

หนังสือขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน และใบอนุญาตเป็นผู้ให้บริการตรวจวัด
และวิเคราะห์ระดับความเข้มข้นของสารเคมีอันตรายในบรรยากาศ
ของสถานที่ทำงานและสถานที่เก็บรักษาสารเคมีอันตราย
ระดับความร้อน แสงสว่าง และเสียง จากกรมสวัสดิการและคุ้มครองแรงงาน



ที่ อก ๐๓๒๐/๑๑๓๔๒

กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

๒๗ กรกฎาคม ๒๕๖๖

เรื่อง ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท อีสเทิร์น ไทย คอนซัลติง ๑๙๙๒ จำกัด

อ้างถึง คำขอต่ออายุของห้องปฏิบัติการวิเคราะห์เอกชน ลงวันที่ ๗ มิถุนายน ๒๕๖๖

สิ่งที่ส่งมาด้วย เอกสารแนบท้ายหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

๑. รายชื่อผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๔๐ ราย
๒. รายชื่อเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๒๕ ราย
๓. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๒๙๒ รายการ จำนวน ๑๙ แผ่น

ตามหนังสือที่อ้างถึง บริษัท อีสเทิร์น ไทย คอนซัลติง ๑๙๙๒ จำกัด ขอต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ๖-๐๐๓ สถานที่ตั้งเลขที่ ๖๘๓ หมู่ที่ ๑๑ ถนนสุขาภิบาล ๘ ตำบลหนองขาม อำเภอศรีราชา จังหวัดชลบุรี ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท อีสเทิร์น ไทย คอนซัลติง ๑๙๙๒ จำกัด ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน โดยมีองค์ประกอบดังนี้

- ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๔๐ ราย ตามสิ่งที่ส่งมาด้วย ๑
- ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๒๕ ราย ตามสิ่งที่ส่งมาด้วย ๒
- ค. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย จำนวน ๔๗ รายการ อากาศเสีย (ปล่องระบาย) จำนวน ๒๑ รายการ น้ำใต้ดิน จำนวน ๑๑๑ รายการ สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน ๑๘ รายการ และดิน จำนวน ๙๕ รายการ รวมทั้งสิ้นจำนวน ๒๙๒ รายการ ตามสิ่งที่ส่งมาด้วย ๓

หนังสือฉบับนี้จะหมดอายุในวันที่ ๕ กรกฎาคม ๒๕๖๙ หากประสงค์จะต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอต่อกรมโรงงานอุตสาหกรรม ภายใน ๓๐ วัน ก่อนวันสิ้นอายุของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ทั้งนี้ สามารถยื่นคำขอผ่านระบบอิเล็กทรอนิกส์ได้ทั้งหน้าเว็บไซต์กรมโรงงานอุตสาหกรรม

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายทวี อาพาพันธ์)

ผู้อำนวยการศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก
ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก

โทร. ๐ ๓๓๓๓ ๖๐๕๕ ต่อ ๕๐๐๓-๒

ไปรษณีย์อิเล็กทรอนิกส์ einw@diw.mail.go.th



"อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว"

COPY



เอกสารแนบท้ายหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท อีสเทิร์น ไทย คอนซัลติง ๑๙๙๒ จำกัด เลขทะเบียน ๖-๐๐๓

ที่ อก ๐๓๒๐/๑๑๓๔๒

ลงวันที่ ๒๗ กรกฎาคม ๒๕๖๖

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๔๐ ราย

- | | | |
|---------------------------------|---------------|--------------|
| ๑) นางสาวมาลีเกษ เลขะวิกุล | ทะเบียนเลขที่ | ๖-๐๐๓-ค-๐๐๐๑ |
| ๒) นายวัฒนา โคตรหล้า | ทะเบียนเลขที่ | ๖-๐๐๓-ค-๐๐๐๒ |
| ๓) นางวรรณเพ็ญ เหลาจินดาวัฒน์ | ทะเบียนเลขที่ | ๖-๐๐๓-ค-๐๐๐๓ |
| ๔) นายกะวีร์ สุธาทรัพย์ | ทะเบียนเลขที่ | ๖-๐๐๓-ค-๐๐๐๔ |
| ๕) นางสาวนันท์ณัฏฐ์ แบนทนต์ | ทะเบียนเลขที่ | ๖-๐๐๓-ค-๐๐๐๕ |
| ๖) นางสาวพรนภา หลงคำหงษ์ | ทะเบียนเลขที่ | ๖-๐๐๓-ค-๐๐๐๖ |
| ๗) นางสาวอริสรา ชื่นอารมย์ | ทะเบียนเลขที่ | ๖-๐๐๓-ค-๐๐๐๗ |
| ๘) นางสาวอัมรินทร์ จิตตยโสธร | ทะเบียนเลขที่ | ๖-๐๐๓-ค-๐๐๐๘ |
| ๙) นางสาวจิรพร ปานคง | ทะเบียนเลขที่ | ๖-๐๐๓-ค-๐๐๐๙ |
| ๑๐) นายสุทธา สอนอินทร์ | ทะเบียนเลขที่ | ๖-๐๐๓-ค-๐๐๑๐ |
| ๑๑) นางสาวนันท์ประภา อูยสูงเนิน | ทะเบียนเลขที่ | ๖-๐๐๓-ค-๐๐๑๑ |
| ๑๒) นายธงชัย บุญศักดิ์ | ทะเบียนเลขที่ | ๖-๐๐๓-ค-๐๐๑๒ |
| ๑๓) นางสาวธนัชพร กลิ่นโสภณ | ทะเบียนเลขที่ | ๖-๐๐๓-ค-๐๐๑๓ |
| ๑๔) นายธีระพงษ์ นวลอินทร์ | ทะเบียนเลขที่ | ๖-๐๐๓-ค-๐๐๑๔ |
| ๑๕) นางสาวแพรว พลเสน | ทะเบียนเลขที่ | ๖-๐๐๓-ค-๐๐๑๕ |
| ๑๖) นายทรงพล ผิวอ้วน | ทะเบียนเลขที่ | ๖-๐๐๓-ค-๐๐๑๖ |
| ๑๗) นายภาณุภูมิ บัวสวัสดิ์ | ทะเบียนเลขที่ | ๖-๐๐๓-ค-๐๐๑๗ |
| ๑๘) นางสาวจันทน์ สายพันธ์ | ทะเบียนเลขที่ | ๖-๐๐๓-ค-๐๐๑๘ |
| ๑๙) นายภาณุพงศ์ บำรุงรส | ทะเบียนเลขที่ | ๖-๐๐๓-ค-๐๐๑๙ |
| ๒๐) นางสาวภาณิน จันดีสอน | ทะเบียนเลขที่ | ๖-๐๐๓-ค-๐๐๒๐ |
| ๒๑) นายวรกร ไวยะเสรี | ทะเบียนเลขที่ | ๖-๐๐๓-ค-๐๐๒๑ |
| ๒๒) นางสาววรรณภา ไชยศิริ | ทะเบียนเลขที่ | ๖-๐๐๓-ค-๐๐๒๒ |
| ๒๓) นางสาวพรพิมล ภูมิคอนสาร | ทะเบียนเลขที่ | ๖-๐๐๓-ค-๐๐๒๓ |
| ๒๔) นางสาวธรรมาวรรณ ผลอ้อ | ทะเบียนเลขที่ | ๖-๐๐๓-ค-๐๐๒๔ |
| ๒๕) นางสาวบุญเรือง บุญถม | ทะเบียนเลขที่ | ๖-๐๐๓-ค-๐๐๒๕ |
| ๒๖) นางสาวภัสรินทร์ ป้อมน้อย | ทะเบียนเลขที่ | ๖-๐๐๓-ค-๐๐๒๖ |
| ๒๗) นายชานันต์ โชติวงค์ | ทะเบียนเลขที่ | ๖-๐๐๓-ค-๐๐๒๗ |
| ๒๘) นางสาวพจณี งามวิสัย | ทะเบียนเลขที่ | ๖-๐๐๓-ค-๐๐๒๘ |
| ๒๙) นายวิญญ์ ชิงห์โต | ทะเบียนเลขที่ | ๖-๐๐๓-ค-๐๐๒๙ |
| ๓๐) นางสาวนุกูล อารศรี | ทะเบียนเลขที่ | ๖-๐๐๓-ค-๐๐๓๐ |
| ๓๑) นายศุภฤกษ์ พาดกลาง | ทะเบียนเลขที่ | ๖-๐๐๓-ค-๐๐๓๑ |
| ๓๒) นายณิชาล ทองหล่อ | ทะเบียนเลขที่ | ๖-๐๐๓-ค-๐๐๓๒ |
| ๓๓) นายธรรมรัตน์ โพธิ์ตันคำ | ทะเบียนเลขที่ | ๖-๐๐๓-ค-๐๐๓๓ |
| ๓๔) นายโอชา ขวัญศิริมงคล | ทะเบียนเลขที่ | ๖-๐๐๓-ค-๐๐๓๔ |
| ๓๕) นายเมธี สุขประเสริฐ | ทะเบียนเลขที่ | ๖-๐๐๓-ค-๐๐๓๕ |

COPY

๓๖) นางสาวพรพินันท์ วิริยกุลกุล	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๓๖
๓๗) นางสาวอาภาภรณ์ เสริมสนธิ	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๓๗
๓๘) นางสาวนภัทรธมณต์ ประดิษฐ์นุช	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๓๘
๓๙) นางสาวสุนิษา เอ็งเล้ง	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๓๙
๔๐) นางสาวระพีณ อินัน	ทะเบียนเลขที่	ว-๐๐๓-ค-๐๐๔๐

ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๒๕ ราย

๑) นางสาวดวงกมล เนื้อทอง	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๐๑
๒) นางสาววัชรภรณ์ อินทสุข	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๐๒
๓) นางสาวกัญจน์กวีภา จันทร์ชอดแก้ว	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๐๓
๔) นางสาวฉัตรสุดา มงคลโกชนัน	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๐๔
๕) นางสาวณัฐวดี อำมาตย์คัน	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๐๕
๖) นางสาวนอรธมา ปาระ	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๐๖
๗) นางสาวธัญลักษณ์ ชื่นไธ	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๐๗
๘) นางสาวสุทธิดา สร้างแก้ว	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๐๘
๙) นายอุดมทรัพย์ เจริญจริง	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๐๙
๑๐) นายนราธิป สงวนศิลป์	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๑๐
๑๑) นายวีระชัย พอใจ	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๑๑
๑๒) นายอัญชลี ทะพงษ์	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๑๒
๑๓) นางสาวสุมลิตรา มีแก่น	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๑๓
๑๔) นางสาวสุวรรยา เพชรประไพ	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๑๔
๑๕) นางสาวจุฑามาศ เจริญพรหม	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๑๕
๑๖) นางสาวนิภาพร คำชมภู	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๑๖
๑๗) นางสาวอรุษา พันธุ์เมือง	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๑๗
๑๘) นายกิตติ ไทโรจน์	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๑๘
๑๙) นายชาญณรงค์ ตั้งธรรมรักษ์	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๑๙
๒๐) นางสาวปวีศา เอสินเทียม	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๒๐
๒๑) นางสาวจุฑาทิพย์ กิจดี	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๒๑
๒๒) นางสาวสุภาวดี ศรีละออง	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๒๒
๒๓) นางสาวณัฐชยา บรรพบุตร	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๒๓
๒๔) นางสาวณัฐนัช นนตานอก	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๒๔
๒๕) นางสาวดวงสุดา แสนวันดี	ทะเบียนเลขที่	ว-๐๐๓-จ-๐๐๒๕

COPY

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท ฮีสเทิร์น ไทย คอนซัลติง ๑๙๙๒ จำกัด เลขทะเบียน ว-๐๐๓

ที่ อก ๐๓๒๐/๑๑๓๔๒

ลงวันที่ ๒๗ กรกฎาคม ๒๕๖๖

ขอข่ายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๒๕๒ รายการ

น้ำเสีย จำนวน 47 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Aldrin	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[4]
2	Arsenic	1) Continuous Hydride Generation/Atomic Absorption Spectrometric Method ^[4] 2) Digestion, Inductively Coupled Plasma Method ^[4]
3	Barium	Digestion, Inductively Coupled Plasma Method ^[4]
4	α-BHC	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[4]
5	β-BHC	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[4]
6	δ-BHC	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[4]
7	γ-BHC	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[4]
8	Biochemical Oxygen Demand	1) 5-Day BOD Test, Membrane Electrode Method ^[4] 2) 5-Day BOD Test, Azide Modification Method ^[4]
9	Cadmium	Digestion, Inductively Coupled Plasma Method ^[4]
10	Chemical Oxygen Demand	Closed Reflux, Titrimetric Method ^[4]
11	cis-Chlordane	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[4]
12	trans-Chlordane	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[4]
13	Chromium	1) Digestion, Direct Air-Acetylene Flame Method ^[4] 2) Digestion, Inductively Coupled Plasma Method ^[4]

COPY

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
14	Color	ADMI Weighted-Ordinate Spectrophotometric Method ⁽⁴⁾
15	Copper	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
16	Cyanide	Distillation, Colorimetric Method ⁽⁴⁾
17	4,4'-DDD	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽⁴⁾
18	4,4'-DDE	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽⁴⁾
19	DDT	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽⁴⁾
20	Dieldrin	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽⁴⁾
21	Endosulfan I	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽⁴⁾
22	Endosulfan II	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽⁴⁾
23	Endosulfan sulfate	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽⁴⁾
24	Endrin	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽⁴⁾
25	Endrin aldehyde	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽⁴⁾
26	Endrin ketone	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽⁴⁾
27	Formaldehyde	Distillation, Colorimetric Method ⁽³⁾
28	Free Chlorine	1) Iodometric Method ⁽⁴⁾ 2) Colorimetric Method ⁽⁴⁾

COPY

29 Heptachlor...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
29	Heptachlor	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽⁴⁾
30	Heptachlor Epoxide	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽⁴⁾
31	Hexavalent Chromium	Filtration, Colorimetric Method ⁽⁴⁾
32	Lead	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
33	Manganese	Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
34	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽⁴⁾
35	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽⁴⁾
36	Nickel	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
37	Oil and Grease	Liquid-Liquid, Partition-Gravimetric Method ⁽⁴⁾
38	pH	Electrometric Method ⁽⁴⁾
39	Phenols	Distillation, Direct Photometric Method ⁽⁴⁾
40	Selenium	Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ⁽⁴⁾
41	Sulfide	ZnS Precipitation, Iodometric Method ⁽⁴⁾
42	Temperature	Field Method ⁽⁴⁾
43	Trivalent Chromium	1) Digestion, Direct Air-Acetylene Flame Method; Filtration, Colorimetric Method; Calculation ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation ⁽⁴⁾
44	Total Dissolved Solids	Dried at 180 °C ⁽⁴⁾
45	Total Kjeldahl Nitrogen	Macro Kjeldahl Method ⁽⁴⁾
46	Total Suspended Solids	Dried at 103-105 °C ⁽⁴⁾
47	Zinc	Digestion, Inductively Coupled Plasma Method ⁽⁴⁾

COPY

อากาศเสีย...

อากาศเสีย (ปล่อยระบาย) จำนวน 21 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Antimony	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
2	Arsenic	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
3	Cadmium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
4	Carbon Monoxide	1) Bag, Non-Dispersive Infrared Method ^[5] 2) Instrumental Analyzer Method ^[5]
5	Chromium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
6	Cobalt	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
7	Copper	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
8	Hydrogen Sulfide	Absorption Sampling, Iodometric Method ^[5]
9	Lead	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
10	Manganese	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
11	Mercury	Isokinetic Sampling, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[5]
12	Nickel	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
13	Opacity	Ringelmann's Method ^[1,5]
14	Oxides of Nitrogen	1) Absorption Sampling, Phenoldisulfonic Acid Method ^[8] 2) Instrumental Analyzer Method ^[7]
15	Selenium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
16	Sulfur Dioxide	1) Absorption Sampling, Barium-Thorin Titrimetric Method ^[5] 2) Instrumental Analyzer Method ^[5]
17	Sulfuric Acid	Isokinetic Sampling, Barium-Thorin Titrimetric Method ^[5]
18	Tin	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]

COPY

19 Total Suspended Particulate...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
19	Total Suspended Particulate	Isokinetic Sampling, Gravimetric Method ^[6]
20	Vanadium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
21	Xylene	Adsorption Sampling, Gas Chromatographic Method ^[6]

น้ำใต้ดิน จำนวน 111 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
2	Acetone	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
3	Aldrin	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
4	Anthracene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
5	Antimony	Digestion, Inductively Coupled Plasma Method ^[4]
6	Arsenic	1) Continuous Hydride Generation/Atomic Absorption Spectrometric Method ^[4] 2) Digestion, Inductively Coupled Plasma Method ^[4]
7	Barium	Digestion, Inductively Coupled Plasma Method ^[4]
8	Benz(a)anthracene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
9	Benzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
10	Benzo(b)fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
11	Benzo(k)fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
12	Benzo(a)pyrene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
13	Benzo[g,h,i]perylene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
14	Beryllium	Digestion, Inductively Coupled Plasma Method ^[4]

COPY

15 Bis(2-chloroethyl)ether...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
15	Bis(2-chloroethyl)ether	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
16	Bis(2-ethylhexyl)phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
17	Bromodichloromethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
18	Bromoform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
19	Butanol	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
20	Butyl benzyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
21	Cadmium	Digestion, Inductively Coupled Plasma Method ^[4]
22	Carbazole	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
23	Carbon disulfide	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
24	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
25	Chlordane	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
26	p-Chloroaniline	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
27	Chlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
28	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
29	Chloroform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
30	2-Chlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
31	Chromium	1) Digestion, Direct Air-Acetylene Flame Method ^[4] 2) Digestion, Inductively Coupled Plasma Method ^[4]
32	Chromium (III)	1) Digestion, Direct Air-Acetylene Flame Method; Filtration, Colorimetric Method; Calculation ^[4] 2) Digestion, Inductively Coupled Plasma Method; Filtration, Colorimetric Method; Calculation ^[4]

COPY

33 Chromium (VI)

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
33	Chromium (VI)	Filtration, Colorimetric Method ^[4]
34	Chrysene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
35	Cyanide	Distillation, Colorimetric Method ^[4]
36	DDD	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
37	DDE	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
38	DDT	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
39	Dibenz(a,h)anthracene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
40	Di-n-butyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
41	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
42	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
43	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
44	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
45	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
46	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
47	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
48	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
49	2,4-Dichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
50	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
51	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]

COPY

52 Dieldrin...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
52	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
53	Diethyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
54	2,4-Dimethylphenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
55	2,4-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
56	2,6-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
57	Di-n-octyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
58	Endosulfan	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
59	Endrin	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
60	Ethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
61	Fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
62	Fluorene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
63	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
64	Heptachlor epoxide	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
65	Hexachlorobenzene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
66	Hexachloro-1,3-butadiene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
67	n-Hexane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
68	α -HCH	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
69	β -HCH	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]

COPY

70 γ -HCH...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
70	γ -HCH	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
71	Hexachlorocyclopentadiene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
72	Hexachloroethane	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
73	Indeno(1,2,3-cd)pyrene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
74	Isophorone	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
75	Lead	1) Digestion, Direct Air-Acetylene Flame Method ^[4] 2) Digestion, Inductively Coupled Plasma Method ^[4]
76	Manganese	Digestion, Inductively Coupled Plasma Method ^[4]
77	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[4]
78	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
79	Methylene chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
80	2-Methylphenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
81	2-Methylnaphthalene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
82	Methyl tert-butyl ether	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
83	Naphthalene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
84	Nickel	Digestion, Inductively Coupled Plasma Method ^[4]
85	Nitrobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
86	N-Nitrosodi-n-propylamine	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
87	pH	Electrometric Method ^[4]
88	Phenanthrene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]

COPY

89 Phenol...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
89	Phenol	1) Distillation, Direct Photometric Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
90	Pyrene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
91	Selenium	Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ⁽⁴⁾
92	Silver	Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
93	Styrene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
94	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
95	Trichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
96	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
97	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
98	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
99	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
100	Toluene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
101	2,4,5-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
102	2,4,6-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
103	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
104	Vanadium	Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
105	Vinyl acetate	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
106	Vinyl chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾

COPY

107 m-Xylene

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
107	m-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
108	o-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
109	p-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
110	Xylene (Total)	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
111	Zinc	Digestion, Inductively Coupled Plasma Method ⁽⁴⁾

สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน 18 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Antimony	Digestion, Inductively Coupled Plasma Method ^(9,10)
2	Arsenic	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,9,10) 2) Digestion, Inductively Coupled Plasma Method ^(9,10)
3	Barium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,9,10) 2) Digestion, Inductively Coupled Plasma Method ^(9,10)
4	Beryllium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,9,10) 2) Digestion, Inductively Coupled Plasma Method ^(9,10)
5	Cadmium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,9,10) 2) Digestion, Inductively Coupled Plasma Method ^(9,10)
6	Chromium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,9,10) 2) Digestion, Inductively Coupled Plasma Method ^(9,10)
7	Chromium (VI)	1) Waste Extraction, Digestion, Colorimetric Method ^(2,13) 2) Alkaline Digestion, Colorimetric Method ^(9,13)
8	Cobalt	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,9,10) 2) Digestion, Inductively Coupled Plasma Method ^(9,10)
9	Copper	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,9,10) 2) Digestion, Inductively Coupled Plasma Method ^(9,10)

COPY

10 Lead

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ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
10	Lead	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[2,9,10]
11	Mercury	2) Digestion, Inductively Coupled Plasma Method ^[9,10] 1) Waste Extraction, Digestion, Cold Vapor Atomic Absorption Spectrometric Method ^[2,11] 2) Digestion, Cold vapor Atomic Absorption Spectrometric Method ^[9,11]
12	Nickel	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[2,9,10] 2) Digestion, Inductively Coupled Plasma Method ^[9,10]
13	Molybdenum	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[2,9,10] 2) Digestion, Inductively Coupled Plasma Method ^[9,10]
14	Selenium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[2,9,10] 2) Digestion, Inductively Coupled Plasma Method ^[9,10]
15	Silver	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[2,9,10] 2) Digestion, Inductively Coupled Plasma Method ^[9,10]
16	Thallium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[2,9,10] 2) Digestion, Inductively Coupled Plasma Method ^[9,10]
17	Vanadium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[2,9,10] 2) Digestion, Inductively Coupled Plasma Method ^[9,10]
18	Zinc	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[2,9,10] 2) Digestion, Inductively Coupled Plasma Method ^[9,10]

COPY

ดิน...

