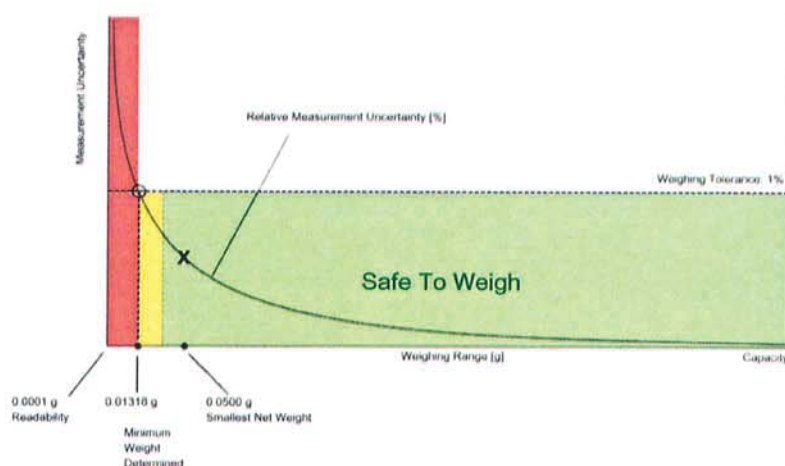
Process Requirements

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					
Tolerance	Safety Factor				
	1	2	3	5	10
0.1%	0.13276 g	0.26775 g	0.40503 g	0.68670 g	1.43539 g
0.2%	0.06610 g	0.13276 g	0.19997 g	0.33610 g	0.68670 g
0.5%	0.02637 g	0.05284 g	0.07939 g	0.13276 g	0.26775 g
1%	0.01318 g	0.02637 g	0.03960 g	0.06610 g	0.13276 g
2%	0.00659 g	0.01318 g	0.01977 g	0.03298 g	0.06610 g
5%	0.00263 g	0.00527 g	0.00790 g	0.01318 g	0.02637 g



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

As Left Minimum Weight Table

Minimum weights for different weighing tolerances and safety factors					
Tolerance	Safety Factor				
	1	2	3	5	10
0.1%	0.13276 g	0.26775 g	0.40503 g	0.68670 g	1.43539 g
0.2%	0.06610 g	0.13276 g	0.19997 g	0.33610 g	0.68670 g
0.5%	0.02637 g	0.05284 g	0.07939 g	0.13276 g	0.26775 g
1%	0.01318 g	0.02637 g	0.03960 g	0.06610 g	0.13276 g
2%	0.00659 g	0.01318 g	0.01977 g	0.03298 g	0.06610 g
5%	0.00263 g	0.00527 g	0.00790 g	0.01318 g	0.02637 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**

Reference Value	Error	Control limits for various weighing tolerances					
		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
199.9999 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

Reference Value	Error	Control limits for various weighing tolerances					
		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
199.9999 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.

Service Date: 2022-01-19
 Document Number: TH2065-164-011922-LABBalanceHR
 ENVIRONMENT RESEARCH&TECHNOLOGY CO., LTD
 25/114 Moo 6, Soi Chinaket 1, Ngamwongwan Rd., Toongsongho ถนนวิภาวดีรังสิต, Laksi, Bangkok 10210
 Ramita Taengthai

METTLER TOLEDO

Balance Health Report

Device Details

System Details			
Manufacturer:	Mettler Toledo	Accessory 1:	
Model:	MS204TS	Accessory 2:	
Serial number:	B547728937	Weight set for routine testing:	Yes /
Firmware:	3.50		

History

Device History		Service History	
Instrument in use:	Yes	Last preventive maintenance:	< 1 year
Instrument age:	3-10 years	Last instrument calibration:	< 1 year
Spare parts available:	Yes	Last minimum weight determination:	< 1 year
Regulations:	ISO	Routine testing performed:	Yes
Process tolerance in %:	1%		
Smallest sample net weight:	0.0500 g		

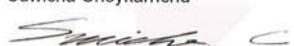
Check List

Environmental Conditions		General & Functional Checks	
Room temperature fluctuation	✓	Levelling	✓
Exposure to direct sun	✓	Cleanliness	✓
Vibrations	✓	Completeness - missing parts see additional remarks	✓
Draft	✓	Settings optimized for operating environment	✓
Dirt or dust	✓	Other - objections noted as additional remarks	—
Static	✓	Electrical Component Checks	
Mechanical Component Checks		Power supply	✓
Draft shield	✓	Sliding door drive	✓
Weighing pan position	✓	Internal weight drive	✓
Housing	✓	Display	✓
Other - objections noted as additional remarks	—	Other - objections noted as additional remarks	—