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ดิน จำนวน 95 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
2	Acetone	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
3	Anthracene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
4	Antimony	Digestion, Inductively Coupled Plasma Method ^[9,10]
5	Arsenic	Digestion, Inductively Coupled Plasma Method ^[9,10]
6	Barium	Digestion, Inductively Coupled Plasma Method ^[9,10]
7	Benz(a)anthracene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
8	Benzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
9	Benzo(b)fluoranthene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
10	Benzo(k)fluoranthene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
11	Benzo(a)pyrene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
12	Benzo[g,h,i]perylene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
13	Beryllium	Digestion, Inductively Coupled Plasma Method ^[9,10]
14	Bis(2-chloroethyl)ether	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
15	Bis(2-ethylhexyl)phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
16	Bromodichloromethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
17	Bromoform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
18	Butanol	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]

COPY

19 Butyl benzyl phthalate...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
19	Butyl benzyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
20	Cadmium	Digestion, Inductively Coupled Plasma Method ^(9,10)
21	Carbazole	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
22	Carbon disulfide	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
23	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
24	p-Chloroaniline	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
25	Chlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
26	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
27	Chloroform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
28	2-Chlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
29	Chromium	Digestion, Inductively Coupled Plasma Method ^(9,10)
30	Chromium (III)	Digestion, Inductively Coupled Plasma Method; Filtration, Colorimetric Method; Calculation ^(9,10)
31	Chromium (VI)	Alkaline Digestion, Colorimetric Method ^(12,13)
32	Chrysene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
33	Dibenz(a,h)anthracene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
34	Di-n-butyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
35	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
36	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
37	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)

COPY

38 1,1-Dichloroethane...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
38	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
39	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
40	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
41	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
42	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
43	2,4-Dichlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
44	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
45	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
46	Diethyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
47	2,4-Dimethylphenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
48	2,4-Dinitrotoluene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
49	2,6-Dinitrotoluene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
50	Di-n-octyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
51	Ethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
52	Fluoranthene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
53	Fluorene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
54	Hexachlorobenzene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
55	Hexachloro-1,3-butadiene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)

COPY

56 n-Hexane...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
56	n-Hexane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
57	Hexachlorocyclopentadiene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
58	Hexachloroethane	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
59	Indeno(1,2,3-cd)pyrene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
60	Isophorone	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
61	Lead	Digestion, Inductively Coupled Plasma Method ^(9,10)
62	Manganese	Digestion, Inductively Coupled Plasma Method ^(9,10)
63	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^(9,11)
64	Methylene chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
65	2-Methylphenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
66	2-Methylnaphthalene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
67	Methyl tert-butyl ether	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
68	Naphthalene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
69	Nickel	Digestion, Inductively Coupled Plasma Method ^(9,10)
70	Nitrobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
71	N-Nitrosodi-n-propylamine	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
72	Phenanthrene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
73	Phenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
74	Pyrene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)

COPY

75 Selenium...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
75	Selenium	Digestion, Inductively Coupled Plasma Method ^(9,10)
76	Silver	Digestion, Inductively Coupled Plasma Method ^(9,10)
77	Styrene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
78	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
79	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
80	Toluene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
81	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
82	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
83	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
84	Trichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
85	2,4,5-Trichlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
86	2,4,6-Trichlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
87	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
88	Vanadium	Digestion, Inductively Coupled Plasma Method ^(9,10)
89	Vinyl acetate	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
90	Vinyl chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
91	m-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
92	o-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
93	p-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)

COPY

94 Xylene (Total)...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
94	Xylene (Total)	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
95	Zinc	Digestion, Inductively Coupled Plasma Method ^(9,10)

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COPY

ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก กรมโรงงานอุตสาหกรรม โทร. ๐ ๓๓๓๓ ๖๐๕๔ ต่อ ๕๐๐๑-๖

ที่ ออก ๐๓๒๐/ ๔๖๐๔



กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๑๔ พฤษภาคม ๒๕๖๗

เรื่อง เปลี่ยนแปลงเอกสารอ้างอิงวิธีวิเคราะห์สารมลพิษ เปลี่ยนแปลงสารมลพิษในดิน และเปลี่ยนแปลงบุคลากร
ของห้องปฏิบัติการวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท อีสเทิร์น ไทย คอนซัลติ้ง ๑๙๙๒ จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๔ มีนาคม ๒๕๖๗

สิ่งที่ส่งมาด้วย เอกสารแนบท้ายหนังสือเปลี่ยนแปลงเอกสารอ้างอิงวิธีวิเคราะห์สารมลพิษ และเปลี่ยนแปลง
สารมลพิษบริษัท อีสเทิร์น ไทย คอนซัลติ้ง ๑๙๙๒ จำกัด จำนวน ๑๒ แผ่น

ตามคำขอฯ ที่อ้างถึง บริษัท อีสเทิร์น ไทย คอนซัลติ้ง ๑๙๙๒ จำกัด ห้องปฏิบัติการวิเคราะห์
เอกชน เลขทะเบียน ๖-๐๐๓ สถานที่ตั้งเลขที่ ๖๘๓ หมู่ที่ ๑๑ ถนนสุขาภิบาล ๘ ตำบลหนองขาม
อำเภอศรีราชา จังหวัดชลบุรี แจ้งขอเปลี่ยนแปลงเอกสารอ้างอิงวิธีวิเคราะห์สารมลพิษในน้ำเสีย น้ำใต้ดิน
เปลี่ยนแปลงสารมลพิษในดิน และเปลี่ยนแปลงบุคลากร นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว มีความเห็นดังนี้

๑. ให้ยกเลิกผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๑ ราย

นายวัฒนา โคตรหล้า ทะเบียนเลขที่ ๖-๐๐๓-จ-๐๐๐๒

๒. ให้ยกเลิกเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๓ ราย

๑) นางสาวอัญชลี ทะพงษ์ ทะเบียนเลขที่ ๖-๐๐๓-จ-๐๐๑๒

๒) นางสาวจุฑามาศ เจริญพรหม ทะเบียนเลขที่ ๖-๐๐๓-จ-๐๐๑๕

๓) นางสาวณัฐนิช นนตานอก ทะเบียนเลขที่ ๖-๐๐๓-จ-๐๐๒๔

๓. ให้ยกเลิกขอบข่ายรายการสารมลพิษในน้ำเสีย และน้ำใต้ดินตามรายการเอกสารแนบท้าย
หนังสือต่ออายุรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชนที่ ออก ๐๓๒๐/๑๑๓๔๒ ลงวันที่ ๒๗ กรกฎาคม ๒๕๖๖

๔. ให้วิเคราะห์สารมลพิษตามขอบข่ายที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย จำนวน ๔๗ รายการ
และน้ำใต้ดิน จำนวน ๑๑๑ รายการ รวมทั้งสิ้นจำนวน ๑๕๘ รายการ ตามเอกสารแนบท้ายหนังสือเปลี่ยนแปลง
เอกสารอ้างอิงวิธีวิเคราะห์สารมลพิษ เปลี่ยนแปลงสารมลพิษในดิน และเปลี่ยนแปลงบุคลากร ดังสิ่งที่ส่งมาด้วย

๕. ให้วิเคราะห์สารมลพิษตามขอบข่ายที่ได้รับขึ้นทะเบียนให้วิเคราะห์เพิ่มเติมในดิน จำนวน
๑๒ รายการ ตามเอกสารแนบท้ายหนังสือเปลี่ยนแปลงเอกสารอ้างอิงวิธีวิเคราะห์สารมลพิษเปลี่ยนแปลงสารมลพิษ
ในดิน และเปลี่ยนแปลงบุคลากร ดังสิ่งที่ส่งมาด้วย

อนึ่ง หนังสือ

COPY



“อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว”



-๒-

อนึ่ง หนังสือฉบับนี้จะหมดอายุพร้อมหนังสือต่ออายุรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์
เอกชนในวันที่ ๕ กรกฎาคม ๒๕๖๙

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

10

(นายพรยศ กลั่นกรอง)

รองอธิบดี ปฏิบัติราชการแทน
อธิบดีกรมโรงงานอุตสาหกรรม

ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก

โทร. ๐ ๓๓๓๓ ๖๐๕๙ ต่อ ๕๐๐๑-๒

ไปรษณีย์อิเล็กทรอนิกส์ airw@diw.mail.go.th



“อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว”



เอกสารแนบท้ายหนังสือเปลี่ยนแปลงเอกสารอ้างอิงวิธีวิเคราะห์สารมลพิษ

บริษัท อีสเทิร์น ไทย คอนซัลติ้ง ๑๙๙๒ จำกัด

เลขทะเบียน ๖-๐๐๓

ที่ อก ๐๓๒๐/

ลงวันที่

ขอขยายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๑๗๐ รายการ

น้ำเสีย จำนวน 47 รายการ

ลำดับ ที่	สารมลพิษ	วิธีวิเคราะห์
1	Aldrin	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[1] 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[1]
2	Arsenic	1) Continuous Hydride Generation/Atomic Absorption Spectrometric Method ^[1] 2) Digestion, Inductively Coupled Plasma Method ^[1]
3	Barium	Digestion, Inductively Coupled Plasma Method ^[1]
4	α-BHC	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[1] 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[1]
5	β-BHC	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[1] 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[1]
6	δ-BHC	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[1] 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[1]
7	γ-BHC	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[1] 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[1]
8	Biochemical Oxygen Demand	1) 5-Day BOD Test, Membrane Electrode Method ^[1] 2) 5-Day BOD Test, Azide Modification Method ^[1]
9	Cadmium	Digestion, Inductively Coupled Plasma Method ^[1]
10	Chemical Oxygen Demand	Closed Reflux, Titrimetric Method ^[1]
11	cis-Chlordane	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[1] 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[1]

COPY 12 trans-Chlordane ...

-๒-

ลำดับ ที่	สารมลพิษ	วิธีวิเคราะห์
12	trans-Chlordane	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[1] 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[1]
13	Chromium	1) Digestion, Direct Air-Acetylene Flame Method ^[1] 2) Digestion, Inductively Coupled Plasma Method ^[1]
14	Color	ADMI Weighted-Ordinate Spectrophotometric Method ^[1]
15	Copper	1) Digestion, Direct Air-Acetylene Flame Method ^[1] 2) Digestion, Inductively Coupled Plasma Method ^[1]
16	Cyanide	Distillation, Colorimetric Method ^[1]
17	4,4'-DDD	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[1] 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[1]
18	4,4'-DDE	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[1] 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[1]
19	DDT	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[1]
20	Dieldrin	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[1] 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[1]
21	Endosulfan I	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[1] 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[1]
22	Endosulfan II	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[1] 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[1]
23	Endosulfan sulfate	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[1] 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[1]
24	Endrin	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[1]

COPY 25 Endrin aldehyde ...

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ลำดับ ที่	สารมลพิษ	วิธีวิเคราะห์
25	Endrin aldehyde	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[1] 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[1]
26	Endrin ketone	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[1] 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[1]
27	Formaldehyde	Distillation, Colorimetric Method ^[4]
28	Free Chlorine	1) Iodometric Method ^[1] 2) Colorimetric Method ^[1]
29	Heptachlor	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[1] 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[1]
30	Heptachlor Epoxide	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[1] 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[1]
31	Hexavalent Chromium	Filtration, Colorimetric Method ^[1]
32	Lead	1) Digestion, Direct Air-Acetylene Flame Method ^[1] 2) Digestion, Inductively Coupled Plasma Method ^[1]
33	Manganese	Digestion, Inductively Coupled Plasma Method ^[1]
34	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[1]
35	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ^[1]
36	Nickel	1) Digestion, Direct Air-Acetylene Flame Method ^[1] 2) Digestion, Inductively Coupled Plasma Method ^[1]
37	Oil and Grease	Liquid-Liquid, Partition-Gravimetric Method ^[1]
38	pH	Electrometric Method ^[1]
39	Phenols	Distillation, Direct Photometric Method ^[1]
40	Selenium	Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[1]

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41 Sulfide ...

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ลำดับ ที่	สารมลพิษ	วิธีวิเคราะห์
41	Sulfide	ZnS Precipitation, Iodometric Method ^[1]
42	Temperature	Field Method ^[1]
43	Trivalent Chromium	1) Digestion, Direct Air-Acetylene Flame Method; Filtration, Colorimetric Method; Calculation ^[1] 2) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation ^[1]
44	Total Dissolved Solids	Dried at 180 °C ^[1]
45	Total Kjeldahl Nitrogen	Macro Kjeldahl Method ^[1]
46	Total Suspended Solids	Dried at 103-105 °C ^[1]
47	Zinc	Digestion, Inductively Coupled Plasma Method ^[1]

น้ำใต้ดิน จำนวน 111 รายการ

ลำดับ ที่	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1]
2	Acetone	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[1]
3	Aldrin	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1]
4	Anthracene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1]
5	Antimony	Digestion, Inductively Coupled Plasma Method ^[1]
6	Arsenic	1) Continuous Hydride Generation/Atomic Absorption Spectrometric Method ^[1] 2) Digestion, Inductively Coupled Plasma Method ^[1]
7	Barium	Digestion, Inductively Coupled Plasma Method ^[1]
8	Benz(a)anthracene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1]

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9 Benzene ...

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ลำดับ ที่	สารมลพิษ	วิธีวิเคราะห์
9	Benzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
10	Benzo(b)fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
11	Benzo(k)fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
12	Benzo(a)pyrene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
13	Benzo[g,h,i]perylene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
14	Beryllium	Digestion, Inductively Coupled Plasma Method ⁽¹⁾
15	Bis(2-chloroethyl)ether	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
16	Bis(2-ethylhexyl)phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
17	Bromodichloromethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
18	Bromoform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
19	Butanol	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
20	Butyl benzyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
21	Cadmium	Digestion, Inductively Coupled Plasma Method ⁽¹⁾
22	Carbazole	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
23	Carbon disulfide	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
24	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾

 25 Chlordane ...

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ลำดับ ที่	สารมลพิษ	วิธีวิเคราะห์
25	Chlordane	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
26	p-Chloroaniline	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
27	Chlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
28	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
29	Chloroform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
30	2-Chlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
31	Chromium	1) Digestion, Direct Air-Acetylene Flame Method ⁽¹⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽¹⁾
32	Chromium (III)	1) Digestion, Direct Air-Acetylene Flame Method; Filtration, Colorimetric Method; Calculation ⁽¹⁾ 2) Digestion, Inductively Coupled Plasma Method; Filtration, Colorimetric Method; Calculation ⁽¹⁾
33	Chromium (VI)	Filtration, Colorimetric Method ⁽¹⁾
34	Chrysene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
35	Cyanide	Distillation, Colorimetric Method ⁽¹⁾
36	DDD	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
37	DDE	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
38	DDT	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
39	Dibenz(a,h)anthracene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾

 40 Di-n-butyl phthalate ...

ลำดับ ที่	สารมลพิษ	วิธีวิเคราะห์
40	Di-n-butyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
41	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
42	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
43	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
44	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
45	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
46	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
47	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
48	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
49	2,4-Dichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
50	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
51	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
52	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
53	Diethyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
54	2,4-Dimethylphenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾

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55 2,4-Dinitrotoluene ...

ลำดับ ที่	สารมลพิษ	วิธีวิเคราะห์
55	2,4-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
56	2,6-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
57	Di-n-octyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
58	Endosulfan	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
59	Endrin	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
60	Ethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
61	Fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
62	Fluorene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
63	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
64	Heptachlor epoxide	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
65	Hexachlorobenzene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
66	Hexachloro-1,3-butadiene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
67	n-Hexane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
68	α -HCH	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
69	β -HCH	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾

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70 γ -HCH ...

ลำดับ ที่	สารมลพิษ	วิธีวิเคราะห์
70	γ -HCH	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1]
71	Hexachlorocyclopentadiene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1]
72	Hexachloroethane	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1]
73	Indeno(1,2,3-cd)pyrene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1]
74	Isophorone	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1]
75	Lead	1) Digestion, Direct Air-Acetylene Flame Method ^[1] 2) Digestion, Inductively Coupled Plasma Method ^[1]
76	Manganese	Digestion, Inductively Coupled Plasma Method ^[1]
77	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[1]
78	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1]
79	Methylene chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[1]
80	2-Methylphenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1]
81	2-Methylnaphthalene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1]
82	Methyl tert-butyl ether	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[1]
83	Naphthalene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[1]
84	Nickel	Digestion, Inductively Coupled Plasma Method ^[1]
85	Nitrobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[1]

86 N-Nitrosodi-n-propylamine ...

ลำดับ ที่	สารมลพิษ	วิธีวิเคราะห์
86	N-Nitrosodi-n-propylamine	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1]
87	pH	Electrometric Method ^[4]
88	Phenanthrene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
89	Phenol	1) Distillation, Direct Photometric Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
90	Pyrene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
91	Selenium	Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[4]
92	Silver	Digestion, Inductively Coupled Plasma Method ^[4]
93	Styrene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
94	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
95	Trichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
96	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
97	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
98	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
99	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
100	Toluene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
101	2,4,5-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]

102 2,4,6-Trichlorophenol ...

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ลำดับ ที่	สารมลพิษ	วิธีวิเคราะห์
102	2,4,6-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
103	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
104	Vanadium	Digestion, Inductively Coupled Plasma Method ^[4]
105	Vinyl acetate	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
106	Vinyl chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
107	m-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
108	o-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
109	p-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
110	Xylene (Total)	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
111	Zinc	Digestion, Inductively Coupled Plasma Method ^[4]

ดิน จำนวน 12 รายการ

ลำดับ ที่	สารมลพิษ	วิธีวิเคราะห์
1	α -HCH	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[2,3]
2	β -HCH	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[2,3]
3	γ -HCH	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[2,3]
4	Heptachlor	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[2,3]

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5 Aldrin ...

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ลำดับ ที่	สารมลพิษ	วิธีวิเคราะห์
5	Aldrin	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[2,3]
6	Heptachlor epoxide	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[2,3]
7	Chlordane	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[2,3]
8	Dieldrin	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[2,3]
9	Endrin	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[2,3]
10	DDD	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[2,3]
11	DDT	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[2,3]
12	Methoxychlor	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[2,3]

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COPY

ศูนย์วิจัยและเฝ้าระวังมลพิษโรงงานภาคตะวันออก กรมโรงงานอุตสาหกรรม โทร. ๐ ๓๗๑๓ ๒๐๔๔ ต่อ ๕๐๐๑-๒



ที่ อว 0303/18183

ใบรับรองความสามารถห้องปฏิบัติการทดสอบ

ใบรับรองฉบับนี้ให้ไว้เพื่อแสดงว่า

ห้องปฏิบัติการ บริษัท อีสเทิร์น ไทย คอนซัลติ้ง 1992 จำกัด
เลขที่ 683 หมู่ที่ 11 ถนนสุขาภิบาล 8 ตำบลหนองขาม
อำเภอศรีราชา จังหวัดชลบุรี 20230

ได้ผ่านการประเมินความสามารถห้องปฏิบัติการทดสอบตามมาตรฐาน ISO/IEC 17025 : 2017
และข้อกำหนด กฎระเบียบ และเงื่อนไขการรับรองความสามารถห้องปฏิบัติการทดสอบ
ของกองบริหารและรับรองห้องปฏิบัติการ กรมวิทยาศาสตร์บริการ

หมายเลขการรับรองระบบงานที่ ทดสอบ - 0159

รายละเอียดการรับรองดังข้อบ่งชี้การรับรองแนบท้าย

ออกให้ ณ วันที่ : 7 พฤศจิกายน 2566

หมดอายุ วันที่ : 6 พฤศจิกายน 2570

ลงชื่อ : 

(นางจันทน์ วรสรรพวิทย์)

นักวิทยาศาสตร์ชำนาญการพิเศษ

รักษาราชการแทน ผู้อำนวยการกองบริหารและรับรองห้องปฏิบัติการ

กองบริหารและรับรองห้องปฏิบัติการ กรมวิทยาศาสตร์บริการ
กระทรวงการอุดมศึกษา วิทยาศาสตร์ วิจัย และนวัตกรรม

ข้อบ่งชี้การรับรองความสามารถห้องปฏิบัติการทดสอบ

ชื่อห้องปฏิบัติการ : ห้องปฏิบัติการ บริษัท อีสเทิร์น ไทย คอนซัลติ้ง 1992 จำกัด

สถานที่ตั้ง : เลขที่ 683 หมู่ที่ 11 ถนนสุขาภิบาล 8 ตำบลหนองขาม
อำเภอศรีราชา จังหวัดชลบุรี 20230

หมายเลขการรับรองระบบงานที่ : ทดสอบ - 0159

สถานะของห้องปฏิบัติการ : ☒ ถาวร ☐ นอกสถานที่ ☐ชั่วคราว ☐เคลื่อนที่

ลำดับ ที่	วัสดุ / ผลิตภัณฑ์ที่ทดสอบ	รายการที่ทดสอบ / ช่วงของการทดสอบ	วิธีทดสอบ / เทคนิคที่ใช้
1	น้ำ	<p>- ซีโอดี 40 mg/L ถึง 5 000 mg/L</p> <p>- โปรท 0.001 mg/L ถึง 0.02 mg/L</p> <p>- บีโอดี 2 mg/L ถึง 5 000 mg/L</p>	<p>Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23rd ed., 2017, part 5220 C</p> <p>Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23rd ed., 2017, part 3112 B</p> <p>Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23rd ed., 2017, part 5210 B</p>

ออกครั้งแรก ณ วันที่ 21 พฤศจิกายน 2560

ฉบับที่ 4

กองบริหารและรับรองห้องปฏิบัติการ กรมวิทยาศาสตร์บริการ กระทรวงการอุดมศึกษา วิทยาศาสตร์ วิจัย และนวัตกรรม

ขอข่ายการรับรองความสามารถห้องปฏิบัติการทดสอบ

ชื่อห้องปฏิบัติการ : ห้องปฏิบัติการ บริษัท อีสเทิร์น ไทย คอนซัลตติ้ง 1992 จำกัด
 สถานที่ตั้ง : เลขที่ 683 หมู่ที่ 11 ถนนสุขาภิบาล 8 ตำบลหนองขาม
 อำเภอศรีราชา จังหวัดชลบุรี 20230
 หมายเลขการรับรองระบบงานที่ : ทดสอบ - 0159
 สถานะของห้องปฏิบัติการ : ☒ ถาวร ☐ นอกสถานที่ ☐ชั่วคราว ☐เคลื่อนที่

ลำดับ ที่	วัสดุ / ผลิตภัณฑ์ที่ทดสอบ	รายการที่ทดสอบ / ช่วงของการทดสอบ	วิธีทดสอบ / เทคนิคที่ใช้
1 (ต่อ)	น้ำ	- สารที่ละลายได้ทั้งหมด ที่อุณหภูมิ 180 °C 25 mg/L ถึง 10 000 mg/L - สารแขวนลอยทั้งหมด ที่อุณหภูมิ 103 °C ถึง 105 °C 5 mg/L ถึง 2 000 mg/L - ฟลูออไรด์ 0.5 mg/L ถึง 10 mg/L	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 2540 C Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 2540 D Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500-F ⁻ C

ขอข่ายการรับรองความสามารถห้องปฏิบัติการทดสอบ

ชื่อห้องปฏิบัติการ : ห้องปฏิบัติการ บริษัท อีสเทิร์น ไทย คอนซัลตติ้ง 1992 จำกัด
 สถานที่ตั้ง : เลขที่ 683 หมู่ที่ 11 ถนนสุขาภิบาล 8 ตำบลหนองขาม
 อำเภอศรีราชา จังหวัดชลบุรี 20230
 หมายเลขการรับรองระบบงานที่ : ทดสอบ - 0159
 สถานะของห้องปฏิบัติการ : ☒ ถาวร ☐ นอกสถานที่ ☐ชั่วคราว ☐เคลื่อนที่

ลำดับ ที่	วัสดุ / ผลิตภัณฑ์ที่ทดสอบ	รายการที่ทดสอบ / ช่วงของการทดสอบ	วิธีทดสอบ / เทคนิคที่ใช้
2	น้ำเสีย	- ซีโอดี 40 mg/L ถึง 5 000 mg/L - ปรีออก 0.001 mg/L ถึง 0.02 mg/L - บีโอดี 2 mg/L ถึง 5 000 mg/L	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 5220 C Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 3112 B Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 5210 B

ขอข่ายการรับรองความสามารถห้องปฏิบัติการทดสอบ

ชื่อห้องปฏิบัติการ : ห้องปฏิบัติการ บริษัท อีสเทิร์น ไทย คอนซัลติ้ง 1992 จำกัด
 สถานที่ตั้ง : เลขที่ 683 หมู่ที่ 11 ถนนสุขาภิบาล 8 ตำบลหนองขาม
 อำเภอศรีราชา จังหวัดชลบุรี 20230

หมายเลขการรับรองระบบงานที่ : ทดสอบ - 0159

สถานที่ของห้องปฏิบัติการ : ☒ ภายใน ☐ นอกสถานที่ ☐ ชั่วคราว ☐ เคลื่อนที่

ลำดับ ที่	วัสดุ / ผลิตภัณฑ์ที่ทดสอบ	รายการที่ทดสอบ / ช่วงของการทดสอบ	วิธีทดสอบ / เทคนิคที่ใช้
2 (ต่อ)	น้ำเสีย	- สารที่ละลายได้ทั้งหมด ที่อุณหภูมิ 180 °C 25 mg/L ถึง 10 000 mg/L	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 2540 C
		- สารแขวนลอยทั้งหมด ที่อุณหภูมิ 103 °C ถึง 105 °C 5 mg/L ถึง 2 000 mg/L	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 2540 D
		- ฟลูออไรด์ 0.5 mg/L ถึง 10 mg/L	Standard Methods for the Examination of Water and Wastewater, APHA, AWWA & WEF, 23 rd ed., 2017, part 4500-F °C

ออกให้ ณ วันที่ : 7 พฤศจิกายน 2566

ลงชื่อ :

(นางจันทร์น วรสรวิทย์)

นักวิทยาศาสตร์ชำนาญการพิเศษ

รักษาราชการแทน ผู้อำนวยการกองบริหารและรับรองห้องปฏิบัติการ

ออกครั้งแรก ณ วันที่ 21 พฤศจิกายน 2560

ฉบับที่ 4

กองบริหารและรับรองห้องปฏิบัติการ กรมวิทยาศาสตร์บริการ กระทรวงการอุดมศึกษา วิทยาศาสตร์ วิจัย และนวัตกรรม



ใบรับรองเลขที่ 23-LB0251
(Certificate No.)

ใบรับรองระบบงาน

(Certificate of Accreditation)

อาศัยอำนาจตามความในพระราชบัญญัติการมาตรฐานแห่งชาติ พ.ศ. ๒๕๕๑

(By Virtue of National Standardization Act B.E. 2551 (2008))

เลขาธิการสำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม

(Secretary-General, Thai Industrial Standards Institute)

ออกใบรับรองฉบับนี้ให้

(Issues this certificate to)

บริษัท อีสเทิร์น ไทย คอนซัลติ้ง 1992 จำกัด

(Eastern Thai Consulting 1992 Co., Ltd.)

ตั้งอยู่เลขที่

(Address)

๖๘๓ หมู่ที่ ๑๑ ถนนสุขาภิบาล ๘ ตำบลหนองขาม อำเภอศรีราชา จังหวัดชลบุรี

(683 Moo 11, Sukhapibarn 8 Road, Nongkham, Sriracha, Chonburi)

ได้รับการรับรองความสามารถ

(Certificate of competence)

ตามมาตรฐานเลขที่ มอก. ๑๗๐๒๕ - ๒๕๖๑

(Standard No. TIS 17025-2561 (2018) (ISO/IEC 17025: 2017))

ข้อกำหนดทั่วไปว่าด้วยความสามารถของ ห้องปฏิบัติการทดสอบและห้องปฏิบัติการสอบเทียบ

(General requirements for the competence of testing and calibration laboratories)

หมายเลขการรับรองที่ ทดสอบ ๑๗๑๒

(Accreditation No. Testing 1712)

โดยมีรายละเอียดสาขาและขอบข่ายที่ได้ใบรับรอง แสดงไว้ใน QR CODE และ www.tisi.go.th

(Details of the scheme and scope of the certificate are shown in QR CODE and www.tisi.go.th)

ออกให้ ณ วันที่ ๒๓ สิงหาคม พ.ศ. ๒๕๖๖

(Issue date : 23 August B.E. 2566 (2023))



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กระทรวงอุตสาหกรรม สำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม
(Ministry of Industry Thailand, Thai Industrial Standards Institute)

(นายเอกนิติ รมยานนท์)

รองเลขาธิการสำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม

ปฏิบัติราชการแทน

เลขาธิการสำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม



รายละเอียดสาขาและขอบข่ายใบรับรองห้องปฏิบัติการ

(Scope of Accreditation for Testing)

ใบรับรองเลขที่ 23-LB0251

(Certification No. 23-LB0251)



ชื่อห้องปฏิบัติการ
(Laboratory Name)

บริษัท อีสเทิร์น ไทย คอนซัลติง 1992 จำกัด
(Eastern Thai Consulting 1992 Co.,Ltd.)

หมายเลขการรับรองที่
(Accreditation No.)

ทดสอบ 1712
(Testing 1712)

ฉบับที่ 01
(Issue No.01)

ออกให้ตั้งแต่วันที่ 17 กรกฎาคม พ.ศ. 2566
(Valid from) (17 July B.E.2566 (2023))

สถานภาพห้องปฏิบัติการ
(Laboratory status)

☒ถาวร (Permanent) ☐นอกสถานที่ (Site) ☐ชั่วคราว (Temporary)

ถึงวันที่ 16 กรกฎาคม พ.ศ. 2571
(Until) (16 July B.E.2571 (2028))

☐เคลื่อนที่ (Mobile) ☐หลายสถานที่ (Multisite)

สาขาการทดสอบ (Field of Testing)	รายการทดสอบ (Parameter)	วิธีทดสอบ (Test Method)
<p>สาขาสิ่งแวดล้อม (Environmental field)</p> <p>1. น้ำ (Water)</p>	<p>- โลหะหนัก (Heavy metal)</p> <ul style="list-style-type: none"> โครเมียม (Cr) 0.03 mg/L to 2.00 mg/L ทองแดง (Cu) 0.03 mg/L to 2.00 mg/L เหล็ก (Fe) 0.03 mg/L to 2.00 mg/L ตะกั่ว (Pb) 0.01 mg/L to 1.00 mg/L นิกเกิล (Ni) 0.03 mg/L to 2.00 mg/L อลูมิเนียม (Al) 0.10 mg/L to 2.00 mg/L แบเรียม (Ba) 0.03 mg/L to 2.00 mg/L แคดเมียม (Cd) 0.003 mg/L to 1.00 mg/L แมงกานีส (Mn) 0.03 mg/L to 2.00 mg/L เงิน (Ag) 0.05 mg/L to 2.00 mg/L สังกะสี (Zn) 0.03 mg/L to 2.00 mg/L 	<p>- Standard Method for the Examination of Water and Wastewater, APHA, AWWA, WEF 23rd edition 2017. Part 3030 F and 3120 B</p>

กระทรวงอุตสาหกรรมสำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม
(Ministry of Industry, Thai Industrial Standards Institute)

รายละเอียดสาขาและขอบข่ายใบรับรองห้องปฏิบัติการ

(Scope of Accreditation for Testing)

ใบรับรองเลขที่ 23-LB0251

(Certification No. 23-LB0251)



ฉบับที่ 01
(Issue No.)

ออกให้ตั้งแต่วันที่ 17 กรกฎาคม พ.ศ. 2566
(Valid from) (17 July B.E.2566 (2023))

สถานภาพห้องปฏิบัติการ
(Laboratory status)

☒ถาวร (Permanent) ☐นอกสถานที่ (Site) ☐ชั่วคราว (Temporary)

ถึงวันที่ 16 กรกฎาคม พ.ศ. 2571
(Until) (16 July B.E.2571 (2028))

☐เคลื่อนที่ (Mobile) ☐หลายสถานที่ (Multisite)

สาขาการทดสอบ (Field of Testing)	รายการทดสอบ (Parameter)	วิธีทดสอบ (Test Method)
<p>สาขาสิ่งแวดล้อม (Environmental field)</p> <p>1. น้ำ (ต่อ) (Water) (cont.)</p> <p>2. น้ำเสีย (Wastewater)</p>	<p>- ไขมันและน้ำมัน (Oil & Grease) 3.0 mg/L - 20.0 mg/L</p> <p>- โลหะหนัก (Heavy metal)</p> <ul style="list-style-type: none"> โครเมียม (Cr) 0.03 mg/L to 2.00 mg/L ทองแดง (Cu) 0.03 mg/L to 2.00 mg/L เหล็ก (Fe) 0.03 mg/L to 2.00 mg/L ตะกั่ว (Pb) 0.03 mg/L to 2.00 mg/L นิกเกิล (Ni) 0.03 mg/L to 2.00 mg/L อลูมิเนียม (Al) 0.10 mg/L to 2.00 mg/L แบเรียม (Ba) 0.03 mg/L to 2.00 mg/L แคดเมียม (Cd) 0.03 mg/L to 2.00 mg/L 	<p>- Standard Method for the Examination of Water and Wastewater, APHA, AWWA, WEF 23rd edition 2017. Part 5520 B</p> <p>- Standard Method for the Examination of Water and Wastewater, APHA, AWWA, WEF 23rd edition 2017. Part 3030 F and 3120 B</p>

กระทรวงอุตสาหกรรมสำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม
(Ministry of Industry, Thai Industrial Standards Institute)

รายละเอียดสาขาและขอบข่ายใบรับรองห้องปฏิบัติการ
(Scope of Accreditation for Testing)

ใบรับรองเลขที่ 23-LB0251
(Certification No. 23-LB0251)



ฉบับที่ 01 ออกให้ตั้งแต่วันที่ 17 กรกฎาคม พ.ศ. 2566
(Issue No.01) (Valid from) (17 July B.E.2566 (2023))
สถานภาพห้องปฏิบัติการ ☒ถาวร ☐นอกสถานที่ ☐ชั่วคราว
(Laboratory status) (Permanent) (Site) (Temporary)

ถึงวันที่ 16 กรกฎาคม พ.ศ. 2571
(Until) (16 July B.E.2571 (2028))
☐เคลื่อนที่ ☐หลายสถานที่
(Mobile) (Multisite)

สาขาการทดสอบ (Field of Testing)	รายการทดสอบ (Parameter)	วิธีทดสอบ (Test Method)
<p>สาขาส่งแวดล้อม (Environmental field)</p> <p>2. น้ำเสีย (ต่อ) (Wastewater) (cont.)</p>	<p>- โลหะหนัก (ต่อ) (Heavy metal) (cont.)</p> <ul style="list-style-type: none"> • แมงกานีส (Mn) 0.03 mg/L to 2.00 mg/L • เงิน (Ag) 0.05 mg/L to 2.00 mg/L • สังกะสี (Zn) 0.03 mg/L to 2.00 mg/L <p>- ไขมันและน้ำมัน (Oil & Grease) 3.0 mg/L - 20.0 mg/L</p>	<p>- Standard Method for the Examination of Water and Wastewater, APHA, AWWA, WEF 23rd edition 2017. Part 3030 F and 3120 B</p> <p>- Standard Method for the Examination of Water and Wastewater, APHA, AWWA, WEF 23rd edition 2017. Part 5520 B</p>

รายละเอียดสาขาและขอบข่ายใบรับรองห้องปฏิบัติการ
(Scope of Accreditation for Testing)

ใบรับรองเลขที่ 23-LB0251
(Certification No. 23-LB0251)



ฉบับที่ 01 ออกให้ตั้งแต่วันที่ 17 กรกฎาคม พ.ศ. 2566
(Issue No.) (Valid from) (17 July B.E.2566 (2023))
สถานภาพห้องปฏิบัติการ ☐ถาวร ☒นอกสถานที่ ☐ชั่วคราว
(Laboratory status) (Permanent) (Site) (Temporary)

ถึงวันที่ 16 กรกฎาคม พ.ศ. 2571
(Until) (16 July B.E.2571 (2028))
☐เคลื่อนที่ ☐หลายสถานที่
(Mobile) (Multisite)

สาขาการทดสอบ (Field of Testing)	รายการทดสอบ (Parameter)	วิธีทดสอบ (Test Method)
<p>สาขาส่งแวดล้อม (Environmental field)</p> <p>3. พื้นที่การทำงาน (Workplace)</p>	<p>- ระดับเสียง (Sound Level)</p> <ul style="list-style-type: none"> • ระดับเสียงเฉลี่ย L_{eqT} ช่วง 30 - 130 dB(A) • ระดับเสียงสูงสุด L_{max} ช่วง 30 - 130 dB(A) 	<p>- ISO 11202:2010</p> <p>- ประกาศกระทรวงอุตสาหกรรม เรื่องมาตรการคุ้มครองความปลอดภัยในการประกอบกิจการโรงงานเกี่ยวกับสภาวะแวดล้อมในการทำงาน พ.ศ.2546 ลงวันที่ 6 พ.ย. 2546 (Notification of The Ministry of Industry B.E. 2546 (2003) on the Safety Protection Measures in Factory Regarding Working Area Environment, dated November 6, 2003)</p> <p>- ประกาศกรมสวัสดิการและคุ้มครองแรงงาน เรื่องมาตรฐานระดับเสียงที่ยอมให้ลูกจ้างได้รับเฉลี่ยตลอดระยะเวลาการทำงานในแต่ละวัน ลงวันที่ 13 ธ.ค. 2560 (Notification of the Department of Labor Protection and Welfare on the standard of noise level that employees are allowed to receive in average period of work each day, dated December 13, 2017.)</p> <p>- ประกาศกรมสวัสดิการและคุ้มครองแรงงาน เรื่องหลักเกณฑ์ วิธีตรวจวัดและการวิเคราะห์สภาวะการทำงานเกี่ยวกับระดับความร้อน แสงสว่าง หรือเสียง รวมทั้งระยะเวลาและประเภทกิจการที่ต้องดำเนินการ ลงวันที่ 8 ก.พ. 2561 (Notification of the Department of Labor Protection and Welfare on Criteria, Measurement Methods, and Analysis of Working Conditions Regarding Heat, Light, or Noise Levels, Including Duration and Types of Businesses to Be Performed, dated February 8, 2018.)</p>

รายละเอียดสาขาและขอบข่ายใบรับรองห้องปฏิบัติการ
(Scope of Accreditation for Testing)

ใบรับรองเลขที่ 23-LB0251
(Certification No. 23-LB0251)



ฉบับที่ 01
(Issue No.)

ออกให้ตั้งแต่วันที่ 17 กรกฎาคม พ.ศ. 2566
(Valid from (17 July B.E.2566 (2023)))

ถึงวันที่ 16 กรกฎาคม พ.ศ. 2571
(Until (16 July B.E.2571 (2028)))

สถานภาพห้องปฏิบัติการ
(Laboratory status)

☐ ถาวร
(Permanent)

☒ นอกสถานที่
(Site)

☐ชั่วคราว
(Temporary)

☐เคลื่อนที่
(Mobile)

☐หลายสถานที่
(Multisite)

สาขาการทดสอบ (Field of Testing)	รายการทดสอบ (Parameter)	วิธีทดสอบ (Test Method)
<p>สาขาส่งแวดล้อม (Environmental field)</p> <p>4. บรรยากาศ (Ambient)</p>	<p>- ระดับเสียง (Sound Level)</p> <p>• ระดับเสียงเฉลี่ย LeqT ช่วง 30.0 - 130.0 dB(A)</p> <p>• ระดับเสียงสูงสุด Lmax ช่วง 30.0 - 130.0 dB(A)</p>	<p>- ISO 1996 - 1 : 2016</p> <p>- ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (2540) เรื่องกำหนด มาตรฐาน ระดับเสียงโดยทั่วไป ลงวันที่ 12 มี.ค. 2540 (Notification of The National Environmental Board Volume 15 B.E. 2540 (1997) on the general noise level standards, dated March 12, 1997)</p> <p>- ประกาศกรมควบคุมมลพิษ เรื่อง การ คำนวณค่าระดับเสียง ลงวันที่ 11 ส.ค. 2540 (Notification of the Pollution Control Department on the calculation of the noise level, dated August 11, 1997.)</p> <p>- ประกาศกรมโรงงานอุตสาหกรรม เรื่อง วิธีการตรวจวัดระดับเสียงการรบกวน ระดับ เสียงเฉลี่ย 24 ชั่วโมง และระดับเสียงสูงสุดที่ เกิดจากการประกอบกิจการโรงงาน พ.ศ. 2553 ลงวันที่ 20 ธ.ค. 2553 (Notification of the Department of Industrial Works on Methods for Measuring Noise Annoyance, Noise Levels 24-Hour Average and Maximum Noise Level from Factory B.E. 2553, dated December 20, 2010.)</p>

ANALYTICAL BALANCE (DU)

Model : XS205DU

Serial No. : 1126323724



Certificate No. : 23-148799

Sample Code : 23-56200-001

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapibarn 8 Rd., Nongkham,
Sriracha, Chonburi 20230

Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.
(Analytical Balance Room)

Equipment : ELECTRONIC BALANCE

Manufacturer : METTLER TOLEDO

Model : XS205DU

Serial No. : 1126323724

ID No. : LABE 05/1

Date of Receipt : 22 December 2023

Date of Calibration : 22 December 2023

Calibrated by : Mr. Somwang Sangdee
Scientist

Issue date : 25 December 2023

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

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

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC)



Certificate No. : 23-148799

Sample Code : 23-56200-001

REPORT OF CALIBRATION

Equipment : ELECTRONIC BALANCE
Manufacturer : METTLER TOLEDO
Model : XS205DU
Capacity : Max 81 g / 220 g
Resolution : 0.01 mg / 0.1 mg
Serial No. : 1126323724
ID No. : LABE 05/1

Result of Calibration

1. Test weight and repeatability of reading

Repeatability is a measure of the ability of a balance to supply the same result in repetitive weighings with one and the same load under the same measurement condition. The measurement of the repeatability must include both the balance specifications and the ambient (vibration, fluctuating air current/temperature/humidity, etc.) Operator handling of the balance is also included in the standard deviation.

Unit : g	Range : 80	<input checked="" type="checkbox"/> Before adjustment	<input checked="" type="checkbox"/> After adjustment
<input type="checkbox"/> No adjustment	Nominal value	40 80 40	80
<input checked="" type="checkbox"/> Adjustment	Standard weight	40.000054 80.000048 40.000054	80.000048
	Average reading of indicator	40.000026 80.000037 40.000017	80.000017
	Standard deviation	0.000015 0.000016 0.000008	0.000009

Unit : g	Range : 200	<input checked="" type="checkbox"/> Before adjustment	<input checked="" type="checkbox"/> After adjustment
<input type="checkbox"/> No adjustment	Nominal value	100 200 100	200
<input checked="" type="checkbox"/> Adjustment	Standard weight	100.000042 200.000041 100.000042	200.000041
	Average reading of indicator	100.00003 200.00004 100.00001	200.00001
	Standard deviation	0.00005 0.00005 0.00003	0.00005

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Certificate No. : 23-148799
Sample Code : 23-56200-001

REPORT OF CALIBRATION

Result of Calibration

2. Sensitivity or value of a scale division

Change in the output variable of a measuring instrument divided by the associated change in the input variable.

Unit : g

Range : 80		Range : 200	
Test Point	Sensitivity, S	Test Point	Sensitivity, S
0	1.00748	0	1.0274
40	0.98753	100	0.9975
80	0.99751	200	0.9975

3. Departure of indication from nominal value, Linearity

Unit : g

Nominal Value	Standard Value	Average Reading of Indicator	Correction Value	Expanded Uncertainty	Coverage Factor (k)
Unload	0.0000000	0.00000	0.00000	0.000012	2.05
0.01	0.0100025	0.01000	0.00000	0.000012	2.05
0.1	0.1000019	0.10001	-0.00001	0.000013	2.03
1	1.0000125	1.00001	0.00000	0.000015	2.02
5	5.0000208	5.00004	-0.00002	0.000021	2.00
10	10.0000004	10.00008	-0.00008	0.000026	2.00
20	20.0000030	20.00011	-0.00008	0.000036	2.00
50	50.0000014	50.00014	-0.00013	0.000068	2.00
100	100.0000042	100.00001	-0.00001	0.000016	2.00
150	150.0000056	150.00001	0.00000	0.000022	2.00
200	200.0000041	200.00002	-0.00002	0.000027	2.00

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The result expanded uncertainty of measurement U is stated as the standard uncertainty multiplied by the coverage factor k , which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003.



Certificate No. : 23-148799
Sample Code : 23-56200-001

REPORT OF CALIBRATION

Result of Calibration :

4. Eccentric or off-centre loading

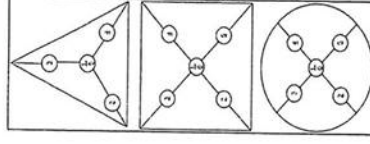
Deviation of the measurement value through off - center (eccentric) loading. The corner load increases with the weight of the load and its removal from the center of the pan support.

Weighing pan ☐ Circle
☐ Triangular
☒ Rectangular

Test weight : 50 and 100

Unit : g

Range	Position	Reading of indicator	Reading of indicator
1	50.00015	100.0001	200
2	50.00022	100.0001	
3	50.00008	100.0001	
4	50.00002	100.0000	
5	50.00016	100.0002	
6	50.00014	100.0001	
Maximum difference		0.00013	0.0001



Condition of Calibration

1. Calibration Method : WI-CL-004 base on UKAS LAB 14: 2019
2. This result of calibration was found accurate as shown on date and place of calibration only.
3. Condition of Calibration item: Normal
4. This certification is traceable to the International System of Unit maintained at :
Through the reference standard laboratory of Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (Instrument number 1).
5. Reference standard instrument :
Instrument 1) STANDARD WEIGHT 1 mg to 1 kg

Company Limited (Instrument number 1).

Certificate No. 23-105642
Class E2
ID No. LB-WE-79
Due Date 10 September 2024

End of Report

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ANALYTICAL BALANCE

Model : MS204TS/00

Serial No. : B904136539

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: EASTERN THAI CONSULTING 1992 CO., LTD.
Address: 683 Moo 11, Sukhaphiban 8 Rd., Nong Kham
City: Sriracha Contact: Sasiporn N.
Zip / Postal: 20230
State / Province: Chonburi
Order Number: 0333333333

Weighing Device

Manufacturer: Mettler Toledo
Model: MS204TSJ00
Serial No.: B904136539
Building: Laboratory
Floor: 1
Room: Balance
Instrument Type: Weighing Instrument
Asset Number: LABE 05/4
Terminal Model: N/A
Terminal Serial No.: N/A
Terminal Asset No.: N/A

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

Procedure

Calibration Guideline: EURAMET cg-18 v. 4.0 (11/2015)
Mettler Toledo Work Instruction: CPW002/20
This calibration certificate contains measurements for As Found and As Left calibrations.
The sensitivity/span of the weighing instrument was adjusted before As Found and As Left calibrations 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	As Left	Start: 23.4 °C	End: 50.6 %
	Start: 23.8 °C	End: 23.4 °C	Start: 51.8 %	End: 51.2 %

As Found Calibration Date: 05-Feb-2024
As Left Calibration Date: 05-Feb-2024
Issue Date: 05-Feb-2024

Calibrator: Sathaporn Tabson
Approved Signatory: Sathaporn Tabson
Technical Manager / Head of Calibration Center



Measurement Results

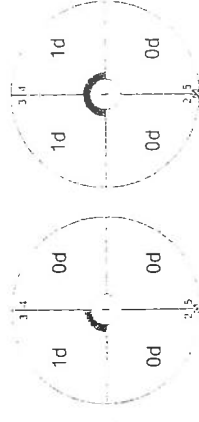
Repeatability

Test Load: 100 g		As Found	As Left	As Found - As Left
1	99.9996 g	100.0001 g		
2	99.9997 g	100.0001 g		
3	99.9997 g	100.0000 g		
4	99.9996 g	100.0001 g		
5	99.9997 g	100.0001 g		
6	99.9996 g	100.0000 g		
7	99.9997 g	100.0001 g		
8	99.9996 g	100.0000 g		
9	99.9996 g	100.0001 g		
10	99.9996 g	100.0001 g		
Standard Deviation	0.00005 g	0.00005 g		

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		As Found	As Left	As Found - As Left
1	99.9996 g	100.0000 g		
2	99.9996 g	100.0000 g		
3	99.9997 g	100.0001 g		
4	99.9996 g	100.0001 g		
5	99.9996 g	100.0000 g		
Maximum Deviation	0.0001 g	0.0001 g		



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

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

Error of Indication

As Found			
Reference Value	Indication	Error of Indication	Expanded Uncertainty
1 0.0000 g	0.0000 g	0.0000 g	0.12 mg
2 0.0100 g	0.0100 g	0.0000 g	0.13 mg
3 0.0500 g	0.0499 g	-0.0001 g	0.13 mg
4 0.1000 g	0.0999 g	-0.0001 g	0.13 mg
5 1.0000 g	0.9999 g	-0.0001 g	0.13 mg
6 5.0000 g	4.9999 g	-0.0001 g	0.14 mg
7 10.0000 g	9.9999 g	-0.0001 g	0.14 mg
8 50.0000 g	49.9997 g	-0.0003 g	0.16 mg
9 100.0000 g	99.9995 g	-0.0005 g	0.20 mg
10 149.9999 g	149.9993 g	-0.0006 g	0.31 mg
11 199.9998 g	199.9990 g	-0.0008 g	0.35 mg

As Left			
Reference Value	Indication	Error of Indication	Expanded Uncertainty
1 0.0000 g	0.0000 g	0.0000 g	0.11 mg
2 0.0100 g	0.0100 g	0.0000 g	0.13 mg
3 0.0500 g	0.0500 g	0.0000 g	0.13 mg
4 0.1000 g	0.1000 g	0.0000 g	0.13 mg
5 1.0000 g	1.0001 g	0.0001 g	0.13 mg
6 5.0000 g	5.0000 g	0.0000 g	0.13 mg
7 10.0000 g	10.0001 g	0.0001 g	0.14 mg
8 50.0000 g	50.0001 g	0.0001 g	0.15 mg
9 100.0000 g	100.0001 g	0.0001 g	0.20 mg
10 149.9999 g	150.0000 g	0.0001 g	0.31 mg
11 199.9998 g	199.9999 g	0.0001 g	0.35 mg

Thermo Bero Hygrometer			
Equipment No.:	IN74	Date of Issue:	19-May-2023
Certificate Number:	SG-H-00418/66	Calibration Due Date:	18-May-2024

Thermo Bero Hygrometer			
Equipment No.:	IN74	Date of Issue:	19-May-2023
Certificate Number:	SG-H-00418/66	Calibration Due Date:	18-May-2024

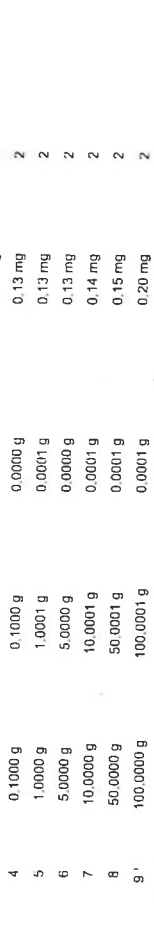
Remarks

FACT adjustment functionality activated

Equipment condition: Good

Next calibration according to customer's procedure

Calibration data not decide by calibration laboratory



End of Accredited Section

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

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

Calibration Points (g)

Calibration Points (g)

Calibration Points (g)

Calibration Points (g)

Calibration Points (g)

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Calibration Points (g)

Calibration Points (g)

Calibration Points (g)

Software Version 1.23.2.187
Report Version 2.17.18
Form Number F.03C

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Page 4 of 5

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 · 10⁻⁶ / K

Temperature range on site for the evaluation of the measurement uncertainty in use: 5 K

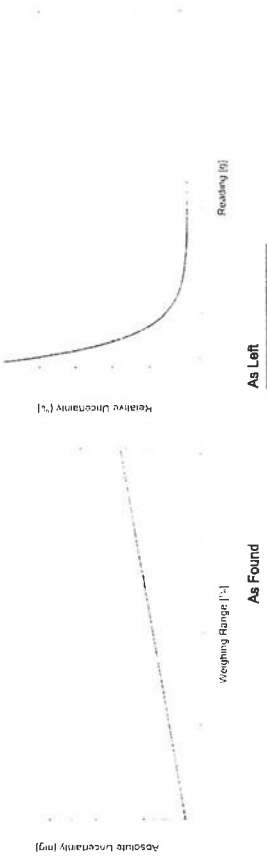
Uncertainty of Uncertainty Equation

1	Range		As Found	As Left
	d	Max		
1	0.0001 g	220 g	$U_1 = 0.13 \text{ mg} + 0.0101 \text{ mg/g} \cdot R$	$U_1 = 0.13 \text{ mg} + 0.00616 \text{ mg/g} \cdot R$

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	
	Value	Relative	Value	Relative
0.0220 g	0.13 mg	0.59%	0.13 mg	0.59%
0.2200 g	0.13 mg	0.060%	0.13 mg	0.060%
2.2000 g	0.15 mg	0.0069%	0.14 mg	0.0065%
22.0000 g	0.35 mg	0.0016%	0.27 mg	0.0012%
220.0000 g	2.4 mg	0.0011%	1.5 mg	0.00068%



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GWP®

Certificate



As Found ✓ As Left ✓

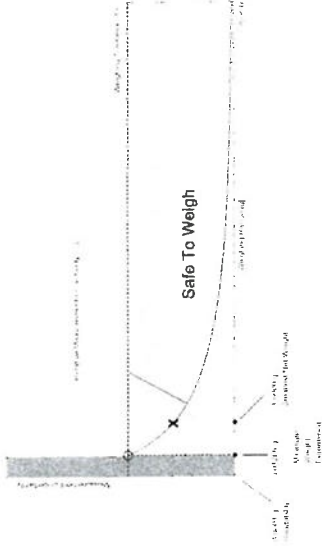
The weighing device meets the given process requirements. The weighing device meets the given process requirements.