Recommendations

Measurement Result Quality		Process Efficiency	
Instrument calibration		Uninstall instrument	
Identify safe weighing range		Replace instrument	
GWP verification / risk assessment		Replace / add parts (see additional remarks)	
Preventive maintenance		Onsite repair	
Perform routine testing with test weights		Depot repair	
User training		Use of accessories (see additional remarks)	

Contact Name: Ramita Taengthai Position: N/A Phone: 0866334490 Email: ramita@enviresearch.co.th

Additional Remarks & Recommendations		Engineer Details	
		Date:	19-Jan-2022
		Name:	Suwicha Choykamchu
		Signature:	

This is not a certificate.

It should not be used to interpret final results for the testing of these devices.

Legend: ✓ Good/Pass ⚠ Needs Attention ✗ Bad/Fail — Not Applicable

26-1-65

Metrohm

Compliance Service

Calibration Certificate (CC) for 930 Compact IC Flex

Instrument details

Type:	1.930.2560
Serial No.:	221307/ME (1930200024120)
Manufacturer:	Metrohm AG Ionenstrasse CH-9100 Herisau Switzerland
Customer instrument ID:	N/A
System Designation Number:	CAL220387/ME

Customer details

Name of company:	Environment Research & Technology Company Limited
Address:	25/114 Moo 6 Soi Chinaket 1, Ngamwongwan Road, Toongsonghong, Laksi, Bangkok 10210
Department:	Laboratory
Responsible person:	คุณเสาวจิต ภาณุวัฒน์
Calibration place:	Laboratory Environment Research & Technology Company Limited

Date and time of calibration:	07/06/2022 - 08:45
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Calibration Certificate (CC)

Introduction

The instrument stated above has been inspected in accordance with the corresponding test instructions of Metrohm Ltd. Servicing instructions are compiled and checked for correctness with account taken of the technical apparatus and ambient conditions available to the service engineer at the servicing location. This Calibration Certificate (CC) declares the results regarding calibration and operational status obtained when carrying out the test instructions referred to below.

Calibration status

We certify that the instrument stated above meets or exceeds the electrical specifications at the points tested. Test equipment is calibrated and traceable back to national and/or international standards (ISO 17025, NIST).

Operational status

We certify that the instrument stated above executes the instrument's specific functions tested except where detailed overleaf.

Declaration

Protocol

	Yes	No
Instrument had to be repaired beforehand If yes, see Calibration Certificate (CC) No.:	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Instrument had to be readjusted beforehand If yes, see Calibration Certificate (CC) No.:	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Conclusion of test results

	Yes	No
Instrument satisfies the specified technical requirements	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Recommended date for next maintenance:		

Comments

Metrohm representative

	Yes	No
Metrohm representative confirms correct execution of instrument calibration	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Date	Name	Signature
07/06/2022	Mr.Prutchaya Kumpaiee	Prutchaya K.

Customer representative

	Yes	No
Customer representative accepts results of instrument calibration	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Date	Name	Signature
07/06/2022	คุณสายใจ ลาตบัวขาว	สายใจ ลาตบัวขาว

Test results

Module	Module Calibration Certificate No.	Pass		
		Yes	No	N/A
930 Basic unit	221307/ME (24120)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Professional IC pump	221307/ME (29512)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Professional Injector / Valve	221307/ME (25047)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Professional Degasser	221307/ME (24427)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Professional Peristaltic pump	221307/ME (23748)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Professional MSM	221307/ME (05503)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Professional MCS	221307/ME (24570)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

CC.930 Document History

Date	Article no.	Author	Description/Changes
24.05.2013	8.930.3002EN	Stephan Wohlwender	Creation

End of CC Document

Document Type	Calibration Certificate (CC)
Description	CC for 930 Basic unit
Document ID	CC.930 Basic unit Version 1.0 / 8.930.3001EN

Metrohm

Compliance Service

Module Calibration Certificate (CC) for 930 Basic unit

Module

Assembly No.:	3.940.1200
Serial No.:	221307/ME (24120)
Firmware:	5.940.0101
Date and time of calibration:	07/06/2022 - 08:45