Tests Performed: As Found As Left

Process Requirements

Weighing Tolerance: 1% | Smallest Net Weight: 1.0000 g | Safety Factor: 2

Safe Weighing Range



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

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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%	0.13300 g	0.26873 g	0.40728 g	0.69320 g	1.46405 g
0.2%	0.06616 g	0.13300 g	0.20051 g	0.33764 g	0.69320 g
0.5%	0.02638 g	0.05288 g	0.07947 g	0.13300 g	0.26373 g
1%	0.01318 g	0.02638 g	0.03962 g	0.06616 g	0.13300 g
2%	0.00659 g	0.01318 g	0.01978 g	0.03300 g	0.06613 g
5%	0.00263 g	0.00527 g	0.00790 g	0.01318 g	0.02633 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%	0.12728 g	0.25614 g	0.38662 g	0.65256 g	1.34797 g
0.2%	0.06344 g	0.12728 g	0.19151 g	0.32118 g	0.65256 g
0.5%	0.02533 g	0.05072 g	0.07618 g	0.12728 g	0.25614 g
1%	0.01266 g	0.02533 g	0.03802 g	0.06344 g	0.12728 g
2%	0.00633 g	0.01266 g	0.01899 g	0.03167 g	0.06344 g
5%	0.00253 g	0.00506 g	0.00759 g	0.01266 g	0.02533 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 Found	✓	As Found	✓
As Left	✓	As Left	✓	As Left	✓

✓ = Passed

✗ = Failed

i. = Safety Factor not met

Repeatability

Test Load: 100 g

Tolerance		Control Limit		As Found		As Left	
Tolerance	Std. Deviation	Result	Std. Deviation	Result	Std. Deviation	Result	Std. Deviation
0.1%	0.00050 g	✓		✓		✓	
0.2%	0.00100 g	✓		✓		✓	
0.5%	0.00250 g	✓		✓		✓	
1%	0.00500 g	✓	0.00005 g	✓	0.00005 g	✓	
2%	0.01000 g	✓		✓		✓	
5%	0.02500 g	✓		✓		✓	

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	
Tolerance	Std. Deviation	Result	Std. Deviation	Result	Std. Deviation	Result	Std. Deviation
0.1%	0.0500 g	✓		✓		✓	
0.2%	0.1000 g	✓		✓		✓	
0.5%	0.2500 g	✓		✓		✓	
1%	0.5000 g	✓	0.0001 g	✓	0.0001 g	✓	
2%	1.0000 g	✓		✓		✓	
5%	2.5000 g	✓		✓		✓	

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

Error of Indication

As Found

		Control limits for various weighing tolerances							
Reference Value	Error	0.1%	0.2%	0.5%	1%	2%	5%		
0.0000 g	0.0000 g	N/A	N/A	N/A	N/A	N/A	N/A		
50.0000 g	-0.0003 g	0.0250 g	0.0500 g	0.1250 g	0.2500 g	0.5000 g	1.2500 g		
100.0000 g	-0.0005 g	0.0500 g	0.1000 g	0.2500 g	0.5000 g	1.0000 g	2.5000 g		
149.9999 g	-0.0006 g	0.0750 g	0.1500 g	0.3750 g	0.7500 g	1.5000 g	3.7500 g		
199.9998 g	-0.0008 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		
100.0000 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		
199.9998 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.

ANALYTICAL BALANCE

Model : SECURA224-1S

Serial No. : 0036707137



Certificate No. : 23-148800

Sample Code : 23-56200-002

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapibarn 8 Rd., Nongkham,
Sriracha, Chonburi 20230

Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.
(Analytical Balance Room)

Equipment : ELECTRONIC BALANCE

Manufacturer : SARTORIUS

Model : SECURA224-1S

Serial No. : 0036707137

ID No. : LABE 05/2

Date of Receipt : 22 December 2023

Date of Calibration : 22 December 2023

Calibrated by Mr. Somwang Sangdee
Scientist

Issue date 25 December 2023

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

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

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).



Certificate No. : 23-148800

Sample Code : 23-56200-002

REPORT OF CALIBRATION

Equipment : ELECTRONIC BALANCE
Manufacturer : SARTORIUS
Model : SECURA224-1S
Capacity : Max 220 g
Resolution : 0.0001 g
Serial No. : 0036707137
ID No. : LABE 05/2

Result of Calibration

1. Test weight and repeatability of reading

Repeatability is a measure of the ability of a balance to supply the same result in repetitive weighings with one and the same load under the same measurement condition. The measurement of the repeatability must include both the balance specifications and the ambient (vibration, fluctuating air current/temperature/humidity, etc.) Operator handling of the balance is also included in the standard deviation.

Unit : g	Range : 220	<input checked="" type="checkbox"/> Before adjustment	<input checked="" type="checkbox"/> After adjustment
<input type="checkbox"/> No adjustment	Nominal value	100 200 100 200	
<input checked="" type="checkbox"/> Adjustment	Standard weight	100.000042 200.000041 100.000042 200.000041	
	Average reading of indicator	99.9998 199.9998 100.0000 200.0000	
	Standard deviation	0.00006 0.00007 0.00003 0.00007	

Unit : -	Range : -	<input type="checkbox"/> Before adjustment	<input type="checkbox"/> After adjustment
<input type="checkbox"/> No adjustment	Nominal value	- - - -	
<input type="checkbox"/> Adjustment	Standard weight	- - - -	
	Average reading of indicator	- - - -	
	Standard deviation	- - - -	

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Certificate No. : 23-148800
Sample Code : 23-56200-002

Page 3 of 4

REPORT OF CALIBRATION

Result of Calibration

2. Sensitivity or value of a scale division

Change in the output variable of a measuring instrument divided by the associated change in the input variable.

Unit : g

Range : 220		Range :	
Test Point	Sensitivity, S	Test Point	Sensitivity, S
0	0.7980		
100	0.8978		
200	0.8978		

3. Departure of indication from nominal value, Linearity

Unit : g

Normal Value	Standard Value	Average Reading of Indicator	Correction Value	Expanded Uncertainty	Coverage Factor (k)
Unload	0.0000000	0.0000	0.0000	0.000086	2.00
0.01	0.0100025	0.0100	0.0000	0.000086	2.00
0.1	0.1000019	0.1000	0.0000	0.000087	2.00
1	1.0000125	1.0000	0.0000	0.000087	2.00
2	2.0000089	2.0000	0.0000	0.000087	2.00
5	5.0000208	5.0001	-0.0001	0.000088	2.00
10	10.000004	10.0000	0.0000	0.000090	2.00
20	20.000030	20.0000	0.0000	0.000093	2.00
50	50.000014	50.0000	0.0000	0.00011	2.00
100	100.000042	100.0000	0.0000	0.00016	2.00
200	200.000041	200.0000	0.0000	0.00028	2.00

The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor k , which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003.

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Certificate No. : 23-148800
Sample Code : 23-56200-002

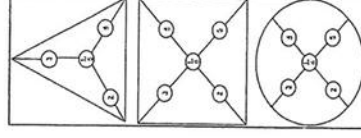
REPORT OF CALIBRATION

Result of Calibration :

4. Eccentric or off-centre loading

Deviation of the measurement value through off - center (eccentric) loading. The corner load increases with the weight of the load and its removal from the center of the pan support.

Weighing pan		Test weight : 100	
		Unit : g	
		Range	
		220	
Position	Reading of indicator	Reading of indicator	
1	100.0000		
2	100.0000		
3	100.0000		
4	99.9999		
5	100.0000		
6	100.0000		
Maximum difference		0.0001	



Condition of Calibration

1. Calibration Method : WI-CL-004 base on UKAS LAB 14: 2019

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

3. Condition of Calibration item: Normal

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

-Through the reference standard laboratory of Asia Medical and Agricultural Laboratory and Research Center Public

Company Limited (instrument number 1).

5. Reference standard instrument :

Instrument
1) STANDARD WEIGHT 1 mg to 1 kg

Class
E2

Certificate No.
23-105642

Due Date
10 September 2024

- End of Report -

Copy

Area Heat Stress Monitor

Model : QUESTemp 34

Serial No. : TEU080014



CALIBRATION CERTIFICATE

Certificate No. : L202307241-0002
 Date Issued : 24-Jul-23

Customer : Eastern Thai Consulting 1992 Co., Ltd.
 683 Moo 11 Sukhapiarn 8 Rd., Nongkham, Sriracha, Chonburi 20230

Equipment : Area Heat Stress Monitor

Manufacturer : QUEST TECHNOLOGY

Model : QUESTEMP 34

Serial No. : TEU080014

ID No./Tag No. : No.13

Date Received : 21-Jul-23

Date Calibrated : 22-Jul-23

Calibrated by : Mr. Apiwat Peanrungrat

Calibration Method or Calibration Procedure Used

In-house method : CP-19 by comparing against Standard Digital Humidity / Temperature Meter

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

Result of Calibration

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

This certificate may not be reproduced other than in full except with the prior written approval of the Miracle International Technology Company Limited.

Approved by: *Saraputh T.*
 (Mr. Sarayuth Tochua)



Page 1 of 2



Certificate No. : L202307241-0002
 Environment : Ambient Temperature : $(25 \pm 2) ^\circ\text{C}$
 Relative Humidity : $(50 \pm 15)\% \text{RH}$

STD	Reading ($^\circ\text{C}$)	UUC Reading ($^\circ\text{C}$)	Before Adjusted	After Adjusted	UUC Error ($^\circ\text{C}$)	Measurement Uncertainty ($\pm ^\circ\text{C}$)
38.00	WET	38.1	-	-	0.10	0.35
38.00	DRY	38.2	-	-	0.20	0.35
38.00	GLOBE	38.0	-	-	0.00	0.35
44.99	WET	45.0	-	-	0.01	0.35
44.99	DRY	45.1	-	-	0.11	0.35
44.99	GLOBE	44.9	-	-	-0.09	0.35

STD = Standard

UUC = Unit Under Calibration

Description of UUC : Range 0 to 100 $^\circ\text{C}$
 Resolution 0.1 $^\circ\text{C}$

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

MIT Certificate No. L202210258-006 for Digital Thermometer with Probe (Fluke) Serial No. 5856603, Due 10-Nov-23

End of Certificate

Page 2 of 2



Area Heat Stress Monitor

Model : QUESTemp 34

Serial No. : TEU080012



CALIBRATION CERTIFICATE

Certificate No. : L202306315-002
 Date Issued : 04-Jul-23

Customer : Eastern Thai Consulting 1992 Co., Ltd.
 683 Moo 11 Sukhapiarn 8 Rd., Nongkham, Sriracha, Chonburi 20230

Equipment : Area Heat Stress Monitor

Manufacturer : TSI
Model : QUESTemp 34
Serial No. : TEU080012
ID No./Tag No. : NO.11
Date Received : 30-Jun-23
Date Calibrated : 02-Jul-23

Calibrated by : Mr. Apiwat Peanrungrat

Calibration Method or Calibration Procedure Used


In-house method : CP-19 by comparing against Standard Digital Humidity / Temperature Meter

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

Result of Calibration

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

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Approved by: 
 (Mr. Sarayuth Tochua)



Page 1 of 2

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Certificate No. : L202306315-002
 Environment : Ambient Temperature : $(25 \pm 2) ^\circ\text{C}$
 Relative Humidity : $(50 \pm 15)\% \text{RH}$

STD Reading ($^\circ\text{C}$)	UUC Reading ($^\circ\text{C}$)		UUC Error ($^\circ\text{C}$)	Measurement Uncertainty ($\pm^\circ\text{C}$)
	Before Adjusted	After Adjusted		
37.99	WET 37.9	-	-0.09	0.35
37.99	DRY 37.9	-	-0.09	0.35
37.99	GLOBE 37.9	-	-0.09	0.35
45.01	WET 45.3	-	0.29	0.35
45.01	DRY 45.2	-	0.19	0.35
45.01	GLOBE 45.1	-	0.09	0.35

STD = Standard

UUC = Unit Under Calibration

Description of UUC : Range 0 to 100 $^\circ\text{C}$
 Resolution 0.1 $^\circ\text{C}$

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

MIT Certificate No. L202210258-006 for Digital Thermometer with Probe (Fluke) Serial No. 5856603, Due 10-Nov-23

End of Certificate

COPY

Area Heat Stress Monitor

Model : QUESTemp 32

Serial No. : TPL090017



CALIBRATION CERTIFICATE

Certificate No. : L202401128-0001
 Date Issued : 22-Jan-24

Customer : Eastern Thai Consulting 1992 Co., Ltd.
 683 Moo 11 Sukhapibarn 8 Rd., Nongkham, Sriracha, Chonburi 20230

Equipment : Area Heat Stress Monitor

Manufacturer : QUEST TECHNOLOGY

Model : QUESTEMP 32

Serial No. : TPL090017

ID No./Tag No. : NO.7

Date Received : 17-Jan-24

Date Calibrated : 18-Jan-24

Calibrated by : Mr. Apiwat Peanrungrat

Calibration Method or Calibration Procedure Used

In-house method : CP-19 by comparing against Standard Digital Humidity / Temperature Meter

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

Result of Calibration

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

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Page 1 of 2

Approved by: *Saranyuth*
 (Mr. Saranyuth Tochua)

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Certificate No. : L202401128-0001

Environment : Ambient Temperature

(25 ± 2) °C

Relative Humidity :

(50 ± 15)%RH

STD Reading (°C)	UUC Reading (°C)	UUC Error (°C)	Measurement Uncertainty (±°C)	MPE (±°C)	Pass / Fail with Guard Band
38.01	WET 38.0	-	0.35	1	Pass
38.01	DRY 37.6	-	0.35	1	Pass
38.01	GLOBE 38.1	-	0.35	1	Pass
45.01	WET 45.0	-	0.35	1	Pass
45.01	DRY 44.6	-	0.35	1	Pass
45.01	GLOBE 45.1	-	0.35	1	Pass

STD = Standard

Pass = |error| + |uncertainty| ≤ |MPE|

UUC = Unit Under Calibration

Fail = |error| + |uncertainty| > |MPE|

Description of UUC :

Range

(-5) to 100 °C

Resolution

0.1 °C

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

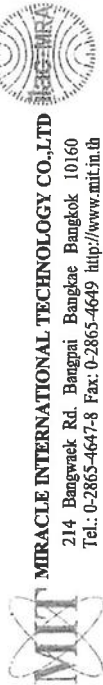
MIT Certificate No. L202310317-0003 for Digital Thermometer with Probe (Fluke) Serial No. 5856603, Due 06-Nov-24

End of Certificate

Area Heat Stress Monitor

Model : QUESTemp 32

Serial No. : TPI050069



MIRACLE INTERNATIONAL TECHNOLOGY CO., LTD
214 Bangwaek Rd. Bangnai Bangkok 10160
Tel.: 0-2865-4647-8 Fax: 0-2865-4649 <http://www.mit.in.th>



CALIBRATION CERTIFICATE

Certificate No. : L202307143-005
Date Issued : 25-Jul-23

Customer : Eastern Thai Consulting 1992 Co., Ltd.
683 Moo 11 Sukhaphibarn 8 Rd., Nongkham, Sriracha, Chonburi 20230

Equipment : Area Heat Stress Monitor

Manufacturer : QUEST TECHNOLOGY
Model : QUESTEMP 32
Serial No. : TP1050069
ID No./Tag No. : NO.2
Date Received : 19-Jul-23
Date Calibrated : 22-Jul-23

Calibrated by : Mr. Apiwat Peanrungrat

Calibration Method or Calibration Procedure Used

In-house method : CP-19 by comparing against Standard Digital Humidity / Temperature Meter

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

Result of Calibration

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

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Approved by: *Saranyuth T.*
(Mr. Saranyuth Tochua)



Page 1 of 2

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Certificate No. : L202307143-005
Environment : Ambient Temperature : $(25 \pm 2) ^\circ\text{C}$
Relative Humidity : $(50 \pm 15)\%\text{RH}$

STD	UUC Reading ($^\circ\text{C}$)		UUC Error ($^\circ\text{C}$)	Measurement Uncertainty ($^\circ\text{C}$)
	Reading ($^\circ\text{C}$)	Before Adjusted	After Adjusted	
38.00	38.00	WET 38.4	-	0.35
		DRY 38.0	-	0.35
		GLOBE 38.0	-	0.35
44.99	44.99	WET 45.3	-	0.35
		DRY 45.2	-	0.35
		GLOBE 45.0	-	0.35

STD = Standard

UUC = Unit Under Calibration

Description of UUC :
Range 0 to 100 $^\circ\text{C}$
Resolution 0.1 $^\circ\text{C}$

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

MIT Certificate No. L202210258-006 for Digital Thermometer with Probe (Fluke) Serial No. 5856603, Due 10-Nov-23

End of Certificate

Page 2 of 2

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Area Heat Stress Monitor

Model : QUESTemp 34

Serial No. : TEU080015

CALIBRATION CERTIFICATE



Certificate No. : L202307241-0001
 Date Issued : 24-Jul-23

Customer : Eastern Thai Consulting 1992 Co., Ltd.
 683 Moo 11 Sukhapibarn 8 Rd., Nongkham, Sriracha, Chonburi 20230

Equipment : Area Heat Stress Monitor

Manufacturer : QUEST TECHNOLOGY

Model : QUESTEMP 34

Serial No. : TEU080015

ID No./Tag No. : No.14

Date Received : 21-Jul-23

Date Calibrated : 22-Jul-23

Calibrated by : Mr. Apiwat Peanrungrat

Calibration Method or Calibration Procedure Used

In-house method : CP-19 by comparing against Standard Digital Humidity / Temperature Meter

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

Result of Calibration

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

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Approved by: *Sarayuth T.*
 (Mr. Sarayuth Tochua)



Page 1 of 2

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Certificate No. : L202307241-0001

Environment : Ambient Temperature : $(25 \pm 2) ^\circ\text{C}$

Relative Humidity : $(50 \pm 15)\%\text{RH}$

STD	UUC Reading ($^\circ\text{C}$)		UUC Error ($^\circ\text{C}$)	Measurement Uncertainty ($\pm ^\circ\text{C}$)
	Before Adjusted	After Adjusted		
38.00	WET 38.0	-	0.00	0.35
38.00	DRY 38.1	-	0.10	0.35
38.00	GLOBE 37.9	-	-0.10	0.35
44.99	WET 44.7	-	-0.29	0.35
44.99	DRY 44.8	-	-0.19	0.35
44.99	GLOBE 44.6	-	-0.39	0.35

STD = Standard

UUC = Unit Under Calibration

Description of UUC : Range 0 to 100 $^\circ\text{C}$
 Resolution 0.1 $^\circ\text{C}$

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

MIT Certificate No. L202210258-006 for Digital Thermometer with Probe (Fluke) Serial No. 5856603. Due 10-Nov-23

End of Certificate

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Area Heat Stress Monitor

Model : QUESTEMP 32

Serial No. : TPH060001



CALIBRATION CERTIFICATE

Certificate No. : L202403380-0001
Date Issued : 04-Apr-24

Customer : Eastern Thai Consulting 1992 Co., Ltd.
999 Moo 11, Nongkham, Sriracha, Chonburi 20230

Equipment : Area Heat Stress Monitor

Manufacturer : TSI

Model : QUESTEMP 32

Serial No. : TPH060001

ID No./Tag No. : NO.1

Date Received : 01-Apr-24

Date Calibrated : 03-Apr-24

Calibrated by : Mr. Apiwat Pearnungrot

Calibration Method or Calibration Procedure Used

In-house method : CP-19 by comparing against Standard Digital Humidity / Temperature Meter

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

Result of Calibration

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor $k = 2$, providing a level confidence approximately 95 percent.
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Approved by: *Sarayuth T.*
(Mr. Sarayuth Tochua)



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Certificate No. : L202403380-0001
Environment : Ambient Temperature : (25 ± 2) °C
Relative Humidity : (50 ± 15)%RH

STD	UUC Reading (°C)		UUC Error	Measurement	MPE	Pass / Fail
Reading (°C)	Before Adjusted	After Adjusted	(°C)	Uncertainty (±°C)	(±°C)	Simple Acceptance
37.98	WET	38.0	-	0.35	0.5	Pass
37.98	DRY	38.0	-	0.35	0.5	Pass
37.98	GLOBE	38.0	-	0.35	0.5	Pass
44.99	WET	44.9	-	0.35	0.5	Pass
44.99	DRY	44.9	-	0.35	0.5	Pass
44.99	GLOBE	44.9	-	0.35	0.5	Pass

STD = Standard
UUC = Unit Under Calibration
Pass = |error| ≤ |MPE|
Fail = |error| > |MPE|

Description of UUC : Range 0 to 100 °C
Resolution 0.1 °C

Condition As-Received : Used Item
The measurement results and statements of conformity with specification only relate to the item calibrated.
Measurement Standards Used & Traceability :
The International System of Units (SI) through
MIT Certificate No. L202310317-0003 for Digital Thermometer with Probe (Fluke) Serial No. 5856603, Due 06-Nov-24

End of Certificate

Area Heat Stress Monitor

Model : HD32.2

Serial No. : 22004318



Irranate Associates Co., Ltd
63/14-15, 5/75-16
Petchburi Road, Bangkapi,
Bangkok 10710, Thailand
Tel: +6688480812
Mobile: +6686395453
Email: irracalibration@irranate.com
Web site: www.irranate.com

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

Temperature measurement laboratory
Calibration services department.



NSC-TISI-TIS 17025
CALIBRATION 0367

CERTIFICATE OF CALIBRATION

Certificate No. : CDT-041-67

MEASUREMENT ITEM
MANUFACTURER
MODEL/TYPE
SERIAL NUMBER
ID NUMBER
CONDITION AS-RECEIVED
CUSTOMER

: Heat Stress Monitor
: Delta OHM
: HD32.2
: 22004318
: -
: Used item
: Eastern Thai consulting 1992 Co., Ltd.
: 683 Moo 11, Sukhapibarn 8 Rd,
Nongkham, Sriracha, Chonburi 20230

RECEIVED DATE
MEASUREMENT DATE
ISSUE DATE

: 08 Feb 2024
: 12 Feb 2024
: 16 Feb 2024

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

Temperature : 23.0 ± 3.0 °C
Relative Humidity : 55.0 ± 15.0 %RH

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

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibrated by:
☐ Mr. Sorawit Thachalad
☐ Miss Jittaporn Lertsomphol
☒ Miss Ruangrumpai Phoornmit



Approved signatory:

[Signature]

Mr. Parinya Booncharoen
Calibration Department Manager



THIS CERTIFICATE MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY

Page 1 of 2 Pages

Calibration procedure:
The temperature calibration was done by In-House calibration method as WI-CL-001 according to comparison method with standard digital temperature indicator and standard temperature probe. The temperature scale use was based on ITS-90.

Traceability:
The measurement results are traceable to the international system of units (SI) through National Institute of Metrology Thailand (NIMT) Certificate number: TT-0038-23, Certificate number ER-0101-23

Reference Used During Calibration:

- Standard Temperature Probe Model: STS-100 AS500, Serial No.: 667682-09, Due date: 28 Mar 2024
- Digital Temperature Indicator Model: DTI-1000-A MK II, Serial No.: 671407-00591 Due date: 14 Sep 2024

Uncertainty of Measurement:

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



Continuation of Certificate of Calibration Number CDT-041-67

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 – 40 °C

Function:

Table 1: This equipment was connected with wet bulb probe Model: HP3201.2 S/N: 22010215.
Dimension: Diameter 3.3 mm. Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
80	20.052	20.0	-0.1	0.099
80	25.057	25.0	-0.1	0.099
80	30.042	30.0	0.0	0.099
80	35.031	35.0	0.0	0.099
80	40.017	40.0	0.0	0.099

Table 2: This equipment was connected with Globe thermometer probe Model: TP3276.2 S/N: 22014940.
Dimension: Diameter 3.3 mm. Length 205 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.052	20.1	0.0	0.099
110	25.057	25.1	0.0	0.099
110	30.042	30.1	0.1	0.099
110	35.032	35.1	0.1	0.099
110	40.017	40.1	0.1	0.099

Table 3: This equipment was connected with temperature probe Model: TP3207.2 S/N: 22003554.
Dimension: Diameter 14 mm. Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.052	20.1	0.0	0.099
75	25.057	25.0	-0.1	0.16
75	30.041	29.8	-0.2	0.099
75	35.031	34.7	-0.3	0.099
75	40.017	39.6	-0.4	0.099

UUC*: Unit Under Calibration

Remark: The reported uncertainty of measurement is 0.16, based on standard uncertainty multiplied by a coverage factor $k=2$ 21 providing a level of confidence of approximately 95%.

End of Certificate of Calibration



Area Heat Stress Monitor

Model : QUESTemp 32

Serial No. : TPQ030024



CALIBRATION CERTIFICATE

Certificate No. : L202401128-0002
Date Issued : 22-Jan-24

Customer : Eastern Thai Consulting 1992 Co., Ltd.
683 Moo 11 Sukhapibarn 8 Rd., Nongkham, Sriracha, Chonburi 20230

Equipment : Area Heat Stress Monitor

Manufacturer : QUEST TECHNOLOGY
Model : QUESTEMP 32
Serial No. : TPQ030024
ID No./Tag No. : NO.9
Date Received : 17-Jan-24
Date Calibrated : 18-Jan-24

Calibrated by : Mr. Apiwat Peannungrot

Calibration Method or Calibration Procedure Used

In-house method : CP-19 by comparing against Standard Digital Humidity / Temperature Meter

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

Result of Calibration

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

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Approved by: 
(Mr. Sarayuth Tochua)


Page 1 of 2

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Certificate No. : L202401128-0002
Environment : Ambient Temperature : (25 ± 2) °C
Relative Humidity : (50 ± 15)%RH

STD	UUC Reading (°C)	UUC Error (°C)	Measurement Uncertainty (±°C)	MPE (±°C)	Pass / Fail with Guard Band
Reading (°C)	Before Adjusted	After Adjusted			
38.01	WET 38.1	-	0.09	0.35	Pass
38.01	DRY 38.2	-	0.19	0.35	Pass
38.01	GLOBE 38.0	-	-0.01	0.35	Pass
45.01	WET 44.8	-	-0.21	0.35	Pass
45.01	DRY 45.0	-	-0.01	0.35	Pass
45.01	GLOBE 45.0	-	-0.01	0.35	Pass
STD = Standard					
UUC = Unit Under Calibration			Pass = error + uncertainty ≤ MPE		
			Fail = error + uncertainty > MPE		
Description of UUC :		Range	(-5) to 100 °C		
		Resolution	0.1 °C		

Condition As-Received : Used Item
The measurement results and statements of conformity with specification only relate to the item calibrated.
Measurement Standards Used & Traceability :

The International System of Units (SI) through
MIT Certificate No. L202310317-0003 for Digital Thermometer with Probe (Fluke) Serial No. 5856603, Due 06-Nov-24

End of Certificate

BAROMETER

Equipment : Analog Barometer

ID No. / Tag No. : BM001/41



CALIBRATION CERTIFICATE

Certificate No. : L202305085-002
Date Issued : 16-May-23

Customer : Eastern Thai Consulting 1992 Co., Ltd.
 683 Moo 11 Sukhapibam 8 Rd., Nongkham, Srisachia, Chonburi 20230

Equipment : Analog Barometer

Manufacturer : Barigo

Model : -

Serial No. : -

ID No./Tag No. : BM001/41

Date Received : 11-May-23

Date Calibrated : 15-May-23

Calibrated by : Mr. Jame Khaothong

Calibration Method or Calibration Procedure Used :

In-house method : CP-21 base on DKD-R 6-1: Edition 3 2014.

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

Result of Calibration

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

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Approved by: *Saranyuth T.*
 (Mr. Sarayuth Tochua)



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Certificate No. : L202305085-002

Environment : Ambient Temperature : (25 ± 2)°C

Relative Humidity : (50 ± 15)%RH

STD Reading mbar	UUC Reading (mbar) Before Adjusted	UUC Reading (mbar) After Adjusted	UUC Error mbar	Uncertainty ± mbar
990.00	990.0	-	0.00	0.61
1000.00	1000.0	-	0.00	0.61
1010.00	1010.0	-	0.00	0.61
1020.00	1020.0	-	0.00	0.61
1030.00	1030.0	-	0.00	0.61

STD = Standard

UUC = Unit Under Calibration

Calibrated condition : Pressure Medium Air : Density = 1.19 kg/m³ @ 20°C, 1 bar
 Mounting Position Vertical
 Reference Level at center of its dial
 Conversion Factor Multiply by 1.0 E+02 - Pa unit

Description of UUC :	Range	990 - 1030	mbar Absolute
Calibration Range	990 - 1030	mbar Absolute	
Scale Interval	1	mbar	
Resolution	0.5	mbar Absolute	

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

IRPC Certificate No. CL1-P220104 for Reference Pressure Monitor Serial No. 1598, Due 11-Nov-23

End of Certificate

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BAROMETER

Equipment : Analog Barometer

ID No. / Tag No. : BM001/41

CALIBRATION CERTIFICATE



Certificate No. : L202405022-0013
Date Issued : 08-May-24

Customer
: Eastern Thai Consulting 1992 Co., Ltd.
683 Moo 11, Sukhaphibarn 8 Rd., Nongkhham, Sriracha, Chonburi 20230

Equipment
: Analog Barometer

Manufacturer
: Barigo
Model
: -
Serial No.
: -
ID No./Tag No.
: BM001/41
Date Received
: 03-May-24
Date Calibrated
: 06-May-24
Calibrated by
: Mr. Saruth Srichutikul

Calibration Method or Calibration Procedure Used

In-house method : CP-21 base on DKD-R 6-1: Edition 3 2014.

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

Result of Calibration

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

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Approved by: 
(Mr. Sarayuth Toehua)



Page 1 of 2

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Certificate No : L202405022-0013

Environment Ambient Temperature : (25 ± 2)°C

Relative Humidity : (50 ± 15)%RH

STD Reading mbar	UUC Reading (mbar) Before Adjusted	UUC Reading (mbar) After Adjusted	UUC Error mbar	Uncertainty ± mbar	MPE ± mbar	Pass / Fail with Guard Band
990.00	990	-	0.00	0.59	10.3	Pass
1000.00	1000	-	0.00	0.59	10.3	Pass
1010.00	1010	-	0.00	0.59	10.3	Pass
1020.00	1020	-	0.00	0.59	10.3	Pass
1030.00	1030	-	0.00	0.59	10.3	Pass

STD = Standard Pass = $|\text{error}| + |\text{uncertainty}| \leq |\text{MPE}|$

UUC = Unit Under Calibration Fail = $|\text{error}| + |\text{uncertainty}| > |\text{MPE}|$

MPE = Maximum Permissible Error

Calibrated condition : Pressure Medium Air : Density = 1.19 kg/m³ @ 20°C, 1 bar
Mounting Position Vertical
Reference Level at center of its dial
Conversion Factor Multiply by 1.0 E+02 - Pa unit

Description of UUC :	Range	950 - 1080	mbar Absolute
	Calibration Range	990 - 1030	mbar Absolute
	Scale Interval	1	mbar

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

IRPC Certificate No. CL1-P230097 for Reference Pressure Monitor Serial No. 1598, Due 09-Nov-24

End of Certificate

Page 2 of 2

BOD INCUBATOR

Model : TC445S

Serial No. : 0223/007275

SX

S K SALES AND SERVICE CO., LTD.
194/56, 194/57 Thokham Rd. Samsae Dam
Bung Khun Thien Bangkok 10150
Tel. : 02-417-2144 Fax : 02-417-2155



Certificate of Calibration

Reference No. : C03190/2309-025
Customer : Eastern Thai Consulting 1992 Co., Ltd.
Certificate No. : S2309-3014
Page 1 of 2

Equipment : 683 Moo 11, Sukhaphiban 8, Tambol Nongkham,
Manufacturer : Siracha District, Chonburi 20230, Thailand
Model : Incubator
Serial No. : Lovibond
ID No. : TC445S
Received Date : 0223/007275
Calibrated Date : 15 September 2023
Issued Date : 18 September 2023
Environment : 18 September 2023

Ambient Temperature (°C)	27.5	Maximum Value	28.1
Relative Humidity (% RH)	57		58
AC Line Voltage (VAC)	224		226

Place Of Calibration : Production Line
Calibrated by : Mr. Teerasak Chalyaporn

Calibration Method

In-house method : SK-WI-23 base on Thai Laboratory Accreditation Scheme Publication Reference G-20

Condition of this result of calibration

1. Reference standard instrument

Instrument	Serial No.	Certificate No.	Due Date
1) Data acquisition/Switch unit	MY44047397	L2305-268	4 November 2023
2) Multiplexer Module	MY41105123	L2305-268	4 November 2023

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

3. This certificate can be traceable to International System of Unit :

- Through Thailand Institute of Scientific And Technological Research (TISTR)

Approved by

☐ Mr. Suphachai Saksri ☐ Mr. Phayak Toolit ☐ Miss Tanjaraporn Petpong

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor 'k' = 2.0 ,providing a level of confidence level of approximately 95 %

This certificate may not be reproduced other than in full except with the prior written approval of S K Sales And Service Company Limited

Certificate No. : S2309-3014

Page 2 of 2

Table1 General Information

Working Area (W*L*H)	60*56*145 cm
Fresh Air	OFF

Table2 Chamber Performance

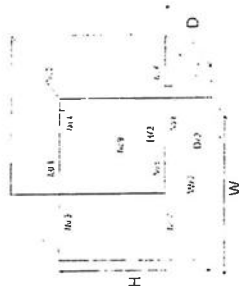
Setting Temperature (°C)	Average Indicating Temperature (°C)	Measured Stability (±°C)	Measured Uniformity (°C)	Overall Variation (°C)
20.0	20.0	0.37	0.64	0.98

Table3 Temperature Distribution

Setting Temperature (°C)	Average Standard Reading (°C)									Uncertainty (±°C)
	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	
20.0	19.52	19.40	19.70	19.43	19.33	19.39	19.45	19.58	19.67	0.55

Resolution : 0.1 (°C)

* Probe No. 9 is Reference Probe



- Notes :
1. The temperature stability is the one-half of greatest maximum difference of measured temperatures at any one probe.
 2. The temperature uniformity is the maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time
 3. Overall variation is the difference of maximum and minimum measured temperatures throughout observation time.
 4. The reported uncertainty of measurement were excluded Uniformity and Stability

** End of Calibration Report **

COPI

[Signature]

CERTIFICATE OF ANALYSIS

EPA PROTOCOL GAS

Cylinder No. : EB0145030



Airgas Specialty Gases
Airgas USA, LLC
6141 Easton Road
Bldg 2
Plumsteadville, PA 18949
Airgas.com

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Part Number: E03N199E15AC0U4
Cylinder Number: EB0145030
Laboratory: 124 - Plumsteadville - PA
PGVP Number: A12021
Gas Code: CH4,PPN,BALN
Reference Number: 160-402242242-1
Cylinder Volume: 144.4 CF
Cylinder Pressure: 2015 PSIG
Valve Outlet: 350
Certification Date: Oct 15, 2021

Expiration Date: Oct 15, 2029

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/001, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a full analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

DO NOT USE THIS CYLINDER BELOW 100 PSIG, I.E. 0.7 MEGAPASCALS.

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
METHANE	180.0 PPM	177.0 PPM	G1	+/- 1.0% NIST Traceable	10/15/2021
PROPANE	185.0 PPM	187.0 PPM	G1	+/- 1.0% NIST Traceable	10/15/2021
NITROGEN	Balance				
CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	08011503	K002564	246.7 PPM METHANE/AIR	+/- 0.6%	May 15, 2025
NTRM	200602-06	6162660Y	243.3 PPM PROPANE/AIR	+/- 0.5%	Mar 17, 2027
ANALYTICAL EQUIPMENT					
Instrument/Make/Model		Analytical Principle			Last Multipoint Calibration
Nicolet IS50 FTIR AUP2110295 CH4		FTIR			Oct 13, 2021
Nicolet IS50 FTIR AUP2110295 C3H8		FTIR			Oct 14, 2021

Triad Data Available Upon Request

NOTES:

Gross Weight: 28.0 Kg
Net Weight: 4.9 Kg
PO# 5221004861



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Michael A. Huber
Approved for Release

CERTIFICATE OF ANALYSIS

EPA PROTOCOL GAS

Cylinder No. : EB0062815

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: E04NI99E15ACX9C
Cylinder Number: E00082815
Laboratory: 124 - Riverton (SAP) - NJ
PGVP Number: B52018
Gas Code: CO,NO,NOX,SO2,BALN

Reference Number: 82-401135335-1
Cylinder Volume: 144.4 CF
Cylinder Pressure: 2015 PSIG
Valve Outlet: 660
Certification Date: Mar 13, 2018
Expiration Date: Mar 13, 2026

Certification performed in accordance with EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)* document EPA 600/R-12/0251, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS				
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
NOX	50.00 PPM	50.55 PPM	G1	+/- 1.4% NIST Traceable
NITRIC OXIDE	50.00 PPM	50.50 PPM	G1	+/- 1.4% NIST Traceable
SULFUR DIOXIDE	50.00 PPM	51.01 PPM	G1	+/- 1.0% NIST Traceable
CARBON MONOXIDE	2000 PPM	1977 PPM	G1	+/- 1.0% NIST Traceable
NITROGEN	Balance			

CALIBRATION STANDARDS			
Type	Lot ID	Cylinder No	Expiration Date
NTRM	16060607	CC442564	Jun 27, 2020
PRM	12367	APEX1099237	Jun 02, 2017
GMIS	0315201604	CC503358	Mar 15, 2019
NTRM	16011025	CC473218	Jun 07, 2022
NTRM	12060735	CC556192	Dec 14, 2026
The SRM, PRM or RGM noted above is only in reference to the GMS used in the assay and not part of the analysis.			

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 APW1100391 CO	FTIR	Feb 08, 2018
Nicolet 6700 APW1100391 NO	FTIR	Feb 15, 2018
Nicolet 6700 APW1100391 NO2	FTIR	Feb 16, 2018
Nicolet 6700 APW1100391 SO2	FTIR	Mar 01, 2018

Triad Data Available Upon Request

NOTES: NET WEIGHT: 10.43lbs
GROSS WEIGHT: 60.93lbs

PO# 5218000763

This calibration std. has been certified in accordance with the May 2012 EPA Traceability Protocol, Document EPA-600/R-12/0531. All testing processes and measurements conform to the requirements of ISO/IEC 17025 and to Airgas ISO 9001:2000 and relate only to items identified on this certificate. All concentrations are certified to be NIST Traceable with total uncertainty as detailed under Analytical Uncertainty. This document shall not be reproduced in full without written approval of the issuer.



TESTING CERT No. 3082.05

Don M. [Signature]
Approved for Release

DIGITAL LIGHT METER

Model : LX-72

Serial No. : Q606371



CALIBRATION CERTIFICATE

Issued date: 23 July 2023

Client Name : **ESTERN THAI CONSULTING 1992 CO., LTD.**

Address : 683 Moo.11, Sukhaphibarn 8 Rd., Nongkharn, Siracha, Chonburi 20230.

Request No : **C-2307 - 306**

Laboratory No.: **CAL- 306**

Date of Request: 19 July 2023.

Date of Calibration: 20 July 2023.

1. Unit Under Calibration (UUC) :

Nomenclature : Digital Light Meter

Maker : DIGICON

Serial No.: Q 606371

Model : LX-72

2. Place of Calibration: Photometry Standard Laboratory, INTERNATIONAL TESTING SERVICE CO., LTD.

3. Range of Calibration: 3 Range

4. Condition of Laboratory: Ambient temperature: (25 ± 2) °C and relative humidity (60 ± 20) %.

5. Reference Standard: Standard Tungsten Halogen Lamp, Serial No.: 504011, which was calibrated on 5 October 2022, can be traceable to International System of Unit (SI) through National Institute of Metrology (Thailand), Certificate No.: TP-1024-22.

6. Support Equipment:

1. Photometric bench, 6.3 meter long.
2. DC. power supply, Serial No.: EJ 19A 009, Model: GPR-25H 300, Maker: GW INSTR.
3. Digital Multimeter, Model: 34401A, S/N: MY44011212 and MY44011215.
4. Foot Candle / Lux Meter, Model: 407026, S/N: Q 558437, Maker: EXTECH.

7. Calibration Procedure:

The measurement was done in accordance with WI-CP-01. The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.

Page 1 of 2

The Results shown in this certification report refer only to the equipment(s) calibrated unless otherwise stated
This Calibration Certificate cannot be reproduced, except in full, without permission of company.

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Request No: **C-2307 - 306**

Laboratory No.: **CAL - 306**

Serial No.: Q 606371

Results :


UUC Range	Standard (lx)	UUC Reading (lx)		Correction (lx)	Uncertainty of Measurement (\pm lx)
		Before adjust	After adjust		
400	0	---	---	---	0.60
	50	49.2	50.1	-0.1	
	100	99.3	100.2	-0.2	
	200	198.7	200.0	0.0	
	300	295.0	296.8	+3.2	
	400	388.4	390.8	+9.2	
4000	500	485	501	-1	2.0 % of Reading
	1000	970	1002	-2	
	2000	1933	1994	+6	
	3000	2858	2970	+30	
(x10)	4000	3783	3920	+80	
	5000	470	488	+120	

Note : 1. The results relate only to the items calibrated.

2. The UUC is not read out at zero lux.


3. The UUC is calibrate at 5000 lx is not NSC-ONSC Accredited.

Calibration result approved by


(Mr. Witana Tholieng)

Approved on behalf of
International Testing Service Co., Ltd




(Mr. Pichit Vivat-Anant)
Managing Director

Page 2 of 2

The Results shown in this certification report refer only to the equipment(s) calibrated unless otherwise stated
This Calibration Certificate cannot be reproduced, except in full, without permission of company.

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DRY GAS METER XC572V

Serial No. : 1110070

Certificate Of Calibration

Method 5 Pre-Test Console Calibration - Cubic meter (m3)

Meter Console Information

Console Model: XC572V
 Console serial: 1110070
 DGM Model #: SK25EX
 DGM Serial #: 0005413

Calibration Condition

Calibration Date: 3-Jul-23
 Due Date: 2-Jul-24
 Cal Report No: WDS-SV660107
 Ambient Temp (°C): 25
 Pressure (mm Hg): 758
 Relative Humidity (%): 60

Factors/Conversion

Std. Temp (°C): 298
 Std. Pressure (mm Hg): 760
 K₁ (K/mm Hg): 0.3857

Reference Equipment

WTM Model: W-NKoDa-5B WTM Cal Due Date: Nov. 2022
 WTM Serial: 600245 Gamma: 1.0000

UUT Meter (DGM)

Reference Meter (WTM)

Run Time (minutes)	DGM Orifice (mm H ₂ O)	Volume		Outlet Temp		Volume		Outlet Temp	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final
9	P _{avg}	V _{in}	V _{out}	t _{in}	t _{out}	V _{in}	V _{out}	t _{in}	t _{out}
15.00	13.0	599.3828	599.5462	27	27	20.05690	20.22163	28	27
10.00	25.0	599.5689	599.7246	27	26	20.24425	20.39999	27	27
8.00	50.0	599.7405	599.9176	26	25	20.41592	20.59344	27	27
7.00	80.0	599.9333	600.1337	26	25	20.60920	20.81034	27	27
5.00	120.0	600.1559	600.3319	25	26	20.83271	21.00950	27	27

Standardized Data

Calibration Results

Test Meter		Reference Meter		Correction Factor		Flow Rate		1-H ₂ O (mm H ₂ O)	
Std. Volume	Std. Flow Rate	Std. Volume	Std. Flow Rate	Gamma	Variation	Std & Corr	0.0212 SCMM	Variation	
V _{avg} (m ³)	Q _{avg} (m ³ /min)	V _{avg} (m ³)	Q _{avg} (m ³ /min)	(Y)	(ΔY)	Q _{avg} (m ³ /min)	ΔH ₀	ΔΔH ₀	
0.159	0.011	0.160	0.011	1.005	0.010	0.011	50.191	2.747	
0.152	0.015	0.152	0.015	0.996	0.000	0.015	48.096	0.662	
0.174	0.022	0.173	0.022	0.995	0.001	0.022	47.605	0.171	
0.197	0.028	0.196	0.028	0.993	-0.003	0.028	45.688	-1.747	
0.174	0.035	0.172	0.034	0.990	-0.006	0.034	45.602	-1.832	
				0.996	= Y Avg		47.434	= ΔH ₀ Avg	

Pass/Fail Result: **Pass**

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance for individual values from the average is ±0.02.
 Note: For ΔH₀, orifice pressure differential that equates to 0.75cfm (0.0212m³/min) at standard temperature and pressure, acceptable tolerance for individual values from the average is ±0.2 inches (5.1mm) H₂O.

Approved By: _____

(Patpasu Chaisana)
 Service Manager

Date: 3-Jul-23

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TEMPERATURE DISPLAY CALIBRATION

Meter Console Information		Calibration Conditions		Reference Equipment	
Console Model	XC572V	Cal Date	3-Jul-23	Temp Simulator Model	FLUKE 714B
Console serial	1110070	Due Date	2-Jul-24	Serial No	60590035
Temp Indicator Model	765-KF	Cal Report No	WDS-SV660107		
Temp Indicator Serial	JC17852	Ambient Temp (°C)	25		
		Pressure (mm Hg)	758		
		Humidity (%)	60		

Temperature Sensor Calibration

Reference Point	Ref. Thermometer Temperature (°C)	Thermocouple Display Temperature (°C)	Temperature Difference (°C)
#			
1	-18.0	-17.0	1.0
2	38.0	37.0	1.0
3	93.0	93.0	0.0
4	149.0	149.0	0.0
5	260.0	259.0	1.0
6	371.0	372.0	-1.0
7	482.0	482.0	0.0
8	593.0	594.0	-1.0
9	816.0	816.0	0.0
10	1038.0	1039.0	-1.0
		Maximum ¹	1.0

Note

¹ For valid test results, the maximum difference between temperature readings should be ≤ 1.0°C (EPA Method 5, Section 6.1.1.8).
 Perform all TC Channel calibrations. Except meter (DGM) channel.

DGM Out Temperature Sensor Calibration

Temperature point	Ref. Thermometer Temperature (°C)	Thermocouple Display Temperature (°C)	Temperature Difference (°C)
#			
Ambient	26.5	27.0	-0.5
Heal	100.5	102.5	-2.0

Difference Range

DGM Out Temp. Diff. ±3 °C

PASS

Approved By: _____

Patpasu Chaisana
 Service Manager

บริษัท วิสโดม สไซน์ จำกัด (มหาชน) หรือ บริษัท วิสโดม สไซน์ จำกัด
 WISDOM SCIENCE SALE AND SERVICE GROUP COMPANY LIMITED

COPY

Address: 9/115 Lumpini Town Ville Kitchapituek (Prakrua Village) No. 4, Bang Kham, Bang Kruai, Nonthaburi 11130 Thailand
 Tel: 050 660 1392 / 084 598 1944 / 084 704 1630



ELAPSED TIMER CALIBRATION

Meter Console Information

Model # : XC572V
Serial # : 1110070
Elapsed Timer Model # : C342-1464
Elapsed Timer Serial # : -

Calibration Conditions

Cal. Date : 03-Jul-23
Due Date : 02-Jul-24
Cal. Report No. : WDS-SV660107
Ambient Temp. (°C) : 25
Pressure (mm Hg) : 756
Humidity (%) : 60

Reference Equipment

Calibration Standard : JS-307
Method Reference : Compare

Run Time Elapsed Time		Calibration Results				Deviation
		Elapsed Time		Average Time		
1	2	3	4			
Minute	Minute	Minute	Minute	Minute	Minute	Minute
2.00	2.00	2.00	2.00	2.000	0.000	0.000
3.00	3.00	3.00	3.00	3.000	0.000	0.000
5.00	5.00	5.00	5.00	5.000	0.000	0.000
7.00	7.00	7.00	7.00	7.000	0.000	0.000
9.00	9.00	9.00	9.00	9.000	0.000	0.000

Approved By

(Patpasu Chaisana)
Service Engineer

WISDOM
SCIENCE

WISDOM SCIENCE (THAILAND) PUBLIC COMPANY LIMITED
100/115 Lumphini Town, Vithayalai Road, Bangkok 10330, Thailand
Tel : 090-660-1392, 084-596-1944, 084-704-1620

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DRY GAS METER MC572V

Serial No. : 0504003

Certificate Of Calibration

Method 5 Pre-Test Console Calibration - Cubic meter (m3)

Meter Console Information

Console Model : MC572V
Console serial : 0504003
DGM Model # : SK25EX
DGM Serial #: 00009854

Calibration Condition

Cal Date: 22-Apr-24
Due Date: 23-Apr-25
Cal Report No.: WDS-SV6704001
Ambient Temp (°C): 25
Pressure (mm Hg): 758
Relative Humidity (%): 60

Factors/Conversion

Std. Temp (°K): 298
Std. Pressure (mm Hg): 760
K₁ (K/mm Hg): 0.3857

Reference Equipment

WTM Model: W-NkoDa-5B WTM Cal. Due Date: Dec. 2023
WTM Serial: 600245 Gamma: 1.0000

UUT Meter (DGM)				Reference Meter (WTM)					
Run Time (minutes)	DGM Orifice (mm H ₂ O)	Volume		Outlet Temp		Volume		Outlet Temp	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final
15.00	13.0	144.5926	144.7699	26	27	60.06607	60.24392	29	28
10.00	25.0	144.8168	144.9795	27	27	60.29098	60.45472	27	27
8.00	50.0	145.0164	145.2002	28	28	60.49135	60.67317	29	27
7.00	80.0	145.2238	145.4291	28	28	60.69691	60.90186	29	28
5.00	120.0	145.4909	145.6692	28	29	60.96349	61.14145	27	26

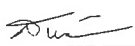
Standardized Data

Test Meter		Reference Meter		Correction Factor		Flow Rate		VH@ (mm H ₂ O)	
Std. Volume	Std. Flow Rate	Std. Volume	Std. Flow Rate	"Gamma"	Variation	Std. & Corr	0.0212 SCMM	Variation	
V _{mstd} (m ³)	Q _{mstd} m ³ /min	V _{rstd} (m ³)	Q _{rstd} m ³ /min	(Y)	(ΔY)	Q _{rstd} (m ³ /min)	ΔH ₂	ΔΔH ₂	
0.173	0.012	0.173	0.012	0.997	0.003	0.012	43.309	-0.858	
0.159	0.016	0.160	0.016	1.004	0.011	0.016	43.381	-0.787	
0.179	0.022	0.176	0.022	0.984	-0.009	0.022	45.447	1.280	
0.201	0.029	0.199	0.028	0.989	-0.005	0.028	44.202	0.035	
0.175	0.035	0.174	0.035	0.994	0.000	0.035	44.497	0.330	
				0.993	= Y Avg			44.167	= ΔH@ Avg

Pass/Fail Result: **Pass**

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 ΔH₂, 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 ±0.2inches (5.1mm) H₂O.