Instrument

Type:	1.930.2560
Serial No.:	1930200024120
System Designation Number:	CAL220387/ME

Declaration

Document

Test instructions used:	C.1 Test instructions for 930 Basic unit, Version 1.0
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Reference standards

Type / Model	Manufacturer	Serial No. / Batch No.	Certificate No.	Due date / Expiry date
Multimeter	Fluke	88490190	E1U222184	25/05/2023
Temperature meas. Instr.	DTM3000	3332/T19	TMU211732	16/06/2022

Test results

No.	Title	Comments	Pass		
			Yes	No	N/A
100	Visual test		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
101	Safety test		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
102	LED		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
103	Fan		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
104	Communication		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
105	Leak detector		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
106	MSB interface		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
107	USB interface		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
108	Column plug interface		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Document Type	Calibration Certificate (CC)
Description	CC for 930 Basic unit
Document ID	CC.930 Basic unit Version 1.0 / 8.930.3001EN

No.	Title	Comments	Pass		
			Yes	No	N/A
109	Column heater (optional)				
	109.1 Temperature absolute				
		Nominal value [°C]	Measured value [°C]	Tolerance [°C]	
	Set temperature	35.0	35.4	± 0.5	
			<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	109.2 Temperature stability				
		Maximum t [°C]	Minimum t [°C]	Tolerance [°C]	
		35.005	34.986	<0.05	
			<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

CC.930 Basic unit Document History

Date	Article no.	Author	Description/Changes
24.05.2013	8.930.3001EN	Stephan Wohlwender	Creation

End of CC Document

Metrohm

Compliance Service

Module Calibration Certificate (CC) for Professional Degasser

Module

Assembly No.:	3.850.3410
Serial No.:	221307/ME (24427)
Date and time of calibration:	07/06/2022 - 08:45

Instrument

Type:	1.930.2560
Serial No.:	1930200024120
System Designation Number:	CAL220387/ME

Declaration

Document

Test instructions used:	C.1 Test instructions for Professional Degasser, Version 1.0
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Reference standards

Type / Model	Manufacturer	Serial No. / Batch No.	Certificate No.	Due date / Expiry date

Test results

No.	Title	Comments	Pass		
			Yes	No	N/A
100	Communication		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
101	Vacuum build-up		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

CC.Professional Degasser Document History

Date	Article no.	Author	Description/Changes
21.05.2013	8.940.3004EN	Stephan Wohlwender	Creation

End of CC Document

Metrohm

Compliance Service

Module Calibration Certificate (CC) for Professional Injector / Valve

Module

Assembly No.:	3.850.3060
Serial No.:	21307/ME (25047)
Date and time of calibration:	07/06/2022 - 08:45

Instrument

Type:	1.930.2560
Serial No.:	1930200024120
System Designation Number:	CAL220387/ME

Declaration

Document

Test instructions used:	C.1 Test instructions for Professional Injector / Valve, Version 1.0
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Reference standards

Type / Model	Manufacturer	Serial No. / Batch No.	Certificate No.	Due date / Expiry date

Document Type	Calibration Certificate (CC)
Description	CC for Professional Injector / Valve
Document ID	CC.Professional Injector / Valve Version 1.0 / 8.940.3003EN

Test results

No.	Title	Comments	Pass		
			Yes	No	N/A
100	Communication		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
101	Switching operation		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

CC.Professional Injector / Valve Document History

Date	Article no.	Author	Description/Changes
21.05.2013	8.940.3003EN	Stephan Wohlwender	Creation

End of CC Document

Metrohm

Compliance Service

Module Calibration Certificate (CC) for Professional MCS

Module

Assembly No.:	3.850.3410
Serial No.:	221307/ME (24570)
Date and time of calibration:	07/06/2022 - 08:45

Instrument

Type:	1.930.2560
Serial No.:	1930200024120
System Designation Number:	CAL220387/ME

Declaration

Document

Test instructions used:	C.1 Test instructions for Professional MCS, Version 1.0
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Reference standards

Type / Model	Manufacturer	Serial No. / Batch No.	Certificate No.	Due date / Expiry date
Flow meter	ANALYT-MTC	94306	AD2201-280-0001	31/01/2023

Test results

No.	Title	Comments	Pass		
			Yes	No	N/A
100	Communication		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
101	Vacuum build-up		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

No.	Title		Yes	No	N/A
102	Air flow without cartridge		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Nominal value [sccm]	Measured value [sccm]			
	10.0 – 15.0	14.8	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