Approved By: 
(Patpasu Chaisana)
Service Manager

Date: 22-Apr-24

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TEMPERATURE DISPLAY CALIBRATION

Calibration Conditions

Cal Date: 22-Apr-24
Due Date: 23-Apr-25
Cal Report No.: WDS-SV6704001
Ambient Temp (°C): 25
Pressure (mm Hg): 758
Humidity (%): 60

Reference Equipment

Temp Meter Model: Fluke 714B
Serial No.: 60590035
Cal Date: 07-Apr-24
Temp Meter Model: Fluke 179
Serial No.: 58620112
Cal Date: 06-Feb-24

Meter Console Information

Console Model: MC572V
Console serial: 0504003
Temp Indicator Model: 765-KF
Temp Indicator Serial: JC05630

Temperature Sensor Calibration

Reference Point	Ref. Thermometer Temperature	Thermocouple Display Temperature	Temperature Difference
#	°C	°C	°C
1	-18.0	-17.0	1.0
2	38.0	37.0	1.0
3	93.0	93.0	0.0
4	149.0	150.0	-1.0
5	260.0	259.0	1.0
6	371.0	372.0	-1.0
7	482.0	482.0	0.0
8	593.0	593.0	0.0
9	816.0	815.0	1.0
10	1038.0	1038.0	0.0
Maximum ¹			1.0

Note

¹ For valid test results, the maximum difference between temperature readings should be ≤1.0°C (EPA Method 5, Section 6.1.1.8).
Perform all TC Channel calibrations. Except meter (DGM) channel.

PASS

DGM Out Temperature Sensor Calibration

Temperature point	Ref. Thermometer Temperature	Thermocouple Display Temperature	Temperature Difference
#	°C	°C	°C
Ice	0.0	1.0	-1.0
Ambient	26.5	26.0	0.5
Heat	109.3	110.0	-0.7

Difference Range
Temp. Difference

±2 °F or ± 1 °C

PASS

Note

The temperatures of the thermocouple and reference thermometers shall agree to within ±2 °F (EPA Method 5, section 10.5)

Approved By:

(Patpasu Chaisana)
Service Manager

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Certificate of Calibration - Supplemental

METHOD 5 PRE-TEST CONSOLE CALIBRATION

Nomenclature

P_b - Barometric Pressure
 DGM - Dry Gas Meter
 K_1 - Constant based on standard temp and press
 O - Run time, in minutes
 P_m - ΔH (Meter Pressure, gauge)
 V_m - Volume collected by test meter, corrected for STP
 $Q_{m(std)}$ - Calculated flow rate of test meter
 K' - Critical orifice coefficient
 P_w - Measured pressure of reference meter
 T_w - Temperature measured in reference meter
 T_m - Temperature measured in test meter
 Y - Ratio of volume collected from test meter and orifice
 sc - Scaling Factor
 $Counts_{sc}$ - Number of pulse counts, standardized
 C_{total} - Number of raw pulse counts of a calibration run

Equations

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

$$V_{m(std)} = Counts_{std} * Y_{sc(avg)}$$

$$Counts_{std} = K_1 \frac{C_{total} * (P_{bar} + \frac{P_{m(std)}}{13.6})}{T_m}$$

$$Q_{m(std)} = \frac{V_{m(std)}}{t}$$

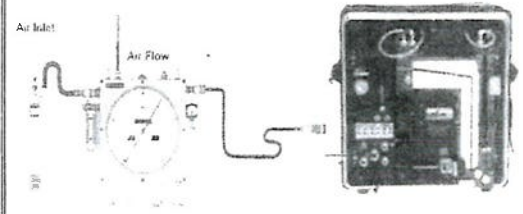
$$Y_{sc} = \frac{V_{m(std)}}{Counts_{std}}$$

$$K_1 = \frac{T_{std}}{P_{std}}$$

$$Y = \frac{V_{m(std)}}{V_{m(std)}}$$

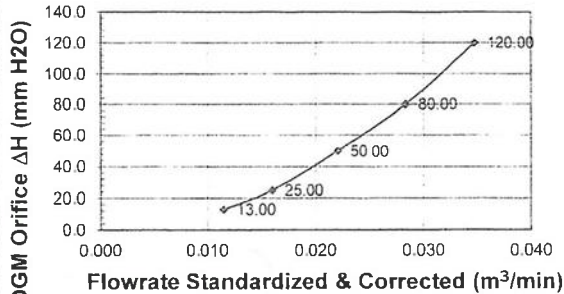
$$Meter \Delta H = \frac{P_{std} * 0.0011626 * P_{std} * \frac{1}{T_{std}}}{T_m} * \left(\frac{T_{std}}{T_m} \right)$$

Calibration Train



Calibration Graphs

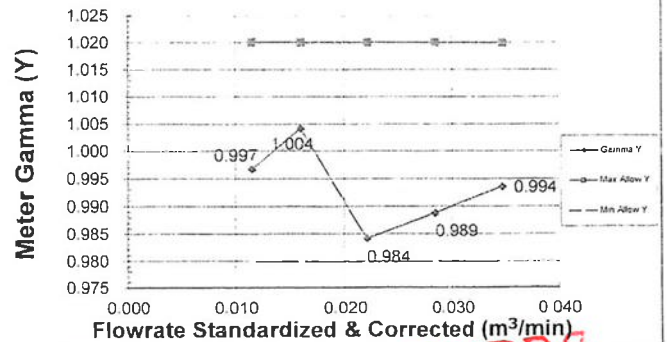
Meter Pressure vs Flowrate



Console Serial 0504003

Console Model MC572V

Meter Gamma vs Flowrate



Console Serial 0504003

Console Model MC572V

COPY

Flue gas Analyzer

Testo 350 NEW

Serial No. 63455616/0722



Calibration Certificate

Certificate No: G 660489
Date of issue : 17-Aug-23

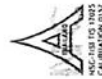
Instrument description : Flue Gas Analyzer
Instrument model : Testo 350 New
Instrument serial no. : 63455616/0722
Control unit serial no. : 03600177/0722
ID no. or control no. :
Manufacturer : Testo SE & Co. KGaA
Probe description :
Probe model :
Probe serial :
Customer name : Eastern Thai Consulting 1992 Company Limited
Customer address : 683 Moo 11, Sukhaphibarn 8 Road, Nongkham, Si Racha, Chon Buri 20280

Total pages of certificate : 2 Pages
Receiving no. : L-232625
Receiving date. : 10-Aug-23
Parameter of calibration : Gas Calibration(Oxygen 2.498,10.04,21.02 %vol, Carbon Monoxide 80.14,302,1003 ppm, Nitrogen Dioxide 80.96 ppm, Nitric Oxide 151.5 ppm, Sulphur Dioxide 100.8 ppm)
Condition of UUC : Used
Ambient condition : All of the Measurement were carried out the stabilized laboratory
Temperature : 23 ± 5 °C
Humidity : 55 ± 15 %RH
Calibration place : 17/121 Soi Ngamwongwan 47 Yaek 48, Toongsongkhong, Lakso, Bangkok 10210
Calibration procedure no. : This instrument was calibrated by comparison with Standard gas mixture according to calibration work instruction no. WI-CL-28-C

The calibration certificate expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.
This certificate is applied only to item under test Environmental condition.
This Calibration Certificate may not be reproduced other than in full except with the permission of the issuing laboratory.
Calibration certificates without signature and seal not valid and The results relate only to the items tested/calibrated.
This calibration certificate documents are traceability to national standards, which realize measurement according to the International System of Units (SI).
Date of calibration : 17-Aug-23

Kwancheep
Mr. Kwanchai Khamdoun
Calibration Technician
Wongsettee
Mrs. Nongluck Wongsettee
Technical Manager

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Calibration Certificate

Certificate No.: G 660489

Standard References (Table 1)

Standard	Certificate No.	Vendor	Due date
Oxygen (O2) 2.498 % Vol	4219/21	Linde	30-Sep-25
Oxygen (O2) 10.04 % Vol	CG-0153-21	Nimt	18-Nov-26
Oxygen (O2) 21.02 % Vol	CG-0041-22	Nimt	10-Feb-27
Carbon monoxide (CO) 80.14 ppm	CG-0040-22	Nimt	14-Feb-27
Carbon monoxide (CO) 302 ppm	1915/23	Linde	16-Jun-25
Carbon monoxide (CO) 1003 ppm	2583/22	Linde	09-Aug-24
Nitrogen Dioxide (NO2) 80.96 ppm	3240/21	Linde	26-Jun-24
Nitric Oxide (NO) 151.5 ppm	0161/23	Linde	22-Jan-25
Sulphur Dioxide (SO2) 100.8 ppm	3507/22	Linde	09-Nov-24

Measured room conditions

Temperature : 23.8 °C Humidity : 62.1 %RH Pressure : 1008.9 mbar

Calibration conditions

Gas Temperature : 24 °C Flow rate : 1,200 ml/min Gas pressure : 1016.8 mbar

Calibration Results (Without adjustment) (Table 2)

Parameter of Standard	Mean of		Uncertainty (±)
	Standard Values	UUC	
O2 (%Vol)	2.498	2.55	0.052
O2 (%Vol)	10.04	10.11	0.07
O2 (%Vol)	21.02	21.14	0.12
CO (ppm)	80.14	80	-0.14
CO (ppm)	302	302	0
CO (ppm)	1003	999	-4
*NO2 (ppm)	80.96	81.5	0.54
*NO (ppm)	151.5	150	-1.5
*SO2 (ppm)	100.8	100	-0.8

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

* Calibrations marked No. TSI Accredited "in this Certificate have been included for completeness."

End of Report

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Hot Air Oven

Model : UM 400

Serial No. : 900982

NSC-TIS-TIS17025
CALIBRATION 0152

Page 1 of 3

Certificate No. : 24-001944

Sample Code : 24-00963-001

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.

683 Moo 11, Sukhapibarn 8 Rd., Nongkham,

Siracha, Chonburi 20230

Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.

(Hot Lab)

Equipment : Temperature controlled enclosures (Hot air oven)

Manufacturer : Memmert Model : UM 400

Serial No. : 900982 ID No. : LABE 17/1

Date of Receipt : 09 January 2024 Date of Calibration : 09 January 2024

Condition of Calibration

1. Environment	1.1 Ambient temperature	: Maximum	30.6 °C	: Minimum	29.2 °C
	1.2 Relative humidity	: Maximum	57.5 %	: Minimum	46.4 %
	1.3 Line voltage supplied	: Maximum	229.5 VAC	: Minimum	222.5 VAC

2. Calibration method

TLAS-G-20: Guidelines for calibration and checks of temperature controlled enclosures.

3. Reference standard instrument

Instrument	ID No.	Certificate No.	Due Date
Data Acquisition With Sensor (RTD-P1100)	LB-DA-10 (RTD-257 to RTD-265)	23-066256	29 June 2024

4. This certificate is traceable to the international system of unit (SI Unit).

The measurement is traceable to Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.

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

6. Condition of calibration item : Normal

Calibrated by

Mr. Sarawoot Thammo

(Mr. Somchai Neampunt)

Signed for Director

Issue date

09 January 2024

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

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

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement, realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

361 Soi Ladprao 122, Ladprao Road,

Phlabphla, Wang Thonglang, Bangkok 10310

FM-CL-114

TEL 02-516-2422

FAX 02-516-6949

Rev 01

CONTACT@AMARC.CO.TH

WWW.AMARC.CO.TH

Effective Date 15/01/21

NSC-TIS-TIS17025
CALIBRATION 0152

Page 2 of 3

Certificate No. : 24-001944

Sample Code : 24-00963-001

REPORT OF CALIBRATION

Results of Calibration

Resolution : 0.1 °C

1. Reporting of Temperature

Calibration point (°C)	UUC* setting (°C)	UUC* reading (°C)	Measured temperature at each positions (°C)								Uncertainty ± (°C)	Coverage factor k
			# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	# g ^{ref}	
60	60.0	60.0	60.04	59.90	59.81	59.84	59.47	59.91	60.08	59.98	59.87	2.00
85	85.0	85.0	86.07	85.75	85.58	85.62	84.69	85.63	86.28	85.94	85.77	2.00

2. Characterization results

Calibration point (°C)	Stability ± (°C)	Uniformity (°C)	Overall variation (°C)
60	0.11	0.49	0.80
85	0.09	1.13	1.72

Notes

UUC* = Unit Under Calibration

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Phlabphla, Wang Thonglang, Bangkok 10310

FM-CL-016

TEL 02-516-2422

FAX 02-516-6949

Rev. 08

CONTACT@AMARC.CO.TH

WWW.AMARC.CO.TH

Effective Date 15/01/21



NSC-TLS-TS17025
CALIBRATION0352

Page 3 of 3

REPORT OF CALIBRATION

Certificate No. : 24-001944

Sample Code : 24-00963-001

Results of Calibration

Notes

- Sensor installation locations
 - All sensors at any corners or walls should be positioned 5 cm (a x b x c) from the wall.
 - The reference sensor is preferably located of the geometric center of the chamber.
- Interior dimensions approx of chamber :
W = 40 cm ; D = 28 cm ; H = 39 cm
- Air valve or fresh air level : Off
- Fan level : Open
- The quoted uncertainty includes "Stability of chamber and loading effect in chamber at 20% of uniformity".
- 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.
- Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.
- Overall variation - the difference of the maximum and the minimum measured temperatures throughout observation time.
- UUC¹ reading - the average reading of indicating device that forms the integral part of the enclosure.
- Calibration results without adjustment.

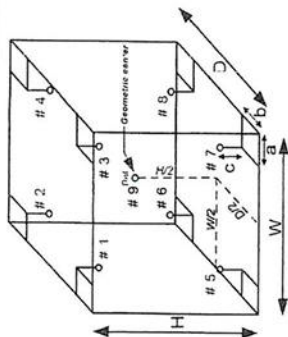


Figure: Example of sensor installation Positions

¹The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor k , which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003.

- End of Report -

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Hot Air Oven

Model : UFE 500

Serial No. : G511.0182

CERTIFICATE OF CALIBRATION

Page 1 of 3
Certificate No. : 23-148804
Sample Code : 23-56200-006

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapibarn 8 Rd., Nongkham,
Si-racha, Chonburi 20230
Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.
(Hot Lab)
Equipment : Temperature controlled enclosures (Hot air oven)
Manufacturer : Memmert
Model : UFE 500
Serial No. : G511.0182
ID No. : LABE 17/4
Date of Receipt : 22 December 2023
Date of Calibration : 22 December 2023

Condition of Calibration

- Environment**
 - Ambient temperature** : Maximum 30.9 °C ; Minimum 29.6 °C
 - Relative humidity** : Maximum 54.5 % ; Minimum 46.8 %
 - Line voltage supplied** : Maximum 227.6 VAC ; Minimum 224.2 VAC

2. Calibration method

TLAS-G-20: Guidelines for calibration and checks of temperature controlled enclosures.

3. Reference standard instrument

Instrument	ID No.	Certificate No.	Due Date
Data Acquisition With Sensor (RTD-Pt100)	LB-DA-08 (RTD-248 to RTD-256)	23-084070	06 August 2024

- This certificate is traceable to the international system of unit (SI Unit).
The measurement is traceable to Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.
- This result of calibration was found accurate as shown on date and place of calibration only.
- Condition of calibration item : Normal

Calibrated by : Mr. Pisek Into
Scientist
Issue date : 25 December 2023
Approved by : (Mr. Somchai Neampunt)
Signed for Director

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The uncertainties are for a confidence probability of approximately 95%.
The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.
This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

REPORT OF CALIBRATION

Page 2 of 3
Certificate No. : 23-148804
Sample Code : 23-56200-006

Results of Calibration

Resolution : 0.5 °C

1. Reporting of Temperature

Calibration point (°C)	UUC* setting (°C)	UUC* reading (°C)	Measured temperature at each positions (°C)									Uncertainty ± (°C)	Coverage factor k
			# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	# 9 ^{ref}		
104	103.5	103.5	104.11	103.94	103.85	103.84	103.97	103.93	103.64	103.51	104.23	0.47	2.00

2. Characterization results

Calibration point (°C)	Stability ± (°C)	Uniformity (°C)	Overall variation (°C)
104	0.04	0.78	0.81

Notes

UUC* = Unit Under Calibration

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REPORT OF CALIBRATION

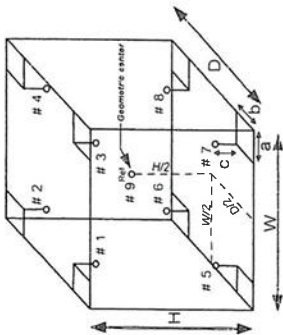
Certificate No. : 23-148804

Sample Code : 23-56200-006

Results of Calibration

Notes

1. Sensor installation locations
 - 1.1 All sensors at any corners or walls should be positioned 5 cm (a x b x c) from the wall.
 - 1.2 The reference sensor is preferably located of the geometric center of the chamber.
2. Interior dimensions approx of chamber :
W = 56 cm ; D = 40 cm ; H = 48 cm
3. Air valve or fresh air level : Off
4. Fan level : Open
5. The quoted uncertainty includes "Stability of chamber and loading effect in chamber at 20% of uniformity".
6. 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.
7. Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.
8. Overall variation - the difference of the maximum and the minimum measured temperatures throughout observation time.
9. UUC* reading - the average reading of indicating device that forms the integral part of the enclosure.
10. Calibration results without adjustment.

Figure: Example of sensor
installation Positions

The result expanded uncertainty of measurement U is stated at the standard uncertainty of measurement multiplied by the coverage factor k , which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003.

- End of Report -

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INDUCTIBELY COUPLED PLASMA SPECTROMETER

Model : Prodigy 7

Serial No. : P70177



Instrument Performance Certificate

For ICP-OES

PRODUCT ID
Serial Number

Prodigy 7, Teledyne Leeman Labs
P70177

Customer Name
Address

EASTERN THAI CONSULTING 1992 CO., LTD.
999 Moo 11 Tambon Nong Kham, Amphoe Si Racha,
Chonburi 20230

Date of Qualified
Next Due date

Dec 13, 2023
May 13, 2024

This certifies for products which was performed in acceptable criteria specifications

Gas supply /Water chiller/Exhaust hood

Cooling Systems
Spectrometer

RF Generator

Sample Introduction & Autosampler

Software & Computer

Hardware Diagnostics Test

Analytical Test

PASSED

PASSED

PASSED

PASSED

PASSED

PASSED

PASSED

Provided by

Scientist Instrument Co., Ltd.
113 Soi Ekachai 44, Ekachai Road
Khlong Bang Phran, Bangkok
Bangkok 10150 Thailand

Certified by
Thunraphol Sakdayos

Service Engineer

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Preventive Maintenance Report

Customer Name: Eastern Thai Consulting 1992 Co., Ltd. Date: Dec 13, 2023
Instrument/Equipment: ICP-OES Model: Prodigy 7
Brand: Teledyne Leeman Labs S/N: P70177

1. Gas Supply / Water Chiller / Exhaust Hood:			Status
Gas systems:			
Argon Pressure (85-95 psi):	90 psi		OK ✓
Nitrogen Pressure (85-95 psi):	— psi		OK ✓ Use Ar.
No leak inspected			OK ✓
Replace camera purge gas Dehydrator			OK □ waiting spare parts
Water Chiller for RF generator			
Minimum flowrate detected			OK ✓
No leak inspected			OK ✓
Water Chiller for Detector			
Check water level and refill			OK ✓
Change water			OK ✓
Temperature: 25 °C			OK ✓
Exhaust Hood:			
Minimum Air flowrate checked			OK ✓

2. Spectrometer			Status
Optical view position			
Axial peak positions	x 3305 y 4205		OK ✓
Radial peak positions	x 4206 y 4220		OK ✓
Hg lamp peak positions	x 2745 y 2615		OK ✓
Wavelength Calibrate with HG Lamp			OK ✓
Full Frame Image			OK ✓
Temperature controlled 31 °C			OK ✓
Purge gas flow control Low/High			OK ✓
Purge gas flow for Detector			OK ✓
Camera Support Module			OK ✓

Engineer Sign

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3.RF Generator	
Plasma Control	Status
Auto Start	OK <input checked="" type="checkbox"/>
Extinguish	OK <input checked="" type="checkbox"/>
RF power setting	OK <input checked="" type="checkbox"/>
Igniter	OK <input checked="" type="checkbox"/>
Air Knife	OK <input checked="" type="checkbox"/>
Coolant /Plasma Flow control	OK <input checked="" type="checkbox"/>
Aux Flow	OK <input checked="" type="checkbox"/>
Optimize sample introduction function	OK <input checked="" type="checkbox"/>
4.Sample Introduction & Autosampler	
Plasma torch	Status
Plasma Torch	OK <input checked="" type="checkbox"/>
Spray chamber	OK <input checked="" type="checkbox"/>
Injector	OK <input checked="" type="checkbox"/>
Nebulizer pressure	OK <input checked="" type="checkbox"/>
Peristaltic pump and control	OK <input checked="" type="checkbox"/>
Speed control	OK <input checked="" type="checkbox"/>
Sample tubing	OK <input checked="" type="checkbox"/>
Drain tubing	OK <input checked="" type="checkbox"/>
Autosampler Control	<input type="checkbox"/> Available <input checked="" type="checkbox"/> Not Available
Position movement	OK <input type="checkbox"/>
Drain tubing	OK <input type="checkbox"/>
Auto Rinse	OK <input type="checkbox"/>
5.Computer & Software Check:	
Interface Cable USB	Status
Software Version 1.2	OK <input checked="" type="checkbox"/>
Operation function check :	OK <input checked="" type="checkbox"/>
Open /Save /Edit method	OK <input checked="" type="checkbox"/>
Instrument Control	OK <input checked="" type="checkbox"/>
Sequence	OK <input checked="" type="checkbox"/>
Full Frame Capture	OK <input checked="" type="checkbox"/>
Auto alignment /Hg alignment	OK <input checked="" type="checkbox"/>
Calibration Curve	OK <input checked="" type="checkbox"/>
Re-Calculation	OK <input checked="" type="checkbox"/>
Print Report	OK <input checked="" type="checkbox"/>

Engineer Sign

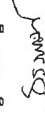


6.Hardware Diagnostics Test		
Power Supply	Value	Status
-12 VDC (+/- 5 %)	-12.7 V	Passed ✓
+12 VDC (+/- 5 %)	11.91 V	Passed ✓
+3.3VDC (+/- 5 %)	3.3 V	Passed ✓
+5.0 VDC (+/- 5 %)	4.945 V	Passed ✓
+13.5 VDC (+/- 5 %)	13.41 V	Passed ✓
Plasma Generator		
ICP Current 0.500A = 1kW	0.502 A	Passed ✓
ICP Ref 5.0Vdc = 1kW	5.002 V	Passed ✓
ICP Current 0.00 Vdc = 0kW	0 A	Passed ✓
ICP Ref 0.00Vdc = 0kW	0 V	Passed ✓
RF Water (Hz) OFF (1 Hz)	0 Hz	Passed ✓
RF Water (Hz) ON (25-35 Hz)	25 Hz	Passed ✓
Air Knife Pres. (0.00V) OFF	0 V	Passed ✓
Air Knife Pres. (3.0 – 7.0 V) ON	3.36 V	Passed ✓
Neb setting to 25 psi	reading 25 psi	Passed ✓
Cool setting to 16 lpm	reading 16 lpm	Passed ✓
Aux setting to 0.5 lpm	reading 0.5 lpm	Passed ✓
Camera Water pump		
Pump Current (0.000 A) OFF	0 A	Passed ✓
Pump Voltage (0.000 V) OFF	0 V	Passed ✓
Pump Current (0.8 to 4.0A) ON	1.1 A	Passed ✓
Pump Voltage (8 to 13 V) ON	12.49 V	Passed ✓
Set Points		
Cam Tec Temperature (-30 to -38°C)	Set -32 °C Read -31 °C	Passed ✓
Op Purge Low (0-15.5 lpm)	Set 5 lpm Read 5.1 lpm	Passed ✓
Op Purge High (0-15.5 lpm)	Set 10 lpm Read 10.1 lpm	Passed ✓
Cam Wtr T (25-30 °C)	Set 25 °C Read 25 °C	Passed ✓

7.Cleaning & Replacement

Status	Status
O-Ring Torch replacement	OK <input checked="" type="checkbox"/>
Pump Tubing replacement	OK <input checked="" type="checkbox"/>
Glassware cleaning	OK <input checked="" type="checkbox"/>
Lubricate the roll peristaltic pump	OK <input checked="" type="checkbox"/>
Optical windows cleaning	OK <input checked="" type="checkbox"/>
Change & refilled Detector water chiller	OK <input checked="" type="checkbox"/>
Change & refilled RF Generator water Chiller	OK <input checked="" type="checkbox"/>
Clean All Electronics Board	OK <input checked="" type="checkbox"/>

Engineer Sign






ICP-OES/Avio550

Serial No. : M81S2210101

ICP-OES/Avio550 Preventive Maintenance (PM)

Company Name:		Eastern Thai Consulting 1992 Co., Ltd.	
Address (Instrument Location):		683 Moo 11 Sukhapibarn 8 Rd., Siracha, Chon Buri 20230	
Serial Number:	MB152210101	PM Number:	1 OF 2 W
Customer Name (if applicable):	KNumphat	Telephone Number:	038 481 197
Service Engineer Name:	K.Piyawit	Service Order Number:	WO-02754304
Date PM Performed: (DD-MM-YYYY)	25-Apr-2024	Next PM Due Date: (DD-MM-YYYY)	25-Oct-2024
Standard Labor Hours to Complete PM :		4 hours	

Part Number	Release	Publication Date	 PerkinElmer
TH09370188 Rev.2	B	July 2020	

Scope

The purpose of this PM is to ensure the continued functionality of the PerkinElmer / Avio550 by inspecting and replacing any worn or damaged parts. This service should only be performed by a trained representative of PerkinElmer. The customer should save their method before the PM begins.

General Instructions:

The customer must provide the engineer operational data to demonstrate recent instrument performance prior to starting the PM.

Always check with the customer before making any changes that may affect the customer's analysis or calibration, including a current back-up of system software and/or data files. The completed document should be signed by an authorized PerkinElmer and customer representative and left with the customer. Update the PM sticker and instrument logbook as required.

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Component List

Component / Specific Model	Serial #	Configuration Notes
Avio550Max	MB152210101	Syngistix 5.1.0.0293

Parts Lists

Parts Included with the PM		
Part Number (if applicable)	Description	Quantity
09995098	Air Filter-Spectrometer	N/A
N077520	Air Filter-RF Generator	N/A
09992731	Axial Window	N/A
B0810377	Radial Window	N/A
N0770438	O-ring kit, injector support adapter	N/A
N0780437	O-ring kit, torch	N/A

Additional Reagents and Standards Required for PM			
Part Number (if applicable)	Description	Quality	Batch/Lot #
N0691579	Multi-Element Standard	AR	61-176CRX1
N9300221	DL Standard diluted 100 X	AR	59-091CRY1
N0582152	Wave Cal Solution	AR	59-150CRX1
N9302946	VIS Wavecal Solution	AR	59-113CRT1
			30-JUN-2025
			30-JUN-2024
			30-SEP-2024
			28-FEB-2025

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Procedure Checklist

Use (✓) to check off those steps in the checklist that have been completed.

1. General:

- ☒ Ask customer about unit's performance since last visit.
- ☒ Check incoming AC line voltage under load for proper levels and grounding.
- ☒ Is the instrument operational? If not, please comment.

2. Mechanical:

- ☒ Inspect and clean all fans and filters.
- ☒ Inspect and replace torch components and necessary.
- ☒ Inspect all tubing for signs of cracking or leaking and replace as necessary.
- ☒ Torch Components Replaced: ☐ Yes ☒ No
- ☒ Tubing Replaced: ☒ Yes ☐ No
- ☒ Inspect the peristaltic pump for proper operation.
- ☒ Check and adjust if necessary, the external nitrogen, argon shear gas and water supply pressures.
- ☒ Check and adjust if necessary, the internal nitrogen, main argon, torch argon and shear gas pressures.

Regulator	Measured Pressure	Set Pressure
Nitrogen		NA (calibrated in Factory)
Main Argon	76 psig	76 psig
Torch Argon	67 psig	67 psig
Shear Gas	65 psig	65 psig
Water	35 psig	35 psig

- ☒ Check shear gas nozzle for blockages and proper, uniform flow.
- ☒ Inspect nitrogen Hi/Low purge and shear gas solenoids for proper function.
- ☒ Inspect the function of all spectrometer motors. Drive the motors from the Spectrometer DCM. (slits, XY motor)
- ☒ Inspect the function of the pneumatic shutter for proper operation.
- ☒ Perform preventative maintenance on the chiller as required. Make the customer aware of the importance of maintaining the chiller fluid level and filter replacement.
- ☒ Drain air compressor surge tank.
- ☒ Clean exterior of instrument.
- ☒ Visually inspect all PC boards for cleanliness and signs of corrosion.

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3. Electrical

- ☒ Check all RF generator and spectrometer power supply voltages.
- ☒ Run instrument diagnostic checks from the appropriate Device Control Module.

RF Generator:

- ☒ Check the RF generator status screens.
- ☒ Check the function of all interlocks.

Spectrometer:

- ☒ Check the spectrometer status screens. Ensure Ready mode with no fetal errors.
- ☒ Check the spectrometer optical tub temperatures (top, bottom, fin, optical base).
- ☒ Check detector temperatures.
- ☒ Check TEC voltages (6.5VDC)

4. Optical:

- ☒ Clean or replace the axial and radial view windows as necessary.
- ☐ Axial Window Replaced: ☐ Yes ☒ No
- ☐ Radial Window Replaced: ☐ Yes ☒ No

5. PM Performance Tests:

- ☒ Perform View Align.

Test Spectral Resolution:

- ☒ Measure the spectrometers ability to separate two adjacent wavelengths.

Parameter	Specification	Test Result	Pass/Fail
As 193.696 - Resolution	≤0.007	0.00534	Passed
Ni 231.604 - Resolution	≤0.008	0.00725	Passed
Ni 341.476 - Resolution	≤0.012	0.00891	Passed
La 408.672 - Resolution	≤0.020	0.01603	Passed
Ba 455.403 - Resolution	≤0.025	0.02190	Passed

Test Precision:

- ☒ Test for reproducibility of a set of measurement.

Parameter	Specification	Test Result	Pass/Fail
As 193.696	%RSD ≤ 1 %	0.65%	Passed
Zn 213.856	%RSD ≤ 1 %	0.66%	Passed
Mn 257.610	%RSD ≤ 1 %	0.41%	Passed
La 379.478	%RSD ≤ 1 %	0.51%	Passed
Ba 455.403	%RSD ≤ 1 %	0.32%	Passed
Ba 493.408	%RSD ≤ 1 %	0.30%	Passed

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☒ Run an Axial & Radial BEC according to the A&T spec.

Test Axial BEC Cd:

Method "BEC-XL" For Samples "IB (2%HNO3)" and "IS (N930-0221/100)", record intensities.

Calculated BEC: BEC = (IB * Conc of Std) / (IS - IB). Where Conc of Std = 500 PPB

Element	Conc.	IB	IS	Pass/Fail
Cd 226	500	2,028.9	162,248.4	
IB*Conc	IS-IB	BEC	Spec	
1,014,450	160,219.5	6.33	<150 PPB	Passed

Test Radial BEC Mn:

Method "BEC-RL" For Samples "IB (2%HNO3)" and "IS (N069-1579)", record intensities.

Calculated BEC: BEC = (IB * Conc of Std) / (IS - IB). Where Conc of Std = 1,000 PPB

Element	Conc.	IB	IS	Pass/Fail
Mn 257	1,000	2,166.8	91,410.0	
IB*Conc	IS-IB	BEC	Spec	
2,166,800	89,243.2	24.28	<45 PPB	Passed

6. Review:

- ☒ Review with the customer PM work performed.
- ☒ Discuss recommended customer supplied materials to have on hand.
- ☒ Attach PM sticker.

Additional Comments

Additional Comments Regarding the PM

Review

The preventive maintenance checks and if applicable performance tests for ICP-OES/Avio550 have been completed.

This ICP-OES/Avio550 Passes ☒ Fails ☐ the preventive maintenance.

Review of Preventive Maintenance:

Authorized PerkinElmer Representative:

Pijawit S.

Date:

25-Apr-2024
(DD-MMM-YY)

Authorized Customer Representative:

Date: 25-Apr-2024
(DD-MMM-YY)

ICP-OES/Avio550

LIQUID IN GLASS THERMOMETER

Model : Total Immersion

Serial No. : 43560



QUALITY CALIBRATION CO.,LTD.
235 Petchkasem 63/2 Road, Laksong, Bangkok, Bangkok 10160
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584
www.qcalibration.com



NSG-TISI-TS17023
CALIBRATION

CERTIFICATE No.: 23T10864
REFERENCE No.: 71117-1

PAGE : 1 OF 2


Certificate of Calibration

EQUIPMENT : LIQUID IN GLASS THERMOMETER
MANUFACTURER : PRECISION
MODEL : 0 °C TO 100 °C

SERIAL No : 43560
ID No : LABE 16/1

RESOLUTION : 0.1 °C
TYPE : TOTAL IMMERSION
CONDITION AS RECEIVED : USED ITEM

SUBMITTED BY : EASTERN THAI CONSULTING 1992 CO., LTD.
683 MOO 11, SUKHAPIBAN 8 ROAD, NONGKHAM,
SRIRACHA, CHONBURI 20230

CALIBRATED BY : CHARUKIT L.
CALIBRATION DATE : 09-Nov-23
APPROVED BY :  PONGSAK J.
ISSUED DATE : 09-Nov-23
RECEIVED DATE : 02-Nov-23

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF
QUALITY CALIBRATION CO., LTD.

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235 Petchkasem 63/2 Road, Laksong, Bangkok, Bangkok 10160
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584
www.qcalibration.com

CERTIFICATE No.: 23T10864

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : LIQUID IN GLASS THERMOMETER
MANUFACTURER : PRECISION
MODEL : 0 °C TO 100 °C
ID No : LABE 16/1
RESOLUTION : 0.1 °C
RECEIVED DATE : 02-Nov-23
AMBIENT TEMPERATURE : 23 °C ± 3 °C
SERIAL NUMBER : 43560
TYPE : TOTAL IMMERSION
CALIBRATION DATE : 09-Nov-23
RELATIVE HUMIDITY : 50 %RH ± 20 %RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BASED ON ASTM E77:1992 BY COMPARISON WITH STANDARD PLATINUM RESISTANCE THERMOMETER (SPRT) INTO LIQUID BATH TEMPERATURE CONTROLLER. THE TEMPERATURE SCALE USED WAS BASED ON ITS-90.

2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) STANDARD THERMOMETER	1502	77964	23T13927	08-Mar-24
2) SPRT PROBE	5614	636626	23T13927	08-Mar-24
3) PRECISION BATH	7320	A21105	22T13199	14-Dec-23
4) PRECISION BATH	CTR-40	A68155	22T13198	09-Dec-23
5) PRECISION BATH	6045	3C023	22T13200	19-Dec-23

3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-

- NATIONAL INSTITUTE OF METROLOGY (THAILAND).

RESULT OF CALIBRATION : WITHOUT ADJUSTMENT

STANDARD READING (°C)	UUC* READING (°C)	IMMERSION DEPTH (mm)	CORRECTION (°C)	EMERGENT STEM TEMPERATURE (°C)	UNCERTAINTY OF MEASUREMENT (±°C)
0.009	0.0	60	0.0090	N/A	0.26
25.01	25.0	165	0.0050	N/A	0.26
50.00	50.0	275	0.0040	N/A	0.26
99.991	100.0	360	-0.009	29.3	0.26

UUC* : UNIT UNDER CALIBRATION

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT

COPY

F-G010 REV

ORIFICE TRANSFER STANDARD CERTIFICATION

WORKSHEET TE-5025A

ROOTSMETER S/N 0438320



TISCH ENVIRONMENTAL, INC.
145 SOUTH MIAMI AVE
VILLAGE OF CLEVELAND, OH
44102
513.467.9000
877.283.7810 TOLL FREE
513.467.9009 FAX

ORIFICE TRANSFER STANDARD CERTIFICATION WORKSHEET TE-5025A

Date - Mar 24, 2016 Rootsmeter S/N 0438320 Ta (K) - 295
Operator Tisch Orifice I.D. - 0136 Pa (mm) - 742.95

PLATE OR Run #	VOLUME START (m3)	VOLUME STOP (m3)	DIFF VOLUME (m3)	DIFF TIME (min)	METER DIFF HG (mm)	ORIFICE DIFF H2O (in.)
1	NA	NA	1.00	1.3400	3.2	2.00
2	NA	NA	1.00	0.9510	6.3	4.00
3	NA	NA	1.00	0.8510	7.8	5.00
4	NA	NA	1.00	0.8130	8.6	5.50
5	NA	NA	1.00	0.6690	12.6	8.00

DATA TABULATION

Vstd	(x axis) Qstd	(y axis)	Va	(x axis) Qa	(y axis)
0.9832	0.7337	1.4054	0.9957	0.7430	0.8911
0.9791	1.0296	1.9875	0.9915	1.0426	1.2603
0.9770	1.1481	2.2221	0.9894	1.1626	1.4090
0.9760	1.2006	2.3305	0.9884	1.2157	1.4778
0.9707	1.4510	2.8107	0.9830	1.4694	1.7823
Qstd slope (m)	= 1.96262		Qa slope (m)	= 1.22096	
intercept (b)	= -0.03249		intercept (b)	= -0.02060	
coefficient (r)	= 0.99993		coefficient (r)	= 0.99993	
y axis = SQRT[H2O(Pa/760) (298/Ta)]			y axis = SQRT[H2O(Ta/Pa)]		

CALCULATIONS

$$Vstd = Diff. Vol [(Pa-Diff. Hg)/760] (298/Ta)$$

$$Qstd = Vstd/Time$$

$$Va = Diff Vol [(Pa-Diff Hg)/Pa]$$

$$Qa = Va/Time$$

For subsequent flow rate calculations:

$$Qstd = 1/m \{ [SQRT (H2O(Pa/760) (298/Ta))] - b \}$$

$$Qa = 1/m \{ [SQRT H2O(Ta/Pa)] - b \}$$

COPY

pH Meter

Model : SevenCompact S220

Serial No. : B448305208

NSC-TIS-17517025
CALIBRATION 0152

CERTIFICATE OF CALIBRATION

Page 1 of 3

Supersede to Calibration Certificate No. 24-001949

Certificate No. : 24-001949/1

Sample Code : 24-00963-006

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapibarn 8 Rd., Nongkham,
Siracha, Chonburi 20230

Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.
(Laboratory)

Equipment : pH Meter
Manufacturer : METTLER TOLEDO
Serial No. : B448305208
Model : SevenCompact S220
ID No. : LABE 11/4
Date of Receipt : 09 January 2024
Date of Calibration : 09 January 2024

Condition of Calibration

1. Environment
1.1 Ambient temperature : 22.4 ± 0.2 °C 1.2 Relative humidity : 56.4 % ± 2.1 %

2. Calibration method

In house method WI-CL-019: based on direct measurement by using standard voltage calibrator and using certified reference material (CRM).

3. Reference standard / Certified reference material

Instrument	ID No.	Certificate No.	Due Date
3.1 Voltage Calibrator	LB-AMC-01	23E3244	03 October 2024
3.2 Digital Thermometer	LB-TH-33	23-098974	25 August 2024
Certified Reference Material			
3.3 Buffer Solution pH 4.008	919273	PH216.L5	24 September 2025
3.4 Buffer Solution pH 6.986	941727	PH107.L5	06 November 2024
3.5 Buffer Solution pH 9.997	919278	PH220.L5	24 September 2024

4. This certificate is traceable to the international system of unit (SI Unit).

- 4.1 Instrument No. 3.1 through Technology Promotion Association (Thailand-Japan).
4.2 Instrument No. 3.2 through Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.
4.3 Buffer Solution pH 3.3 and No. 3.5 traceable to CPA chem (through primary measurement method-Harned cell using calibrated thermometer, barometer, and nanovoltmeter Accredited laboratory ISO/IEC 17025 and ISO/IEC 17034).
4.4 Buffer Solution No. 3.4 traceable to CPA chem (CPA RefN HARNED CELL LotN 61275737; CPA RefN HARNED CELL LotN 61273986 Accredited laboratory ISO/IEC 17025 and ISO/IEC 17034).

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

6. Condition of calibration item : Normal

Calibrated by : Mr. Nutsaput Timula
Scientist

Approved by :
(Mr. Sotichai Neampunt)
Signed for Director :

Issue date : 31 January 2024

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

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

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

NSC-TIS-17517025
CALIBRATION 0152

REPORT OF CALIBRATION

Page 2 of 3

Supersede to Calibration Certificate No. 24-001949

Certificate No. : 24-001949/1

Sample Code : 24-00963-006

Equipment : pH Meter
Manufacturer : METTLER TOLEDO
Serial No. : B448305208
Model : SevenCompact S220
ID No. : LABE 11/4
Resolution : 0.01 pH ; 0.1 mV ; 0.1 °C
Range : -2.000 pH to 20.000 pH ; ± 2000.0 mV ; -5.0°C to 130.0°C

Results of Calibration

Part 1. DC Voltage measurement

pH Meter Serial No. : B448305208

Nominal Value	Applied DC Voltage mV	Average indicator reading		Uncertainty mV	Coverage factor k
		mV	pH		
0	414.113	413.9	0.00	± 0.083	2.00
4	177.477	177.4	4.00	± 0.083	2.00
7	0.000	0.1	7.00	± 0.083	2.00
10	-177.477	-177.3	10.00	± 0.083	2.00
14	-414.113	-413.8	14.00	± 0.083	2.00

Part 2. Performance of Electrode system

Electrode Manufacturer : METTLER TOLEDO

Model : InLab Expert Pro-ISM

Electrode Serial No. : 2453982

Three-Point Calibration at pH4, pH7 and pH10
Percent Slope : 98.3

Standard Buffer Solution pH (@ 25 °C)	Average indicator reading		Error Value pH	Uncertainty pH	Coverage factor k
	pH	mV			
4.008	4.01	182.1	0.002	± 0.010	2.00
6.986	7.00	7.8	0.014	± 0.011	2.00
9.997	10.01	-167.2	0.013	± 0.011	2.00

The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor k , which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS MD003

NSC-TSI-TS17025
CALIBRATION 0152
Page 3 of 3

REPORT OF CALIBRATION

Supersede to Calibration Certificate No. 24-001949

Certificate No. : 24-001949/1

Sample Code : 24-00983-006

Equipment : pH Meter (Digital Thermometer with sensor)

Thermometer readout

Manufacturer : METTLER TOLEDO Model : SevenCompact S220

Serial No. : B448305208 ID No. : LABE 11/4

Resolution : 0.1 °C Range : -5.0 °C to 130.0 °C

Thermometer sensor

Manufacturer : METTLER TOLEDO Model : InLab Expert Pro-ISM

Serial No. : 2453982 ID No. : N/A

Condition of Calibration

1. Environment
- 1.1 Ambient temperature : 22.6 °C ± 0.1 °C
- 1.2 Relative humidity : 55.1 % ± 3.3 %

2. Calibration method

- 2.1 The calibration use in house method WI-CL-021 : by comparison with standard thermometer
- 2.2 The calibration by comparison unit under calibration (UUC) to the standard thermometer in a calibration bath at the controlled temperature.
- 2.3 The temperature scale in use of this laboratory is the international temperature scale of 1990 (ITS-90).

3. Reference standard instrument

Instrument	Model	ID. No.	Certificate No.	Due date
3.1 Resistance Thermometer	PT-100	RTD-90	23-098974	25 August 2024
3.2 Thermometer Readout	GT-11	LB-TH-33	23-098974	25 August 2024

4. This certificate is traceable to the international system of unit (SI Unit).

Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (Accreditation Under TLAS Laboratory Calibration No.0152)

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

6. Condition of Calibration Item : Normal

Results of Calibration

Calibration point °C	Average of standard reading °C	Unit under calibration		Expanded uncertainty °C	Coverage factor k
		Immersion depth mm	Average reading °C	Correction value °C	
25	25.000	120	25.0	0.000	± 0.14
					2.00

Notes

- Calibration results without adjustment

The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor k, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003

- End of report -

STANDARD WEIGHT 50 g



Certificate No. : 22-052238

Sample Code : 22-19150-003

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.

683 Moo 11, Sukhapiban 8 Rd., Nongkham,

Sriracha, Chonburi 20230

Location of Calibration : Asia Medical and Agricultural Laboratory and Research Center Public Company Limited
(Calibration Laboratory)

Equipment : Standard Weight 50 g

Manufacturer : METTLER TOLEDO

Class : F1

Serial No. : N/A

ID No. : LABE 10/1

Date of Receipt : 18 May 2022

Date of Calibration : 30 May 2022

Calibrated by : Mr. Somwang Sangdee
Scientist(Mr. Somchai Neampunt)
Signed for Director

Issue date : 31 May 2022

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

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

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to recognised national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).



Certificate No. : 22-052238

Sample Code : 22-19150-003

REPORT OF CALIBRATION

Equipment : Standard Weight 50 g

Manufacturer : METTLER TOLEDO

Class : F1

Serial No. : N/A

ID No. : LABE 10/1

Result of Calibration :

☒ Without adjustment☐ Adjustment

Conventional value of the result of weighing in air. For a weight taken at a reference temperature (t_{ref}) of 20°C, the conventional mass is the mass of a reference weight of a density (ρ_{ref}) of 8000 kg.m⁻³ which it balances in air of a reference density (ρ_0) of 1.2 kg.m⁻³

Description	Deviation	Conventional Mass	Expanded Uncertainty	Maximum Permissible Error	ID No.
50 g	(mg) -0.324	49.999676 g	(mg) 0.10	\pm (mg) 0.30	LABE 10/1

The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2.0$, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003

Certificate No. : 22-052238

Sample Code : 22-19150-003

REPORT OF CALIBRATION

Condition of Calibration

1. Ambient Conditions : Temperature 20 °C ± 1.5°C, Relative humidity 50% ± 10% and air density 1.20 kg/m³
2. Calibration Method : Direct comparison weighing according to OIML R111-1 : 2004(E)
3. Reference standard instrument

Instrument	Class	ID No.	Certificate No.	Due Date
1) Standard Weight 1 mg to 1 kg	E2	LB-WE-79	21-079366	22 September 2022

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

Asia Medical and Agricultural Laboratory and Research Center Public Company Limited
(Instrument number 1).

5. Condition of Calibration item: Normal

6. Description of Calibrated Item :

Type and Nominal Value :	Standard Weight 50 g
Shape :	Cylindrical weight with knob
Material :	Stainless steel
Case :	Wooden Box
Comments :	Recalibration

End of Report -

COPY

STANDARD WEIGHT 100 g



Certificate No. : 22-052239
Sample Code : 22-19150-004

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
663 Moo 11, Sukhapiban 8 Rd., Nongkham,
Sriracha, Chonburi 20230

Location of Calibration : Asia Medical and Agricultural Laboratory and Research Center Public Company Limited
(Calibration Laboratory)

Equipment : Standard Weight 100 g

Manufacturer : N/A

Class : N/A

Serial No. : N/A

ID No. : LABE 10/2

Date of Receipt : 18 May 2022

Date of Calibration : 30 May 2022

Calibrated by : Mr. Somwang Sangdee
Scientist
Issue date : 31 May 2022

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

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

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).



Certificate No. : 22-052239
Sample Code : 22-19150-004

REPORT OF CALIBRATION

Equipment : Standard Weight 100 g

Manufacturer : N/A

Class : N/A

Serial No. : N/A

ID No. : LABE 10/2

Result of Calibration :

☒ Without adjustment

☐ Adjustment

Conventional value of the result of weighing in air. For a weight taken at a reference temperature (t_{ref}) of 20°C, the conventional mass is the mass of a reference weight of a density (ρ_{ref}) of 8000 kg.m⁻³ which it balances in air of a reference density (ρ_0) of 1.2 kg.m⁻³

Description	Deviation	Conventional	Expanded	Maximum	ID No.
		Mass	Uncertainty	Permissible Error	
	(mg)		(mg)	\pm (mg)	
100 g	-0.171	99.999829 g	0.16	0.50	LABE 10/2

The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2.0$, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003

COPY



Certificate No. : 22-052239

Sample Code : 22-19150-004

Page 3 of 3

REPORT OF CALIBRATION

Condition of Calibration

1. Ambient Conditions : Temperature 20 °C ± 1.5°C, Relative humidity 50% ± 10% and air density 1.18 kg/m³

2. Calibration Method : WI-CL-007 base on OIML R 111-1 : 2004(E)

3. Reference standard instrument

Instrument	Class	ID.No.	Certificate No.	Due Date
1) Standard Weight 1 mg to 1 kg	E2	LB-WE-79	21-079366	22 September 2022

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

Asia Medical and Agricultural Laboratory and Research Center Public Company Limited
(Instrument number 1).

5. Condition of Calibration item: Normal

6. Description of Calibrated Item	
Type and Nominal Value :	Standard Weight 100 g
Shape :	Cylindrical weight with knob
Material :	Stainless steel
Case :	Wooden Box
Comments :	Recalibration

- End of Report -

COPY

STANDARD WEIGHT 50 g



Certificate No. : 22-052237
Sample Code : 22-19150-002

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapiban 8 Rd., Nongkham,
Sriracha, Chonburi 20230

Location of Calibration : Asia Medical and Agricultural Laboratory and Research Center Public Company Limited
(Calibration Laboratory)

Equipment : Standard Weight 50 g

Manufacturer : N/A

Class : N/A

Serial No. : N/A

ID No. : LABE 10/4

Date of Receipt : 18 May 2022

Date of Calibration : 30 May 2022

Calibrated by : Mr. Somwang Sangdee
Scientist
Issue date : 31 May 2022

Approved by : (Mr. Somchai Neamput)
Signed for Director

The uncertainties are for a confidence probability of approximately 95%.
The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).