No.	Title		Yes	No	N/A
103	Air flow with cartridge		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Nominal value [sccm]	Measured value [sccm]			
	>8.0	14.7	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

CC.Professional MCS Document History

Date	Article no.	Author	Description/Changes
21.05.2013	8.940.3005EN	Stephan Wohlwender	Creation

End of CC Document

Metrohm

Compliance Service

Module Calibration Certificate (CC) for Professional Peristaltic pump

Module

Assembly No.:	3.850.3200
Serial No.:	221307/ME (23748)
Date and time of calibration:	07/06/2022 - 08:45

Instrument

Type:	1.930.2560
Serial No.:	1930200024120
System Designation Number:	CAL220387/ME

Declaration

Document

Test instructions used:	C.1 Test instructions for Professional Peristaltic pump, Version 1.0
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Reference standards

Type / Model	Manufacturer	Serial No. / Batch No.	Certificate No.	Due date / Expiry date

Document Type	Calibration Certificate (CC)
Description	CC for Professional Peristaltic pump
Document ID	CC.Professional Peristaltic pump Version 1.0 / 8.940.3007EN

Test results

No.	Title	Comments	Pass		
			Yes	No	N/A
100	Communication		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
101	Rotation CW		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
102	Rotation CCW		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
103	Speed control		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

CC.Professional Peristaltic pump Document History

Date	Article no.	Author	Description/Changes
21.05.2013	8.940.3007EN	Stephan Wohlwender	Creation

End of CC Document

Metrohm

Compliance Service

Module Calibration Certificate (CC) for Professional IC pump

Module

Assembly No.:	3.850.3000
Serial No.:	221307/ME (29512)
Date and time of calibration:	07/06/2022 - 08:45

Instrument

Type:	1.930.2560
Serial No.:	1930200024120
System Designation Number:	CAL220387/ME

Declaration

Document

Test instructions used:	C.1 Test instructions for Professional IC pump, Version 1.0
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Reference standards

Type / Model	Manufacturer	Serial No. / Batch No.	Certificate No.	Due date / Expiry date
High pressure gauge	Metrohm	05108	CAL0252-21Q0119	22/09/2022

Test results

No.	Title	Comments	Pass		
			Yes	No	N/A
100	Installation		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
101	Communication		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
102	Pump head detection		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
103	Deaerate		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
104	Pump dynamics		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

No.	Title	Pass		
		Yes	No	N/A
105	Pulsation			
		Maximum [MPa]	Minimum [MPa]	Difference [%]
	Standard pump head	11.02	10.74	<5.0
	Macro pump head	N/A	N/A	<10.0

No.	Title	Pass		
		Yes	No	N/A
106	Pressure transducer			
		Nominal value [MPa]	Measured value [MPa]	Tolerance [%]
		10.91	11	± 10.0

Document Type	Calibration Certificate (CC)
Description	CC for Professional IC pump
Document ID	CC.Professional IC pump Version 1.0 / 8.940.3002EN

No.	Title	Pass				
		Yes	No	N/A		
107	Flow rate					
		Nominal value [mL]	Measured value [mL]	Tolerance [mL]		
	Standard pump head	4.0	4.1	± 0.2	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Macro pump head	20.0	N/A	± 1.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>

No.	Title	Comments	Pass		
			Yes	No	N/A
108	Shut off at minimum pressure		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
109	Shut off at maximum pressure		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

No.	Title	Pass				
		Yes	No	N/A		
110	Leak test					
		Maximum [MPa]	Minimum [MPa]	Difference [MPa]		
		18.45	17.95	<1.0	<input checked="" type="checkbox"/>	<input type="checkbox"/>

CC.Professional IC pump Document History

Date	Article no.	Author	Description/Changes
21.05.2013	8.940.3002EN	Stephan Wohlwender	Creation

End of CC Document

Metrohm

Compliance Service

Module Calibration Certificate (CC) for Professional MSM

Module

Assembly No.:	3.940.3000
Serial No.:	221307/ME (05503)
Date and time of calibration:	07/06/2022 - 08:45

Instrument

Type:	1.930.2560
Serial No.:	1930200024120
System Designation Number:	CAL220387/ME

Declaration

Document

Test instructions used:	C.1 Test instructions for Professional MSM, Version 1.0
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Reference standards

Type / Model	Manufacturer	Serial No. / Batch No.	Certificate No.	Due date / Expiry date

Document Type	Calibration Certificate (CC)
Description	CC for Professional MSM
Document ID	CC.Professional MSM Version 1.0 / 8.940.3006EN

Test results

No.	Title	Comments	Pass		
			Yes	No	N/A
100	Communication		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
101	Switching operation		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

CC.Professional MSM Document History

Date	Article no.	Author	Description/Changes
21.05.2013	8.940.3006EN	Stephan Wohlwender	Creation

End of CC Document

Metrohm

Compliance Service

Calibration Certificate (CC) for 850.9010 Conductivity Detector

Instrument details

Type:	18509010
Serial No.:	221308/ME (1850901042128)
Manufacturer:	Metrohm AG, Ionenstrasse, CH-9100 Herisau Switzerland
Customer instrument ID:	N/A
System Designation Number:	CAL220387/ME

Control device details

Type:	1.930.2560
Serial No.:	1930200024120
Firmware:	5.940.0101

Customer details

Name of company:	Environment Research & Technology Company Limited
Address:	25/114 Moo 6 Soi Chinaket 1, Ngamwongwan Road, Toongsonghong, Laksi, Bangkok 10210
Department:	Laboratory
Responsible person:	คุณสาธิตใจ อากนันทชาว
Calibration place:	Laboratory Environment Research & Technology Company Limited

Date and time of calibration:	07/06/2022 - 08:45
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Calibration Certificate (CC)

Introduction

The instrument stated above has been inspected in accordance with the corresponding test instructions of Metrohm Ltd. Servicing instructions are compiled and checked for correctness with account taken of the technical apparatus and ambient conditions available to the service engineer at the servicing location. This Calibration Certificate (CC) declares the results regarding calibration and operational status obtained when carrying out the test instructions referred to below.

Calibration status

We certify that the instrument stated above meets or exceeds the electrical specifications at the points tested. Test equipment is calibrated and traceable back to national and/or international standards (ISO 17025, NIST).

Operational status

We certify that the instrument stated above executes the instrument's specific functions tested except where detailed overleaf.

Declaration

Document

Test instructions used:	C.1 Test instructions for 850.9010 Conductivity Detector, Version 1.3
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Reference standards

Type / Model	Manufacturer	Serial No. / Batch No.	Certificate No.	Due date / Expiry date
Temperature meas. Instr.	DTM3000	3332/T19	TMU211732	16/06/2022
Conductivity standard (opt.)	Metrohm	21190059	12-0187	25/08/2022

Protocol

	Yes	No
Instrument had to be repaired beforehand If yes, see Calibration Certificate (CC) No.:	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Instrument had to be readjusted beforehand If yes, see Calibration Certificate (CC) No.:	<input type="checkbox"/>	<input checked="" type="checkbox"/>


Document Type	Calibration Certificate (CC)
Description	CC for 850.9010 Conductivity Detector
Document ID	CC.850 Version 1.3 / 8.850.3022EN

Conclusion of test results


	Yes	No
Instrument satisfies the specified technical requirements	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Recommended date for next maintenance:		

Comments

Metrohm representative

	Yes	No
Metrohm representative confirms correct execution of instrument calibration	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Date	Name	Signature
07/06/2022	Mr.Prutchaya Kumpaiee	

Customer representative

	Yes	No
Customer representative accepts results of instrument calibration	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Date	Name	Signature
07/06/2022	คุณศุภชัย หาดบัวขาว	

Test results

No.	Title	Comments	Pass		
			Yes	No	N/A
100	Communication		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

No.	Title				Pass		
					Yes	No	N/A
101	Temperature absolute						
		Nominal value [°C]	Measured value [°C]	Tolerance [°C]			
		Temperature 1	34.996	35.4	± 1.0	<input checked="" type="checkbox"/>	<input type="checkbox"/>
		Temperature 2	40.001	40.1	± 1.0	<input checked="" type="checkbox"/>	<input type="checkbox"/>

No.	Title				Pass		
					Yes	No	N/A
102	Temperature stability						
		Maximum t [°C]	Minimum t [°C]	Difference [°C]			
		40.001	39.998	< 0.010	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

No.	Title				Pass		
					Yes	No	N/A
103	Signal noise						
		Drift compensated [nS/cm]		Tolerance [nS/cm]			
		1 M	0.251	< 0.4	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		20 k 5	4.386	< 10.0	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

No.	Title	Comments	Pass		
			Yes	No	N/A
104	Conductivity dry test		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

No.	Title	Pass		
		Yes	No	N/A
105	Conductivity cell (optional)			
105.1	System installation and preparation	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
105.2	Write a method	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
105.3	Measurement			
	Nominal value [µS/cm]	Measured value [µS/cm]	Tolerance [%]	
	91.32	92.31	± 10	<input checked="" type="checkbox"/>

CC.850 Document history

Date	Article No.	Author	Description/Changes
26.04.2012	8.850.3022EN	Philipp Rüegg	Layout adapted to Metrohm Compliance Service

End of CC Document

Metrohm

Compliance Service

Calibration Certificate (CC) for 863 Compact Autosampler

Instrument details

Type:	18630010
Serial No.:	221309/ME (1863001022147)
Manufacturer:	Metrohm AG Ionenstrasse CH-9100 Herisau Switzerland
Firmware:	5.863.0022
Customer instrument ID:	N/A
System Designation Number:	CAL220387/ME

Customer details

Name of company:	Environment Research & Technology Company Limited
Address:	25/114 Moo 6 Soi Chinaket 1, Ngamwongwan Road, Toongsonghong, Laksi, Bangkok 10210
Department:	Laboratory
Responsible person:	นายณัฏฐพร นิลนันทน์
Calibration place:	Laboratory Environment Research & Technology Company Limited

Date and time of calibration:	07/06/2022 - 11:15
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System Designation Number: CAL220387/ME

Calibration Certificate (CC) No.: 221309/ME (1863001022147) - 07/06/2022 - 11:15

Document Type	Calibration Certificate (CC)
Description	CC for 863 Compact Autosampler
Document ID	CC.863 Version 1.0 / 8.863.3003EN

Calibration Certificate (CC)

Introduction

The instrument stated above has been inspected in accordance with the corresponding test instructions of Metrohm Ltd. Servicing instructions are compiled and checked for correctness with account taken of the technical apparatus and ambient conditions available to the service engineer at the servicing location. This Calibration Certificate (CC) declares the results regarding calibration and operational status obtained when carrying out the test instructions referred to below.

Calibration status

We certify that the instrument stated above meets or exceeds the electrical specifications at the points tested. Test equipment is calibrated and traceable back to national and/or international standards (ISO 17025, NIST).

Operational status

We certify that the instrument stated above executes the instrument's specific functions tested except where detailed overleaf.

Declaration

Document

Test instructions used:	C.1 Test instructions for 863 Compact Autosampler, Version 1.0
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Reference standards

Type / Model	Manufacturer	Serial No. / Batch No.	Certificate No.	Due date / Expiry date
Multimeter	Fluke	88490190	E1U222184	25/05/2023

Protocol

	Yes	No
Instrument had to be repaired beforehand If yes, see Calibration Certificate (CC) No.:	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Instrument had to be readjusted beforehand If yes, see Calibration Certificate (CC) No.:	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Conclusion of test results

	Yes	No
Instrument satisfies the specified technical requirements	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Recommended date for next maintenance:		

Comments

Metrohm representative

	Yes	No
Metrohm representative confirms correct execution of instrument calibration	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Date	Name	Signature
07/06/2022	Mr.Prutchaya Kumpaiee	<i>Prutchaya K.</i>

Customer representative

	Yes	No
Customer representative accepts results of instrument calibration	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Date	Name	Signature
07/06/2022	คุณเสวยใจ ลาคนัวขาว	<i>เสวยใจ ลาคนัวขาว</i>

Test results

No.	Title	Comments	Pass		
			Yes	No	N/A
100	Visual check		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
101	Safety check		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
102	Getting started (system self test)		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
103	Serial number, date and time check		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
104	Prepare the instrument for diagnosis		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
105	Display test		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
106	Keyboard test		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
107	Prepare the instrument for service		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
108	Contrast test		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
109	Remote test		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

No.	Title	Comments	Pass		
			Yes	No	N/A
110	RS bridge test (USB-RS232-bridge)		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	RS-232/1		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	RS-232/2		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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No.	Title	Comments	Pass		
			Yes	No	N/A
111	Table test		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
112	Lift test		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
113	Peristaltic pump test		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
115	Test end		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

CC.863 Document history

Date	Article No.	Author	Description/Changes
03.08.2011	8.863.3003EN	Giuseppe Conte	Layout adapted to Metrohm Compliance Service

End of CC document