Certificate No. : 22-052237
Sample Code : 22-19150-002

REPORT OF CALIBRATION

Equipment : Standard Weight 50 g

Manufacturer : N/A

Class : N/A

Serial No. : N/A

ID No. : LABE 10/4

Result of Calibration : ☒ Without adjustment ☐ Adjustment

Conventional value of the result of weighing in air. For a weight taken at a reference temperature (t_{ref}) of 20°C, the conventional mass is the mass of a reference weight of a density (ρ_{ref}) of 8000 kg.m⁻³ which it balances in air of a reference density (ρ_0) of 1.2 kg.m⁻³

Description	Deviation	Conventional	Expanded	Maximum	ID No.
		Mass	Uncertainty	Permissible Error	
50 g	(mg)	49.999889 g	(mg)	\pm (mg)	LABE 10/4
	-0.111		0.10	0.30	

The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2.0$, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003

[Signature]

[Red Stamp]



Certificate No. : 22-052237

Sample Code : 22-19150-002

REPORT OF CALIBRATION

Condition of Calibration

1. Ambient Conditions : Temperature 20 °C ± 1.5°C, Relative humidity 50% ± 10% and air density 1.18 kg/m³

2. Calibration Method : WI-CL-007 base on OIML R 111-1 : 2004(E)

3. Reference standard instrument

Instrument	Class	ID No.	Certificate No.	Due Date
1) Standard Weight 1 mg to 1 kg	E2	LB-WE-79	21-079366	22 September 2022

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

Asia Medical and Agricultural Laboratory and Research Center Public Company Limited

(Instrument number 1).

5. Condition of Calibration Item: Normal

6. Description of Calibrated Item :

Type and Nominal Value :	Standard Weight 50 g
Shape :	Cylindrical weight with knob
Material :	Stainless steel
Case :	Wooden Box
Comments :	Recalibration

- End of Report -

COPY

THERMO-HYGROMETER

Model : 608-H1

Serial No. : 45106737



CERTIFICATE OF CALIBRATION

Page 1 of 2

Certificate No. : 23-055203
Sample Code : 23-21440-001

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapiarn 8 Rd., Nongkham,
Siracha, Chonburi 20230

Location of Calibration : Asia Medical and Agricultural Laboratory and Research Center Public Company Limited
(Calibration laboratory)

Equipment : Digital thermo-hygrometer

Manufacturer : testo

Serial No. : 45106737

Date of Receipt : 25 May 2023

Model : 608-H1

ID No. : LABE 09/7

Date of Calibration : 29 May 2023

Condition of Calibration

1. Environment : 1.1 Ambient temperature : 23.0 °C ± 3.0 °C
: 1.2 Relative humidity : 55.0 % ± 15.0 %

2. Calibration method

- 2.1 In-house method: WI-CL-045 By comparison with thermometer standard / chilled mirror hygrometer in controlled chamber.
- 2.2 The calibration by comparison unit under calibration (UUC) to the thermometer standard / chilled mirror hygrometer in a chamber at the controlled temperature / relative humidity.

3. Reference standard instrument

Instrument	Model	ID No.	Certificate No.	Due Date
3.1 Chilled Mirror	Optidew Vision	LB-DP-02 & LB-DP-02 (DP)	TH-0157-22	05 December 2023
3.2 Digital Thermometer	Optidew Vision	LB-DP-02 & LB-DP-02 (Temp.)	23-014916	12 February 2024
3.3 Digital Thermometer	34972A	LB-DA-07 with RTD-89	22-095535	06 September 2023

4. This certificate is traceable to the international system of unit (SI Unit).

- 4.1 Instrument No. 3.1 through National Institute of Metrology (Thailand).
- 4.2 Instrument No. 3.2 and 3.3 through Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.
5. This result of calibration was found accurate as shown on date and place of calibration only.

6. Condition of calibration item : Normal

Calibrated by

Miss Pornsuda Lohabal

Scientist

Approved by

(Mr. Somchai Neampunt)

Signed for Director

Issue date

31 May 2023

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

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

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

361 Soi Ladpraoo 122, Ladpraoo Road,

Phlabphla, Wang Thonglang, Bangkok 10310

TEL 02-516-2422

FAX 02-516-6949

Rev 01

CONTACT@AMARC.CO.TH

WWW.AMARC.CO.TH

Effective Date: 15/07/21

NSC-TIS-1517025
CALIBRATION 0152

REPORT OF CALIBRATION

Page 2 of 2

Certificate No. : 23-055203
Sample Code : 23-21440-001

Results of Calibration

Temperature measurement

Resolution : 0.1 °C

Range : 0 °C to 50 °C

Calibration point °C	Average of standard reading		Unit under calibration		Expanded uncertainty °C
	Controlled humidity %RH	Temperature °C	Average reading °C	Correction value °C	
20	50	20.00	20.0	0.00	± 0.39
25	50	25.02	25.1	- 0.08	± 0.39
30	50	30.00	30.0	0.00	± 0.39

Humidity measurement

Resolution : 0.1 %RH

Range : 10 %RH to 95 %RH

Calibration point %RH	Average of standard reading		Unit under calibration		Expanded uncertainty %RH
	Air temperature °C	Calculated humidity %RH	Average reading %RH	Correction value %RH	
45	25.00	45.18	53.5	- 8.32	± 1.3
60	25.00	60.03	68.3	- 8.27	± 1.5
75	25.00	75.20	83.2	- 8.00	± 1.7

Notes

- Calibration results without adjustment.

The result expanded uncertainty of measurement U is stated as the standard uncertainty multiplied by the coverage factor k, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M0003

- End of Report -

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THERMO-HYGROMETER

Model : 608-H1

Serial No. : 45106737



CERTIFICATE OF CALIBRATION

Page 1 of 2
Certificate No. : 24-062442
Sample Code : 24-25546-002Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapibarn 8 Rd., Nongkham,
Siiracha, Chonburi 20230Location of Calibration : Asia Medical and Agricultural Laboratory and Research Center Public Company Limited
(Calibration laboratory)Equipment : Digital thermo-hygrometer
Manufacturer : testo
Serial No. : 45106737
Date of Receipt : 23 May 2024
Model : 608-H1
ID No. : LABE 09/7
Date of Calibration : 27-28 May 2024

Condition of Calibration

1. Environment
1.1 Ambient temperature : 23.0 °C ± 3.0 °C
1.2 Relative humidity : 55.0 % ± 15.0 %

2. Calibration method

- 2.1 In-house method: WI-CL-045 By comparison with thermometer standard / chilled mirror hygrometer in controlled chamber.
- 2.2 The calibration by comparison unit under calibration (UUC) to the thermometer standard / chilled mirror hygrometer in a chamber at the controlled temperature / relative humidity.

3. Reference standard instrument

Instrument	Model	ID No.	Certificate No.	Due Date
3.1 Chilled Mirror	Optidew 401	LB-DP-03 & LB-DP-03 (DP)	TH-0064-23	07 August 2024
3.2 Digital Thermometer	Optidew 401	LB-DP-03 & LB-DP-03 (Temp.)	23-103423	03 September 2024
3.3 Digital Thermometer	34972A	LB-DA-07 with RTD-89	23-101374	05 September 2024

4. This certificate is traceable to the international system of unit (SI Unit).

4.1 Instrument No. 3.1 through National Institute of Metrology (Thailand).

4.2 Instrument No. 3.2 and 3.3 through Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.

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

6. Condition of calibration item : Normal

Calibrated by Miss Pornsuda Lohabai

Scientist

Issue date 30 May 2024

(Mr. Somchai Neampunt)

Signed for Director

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

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

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC)



REPORT OF CALIBRATION

Page 2 of 2
Certificate No. : 24-062442
Sample Code : 24-25546-002

Results of Calibration

Temperature measurement

Resolution : 0.1 °C
Range : 0 °C to 50 °C

Calibration point °C	Average of standard reading		Unit under calibration		Expanded uncertainty °C
	Controlled humidity %RH	Temperature °C	Average reading °C	Correction value °C	
20	50	20.00	20.1	- 0.10	± 0.39
25	50	25.00	25.0	0.00	± 0.39
30	50	30.00	29.9	+ 0.10	± 0.39

Humidity measurement

Resolution : 0.1 %RH
Range : 10 %RH to 95 %RH

Calibration point %RH	Average of standard reading		Unit under calibration		Expanded uncertainty %RH
	Air temperature °C	Calculated humidity %RH	Average reading %RH	Correction value %RH	
45	25.02	45.10	48.4	- 3.30	± 1.3
60	25.01	60.07	63.4	- 3.33	± 1.5
75	25.01	75.15	78.5	- 3.35	± 1.7

Notes

- Calibration results without adjustment.

The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor k, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003.

- End of Report -

COPY

UV/VIS SPECTROPHOTOMETER

Model : UV - 1800

Serial No. : A11635101643 CD



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Siam Bangkok Bangkok Thailand 10500
Tel : 02-6324300 Fax : 02-6375496-7
www.barscientific.com

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Certificate of Calibration

2 of 3

Certificate No. BSCC-UV-152/23

Calibration Results:

1. Wavelength Accuracy

Certified Wavelength (nm)	UUC (nm)	Error (nm)	Uncertainty (±nm)
287.71	287.65	-0.06	0.18
445.82	445.80	-0.02	0.18
536.52	536.35	-0.17	0.18
741.02	740.99	-0.03	0.18
879.41	879.27	-0.14	0.18

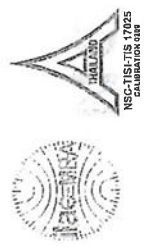
2. Photometric Accuracy (UV)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (±A)
235	0.0000	0.0000	0.0000	0.0075
	0.7311	0.7313	0.0002	0.0075
257	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
313	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
350	0.0000	0.0000	0.0000	0.0075
	0.6306	0.6314	0.0008	0.0075

*CNR = Customer not request



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1 of 3

Number of Page(s)

BSCC-UV-152/23

UV/Vis Spectrophotometer

Model UVI-1800

Manufacturer Shimadzu

Serial No. A11635101643 CD

ID No. N/A

Date of receipt 25 April 2023

Date of calibration 25 April 2023

Date of issue 27 April 2023

Customer name Eastern Thai Consulting 1992 Co., Ltd

Address 683 Moo 11, Sukkaphibam 8 Rd., Nongkham, Siracha, Chonburi 20230

Temperature (22.4-23.1) °C (On site)
Humidity (44.5-45.2) %RH (On site)

Equipment condition Good Operation

Calibration Location Analysis Department

Calibration Procedure In-house method WI-UV-702-01 based on ASTM E275-01

Traceability Wavelength Accuracy is traceable to certificate No. 94780 and 94775
Photometric Accuracy is traceable to certificate No. 94808 and 100147
94791
Stray Light is traceable to certificate No.
The above certificate are traceable to SI unit through Starna Scientific Ltd.
(UKAS accredited calibration laboratory NO. 0659)

Calibrated by Mr. Pannaphong Phannmekakul

Approved by

Mr. Kanchit Choothep
Technical Manager



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Certificate of Calibration

Certificate No.

BSCC-UV-152/23

Calibration Results:

Number of Page(s)

3 of 3

3. Photometric Accuracy (Visible)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (±A)
420.0	0.0000	0.0000	0.0000	0.0042
	0.5488	0.5508	0.0020	0.0042
	0.7527	0.7535	0.0008	0.0042
	1.0756	1.0758	0.0002	0.0042
440.0	0.0000	0.0000	0.0000	0.0042
	0.5391	0.5406	0.0015	0.0042
	0.7355	0.7360	0.0005	0.0042
	1.0509	1.0501	-0.0008	0.0042
465.0	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
546.1	0.0000	0.0000	0.0000	0.0042
	0.5045	0.5044	-0.0001	0.0042
	0.6884	0.6885	0.0001	0.0042
	0.9816	0.9808	-0.0008	0.0042
590.0	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
635.0	0.0000	0.0000	0.0000	0.0042
	0.5183	0.5178	-0.0005	0.0042
	0.6864	0.6868	0.0004	0.0042
	0.9747	0.9739	-0.0008	0.0042

*CNR = Customer not request

4. Stray Light*

Standard cut-off wavelength (nm)	Unit Under Calibration(UUC)	
	Wavelength (nm)	Absorbance (A)
200.75±0.1nm	200.72	2.0164

The stray light transmission reference is less than 1.0%T and stray light absorbance reference is greater than 2.00A

*Stray Light not NSC-ONSC Accredited.

The measurement uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95%
End of Certificate

The above results are valid exclusively for the calibrated item(s) as mentioned in this report / Certificate and the results are prohibited and also shall not be reproduced except in full without written approval of the Bara Scientific Co., Ltd.

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UV/VIS SPECTROPHOTOMETER

Model : UV-1800

Serial No. : A11635101643 CD



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Certificate of Calibration

Number of Page(s) 1 of 3

Certificate No. BSCC-UV-146/24
Equipment UV/Vis Spectrophotometer
Model UV-1800
Manufacturer Shimadzu
Serial No. A11635101643 CD
ID No. LABE 03/2
Date of receipt 22 April 2024
Date of calibration 22 April 2024
Date of issue 29 April 2024
Customer name Eastern Thai Consulting 1992 Co., Ltd.
Address 683 Moo 11, Sukkaphibarn 8 Rd., Nongkham, Sriracha, Chonburi 20230

Temperature (22.9-24.1) °C (On site)
Humidity (41.7-46.9) %RH (On site)

Equipment condition Good Operation

Calibration Location Analysis Department

Calibration Procedure In-house method WI-UV-702-01 based on ASTM E275-01

Traceability Wavelength Accuracy is traceable to certificate No. 116614 and 116613
Photometric Accuracy is traceable to certificate No. 116210 and 116224
Sray Light is traceable to certificate No. 116616
The above certificate are traceable to SI unit through Starna Scientific Ltd.
(UKAS accredited calibration laboratory NO. 0659)

Calibrated by Mr. Poomjai Korsawavorakul

Approved by

Mr. Sonthi Temboonsakdi
Service Manager

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Certificate of Calibration

Number of Page(s) 2 of 3

Certificate No. BSCC-UV-146/24

Calibration Results:

1. Wavelength Accuracy

Certified Wavelength (nm)	UUC (nm)	Error (nm)	Uncertainty (±nm)
287.71	287.75	0.04	0.18
445.82	445.89	0.07	0.18
536.52	536.50	-0.02	0.18
741.02	741.01	-0.01	0.18
879.41	879.33	-0.08	0.18

2. Photometric Accuracy (UV)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (±A)
235	0.0000	0.0000	0.0000	0.0075
	0.7415	0.7387	-0.0028	0.0075
257	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
313	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
350	0.0000	0.0000	0.0000	0.0075
	0.6406	0.6395	-0.0011	0.0075

*CNR = Customer not request

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Certificate of Calibration

Certificate No. **BSCC-UV-146/24** Number of Page(s) **3 of 3**

Calibration Results:

3. Photometric Accuracy (Visible)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (±A)
420.0	0.0000	0.0000	0.0000	0.0042
	0.5715	0.5729	0.0014	0.0042
	0.7087	0.7087	0.0000	0.0042
	1.0987	1.1005	0.0018	0.0042
440.0	0.0000	0.0000	0.0000	0.0042
	0.5561	0.5578	0.0017	0.0042
	0.6968	0.6969	0.0001	0.0042
	1.0757	1.0774	0.0017	0.0042
465.0	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
546.1	0.0000	0.0000	0.0000	0.0042
	0.5193	0.5213	0.0020	0.0042
	0.6937	0.6940	0.0003	0.0042
	1.0411	1.0428	0.0017	0.0042
590.0	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
635.0	0.0000	0.0000	0.0000	0.0042
	0.5605	0.5624	0.0019	0.0042
	0.7579	0.7583	0.0004	0.0042
	1.1131	1.1138	0.0007	0.0042

*CNR = Customer not request

4. Stray Light*

Standard cut-off wavelength (nm)	Unit Under Calibration(UUC)	
	Wavelength (nm)	Absorbance (A)
201.33±0.1nm	200.80	2.0111

The Stray light transmission reference is less than 1.0%T and Stray light absorbance reference is greater than 2.00A

*Stray Light not NSC-ONSC Accredited.

The measurement uncertainty is base on a standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95%.

End of Certificate

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SOUND LEVEL CALIBRATOR

MODEL : NC-75

SERIAL No. : 34802645



Calibration Certificate

Equipment : SOUND CALIBRATOR

Manufacturer : RION

Model : NC-75

Serial No.: 34802645

ID No.:

Condition As Found : GOOD

Customer :

EASTERN THAI CONSULTING 1992 CO., LTD.
SAHA GROUP INDUSTRIAL PARK, 683 MOO 11,
NONGKHAM, SIRACHA, CHONBURI 20230 THAILAND.

Location :

Ambient Temperature : (23.0 ± 3) °C

Pressure : (101.3 ± 3) kPa

Relative Humidity : (50.0 ± 20) %

Received Date : 06 SEPTEMBER 2023

Calibration Date : 12 OCTOBER 2023

Date of Issue : 16 OCTOBER 2023

Calibrated by :

Nathakorn Pisutpaisan

Approved by :

T. Petchurai
(Thanakul Petchurai)

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

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Continuation of Calibration Certificate

Calibration Procedure : CP-AC-03

Calibration Method :

This equipment was calibrated by based on IEC-60942-2003 Standard.

The sound pressure level, frequency and total distortion of the sound calibrator was measured using the reference microphone.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33511B	MY52302742	EF-0010-23	07-FEB-24
Digital Multimeter	33461A	MY53220104	EEL-BP 30/0766	13-FEB-24
Digital Multimeter	33461A	MY53220076	EEL-BP 30/0267	13-FEB-24
Digital Multimeter	33461A	MY60024273	EEL-BP 31/0266	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EF-0011-23	08-FEB-24
Condenser Microphone	4180	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KAI	34560495	AA-3002-23	14-FEB-24
Audio Analyzer	AVR-3360A	V744B6069	EF-0012-23	10-FEB-24

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

COPY

T. Petchurai

Continuation of Calibration Certificate

Cert. No. : ACC23037
Job No. : VC66AC0097
Pages : 3 of 3

Result of calibration :

1. Sound pressure level

Specified sound pressure level (dB)	Measured value (dB)	Deviated value (dB)	Uncertainty (dB)	Acceptance limit (dB)
94	93.94	-0.06	0.14	0.40

2. Frequency

Specified Frequency (Hz)	Measured value (Hz)	Deviated value (%)	Uncertainty (%)	Acceptance limit (%)
1000	1000.0	0.0	0.1	1.0

3. Total distortion

Measured value (%)	Uncertainty (%)	Acceptance limit (%)
0.24	0.10	3.0

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

_____ End of Calibration Certificate

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Y. Petcha

SOUND LEVEL METER

MODEL : NL-52A

SERIAL No. : 00230991



Acoustic Laboratory (Thailand) Co., Ltd.
6/57 Soi Phoen Sin 42, Sai Mai, Sai Mai, Bangkok 10220
Tel: (+66) 02-1296780 Email: info@altbkk.com



Certificate of Calibration

Certificate No.: S2402-0646

Customer: Eastern Thai Consulting 1992 Co., Ltd.
683 Moo 11, Sukhaphibam 8 Rd,
Nongkham, Sriracha, Chonburi 20230

Date of calibration: 2024-03-05
Date of issue: 2024-03-07

Instrument Calibrated: Sound Level Meter
Manufacturer: Rion
Model: NL-52A (Meter), UC-59 (Microphone), NH-25 (Preamplifier)
Serial no: 00230991 (Meter), 22354 (Microphone), 22341 (Preamplifier)

Calibration and verification performed:
Acoustical levels are stated relative to 20µPa. Other dB levels are relative values.
The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k, which with the reported effective degree of freedom corresponds to coverage probability of approximately 95%.

The sound level meter instrument submitted for periodic testing following the periodic tests of IEC 61672-3 : 2013.

Preconditioning:
The equipment was preconditioned for more than 16 hours at the specified calibration temperature and humidity

Instruments and Program:
A complete list of instruments, hardware, and software, that has been used for this calibration is separately available from the calibration laboratory.

Equipment standards used:

- Sound measuring equipment calibration unit 483B S/N31083
- Digital multimeter Keysight S/N HP34401A
- Ultra-low distortion function generator Stanford SRS DS360 S/N123625
- Acoustic sound calibrator class 1 Nor1256 S/N125626542
- Combined Pressure, Humidity and Temperature Transmitter PTU300 S/NM2320568

Traceability
The measured values are traceable to following the ISO/IEC 17025 laboratories:
Sound Pressure Level: EEL, Thailand
Reference Pressure, Humidity and Temperature: TPA, Thailand
Voltage: TPA, Thailand
Frequency: TPA, Thailand

This certificate of calibration is issued by Acoustic Laboratory Thailand (ALT). It also states that the laboratory has a satisfactory quality assurance system and traceability to accredited or national calibration laboratories. This certificate may not be reproduced other than in full

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Certificate No.: S2402-0646

Environmental conditions: Pressure: 101.325 kPa Temperature: 23.0 °C
Reference conditions: 101.27 ± 0.10 kPa 23.5 ± 1.0 °C
Measurement conditions: 50 %RH
53.2 ± 2.0 %RH

1. Indication at the calibration check frequency

Reference Acoustic Signal (dB)	Measured value (dB)		Deviated value (dB)	Acceptant limit (dB)
	Before adjust	After adjusted		
93.9	94.0	93.9	0.0	±0.7

Note: Indication at the checked calibration frequency was adjusted to 93.9 dB by the sound calibrator Type NC-75 S/N: 34234715

2. Self-generated noise

Frequency Weighting	Measured value (dB)
A-Weighting	10.9
C-Weighting	14.6
Z-Weighting	20.2

3. Electrical signal test of frequency weighting at 93 dB

Frequency (Hz)	Deviation from various frequency weighting response curve		
	A-Weighting (dB)	C-Weighting (dB)	Z-Weighting (dB)
63	-0.1	-0.2	-0.1
125	-0.1	0.0	-0.1
250	-0.1	-0.1	-0.1
500	-0.1	0.0	-0.1
1000	0.0	0.0	0.0
2000	-0.1	0.0	-0.1
4000	0.0	0.0	-0.1
8000	0.1	0.1	0.0
16000	-1.2	-1.2	0.0

Date of calibration : 2024-03-05
Date of issue : 2024-03-07

COPY

4. Frequency and time weighting at 1 kHz

4.1 Frequency weighting at 1 kHz

Frequency weightings	Measured value (dB)	Deviated value (dB)	Acceptant limit (dB)
A	94.0	0.0	± 0.2
C	94.0	0.0	± 0.2
Z	94.0	0.0	± 0.2

4.2 Time weighting at 1 kHz

Time weightings	Measured value (dB)	Deviated value (dB)	Acceptant limit (dB)
Fast	94.0	0.0	± 0.1
Slow	94.0	0.0	± 0.1
LAeq	94.0	0.0	± 0.1

5. Long term stability

Time interval (min:ss)	Start level (dB)	Stop level (dB)	Deviated value (dB)	Acceptant limit (dB)
30:12	94.0	94.0	0.0	± 0.1

Date of calibration : 2024-03-05
Date of issue : 2024-03-07

6. Level linearity on the reference level range

6.1 Measured at 31.5 Hz

Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptant limit (dB)
84.0	84.0	0.0	± 0.8
89.0	89.0	0.0	± 0.8
94.6	94.6	0.0	± 0.8
95.6	95.6	0.0	± 0.8
96.6	96.6	0.0	± 0.8
97.6	97.6	0.0	± 0.8
98.6	98.6	0.0	± 0.8
84.0	84.0	0.0	± 0.8
79.0	79.0	0.0	± 0.8
74.0	74.0	0.0	± 0.8
69.0	69.0	0.0	± 0.8
64.0	64.0	0.0	± 0.8
59.0	59.0	0.0	± 0.8
54.0	54.0	0.0	± 0.8
49.0	49.0	0.0	± 0.8
44.0	44.0	0.0	± 0.8
42.0	42.0	0.0	± 0.8
41.0	41.0	0.0	± 0.8
40.0	40.0	0.0	± 0.8
39.0	39.0	0.0	± 0.8
38.0	38.0	0.0	± 0.8

Date of calibration : 2024-03-05
Date of issue : 2024-03-07



Certificate No.: S2402-0646

6.2 Measured at 1 kHz

Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptant limit (dB)
109.0	109.0	0.0	±0.8
114.0	114.0	0.0	±0.8
119.0	119.0	0.0	±0.8
124.0	124.0	0.0	±0.8
129.0	129.0	0.0	±0.8
134.0	134.0	0.0	±0.8
135.0	135.0	0.0	±0.8
136.0	136.0	0.0	±0.8
137.0	137.0	0.0	±0.8
138.0	137.9	-0.1	±0.8
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	78.9	-0.1	±0.8
74.0	74.0	0.0	±0.8
69.0	68.9	-0.1	±0.8
64.0	63.9	-0.1	±0.8
59.0	58.9	-0.1	±0.8
54.0	53.9	-0.1	±0.8
49.0	48.9	-0.1	±0.8
44.0	43.9	-0.1	±0.8
42.0	41.9	-0.1	±0.8
41.0	40.9	-0.1	±0.8
40.0	39.9	-0.1	±0.8
39.0	38.9	-0.1	±0.8
38.0	37.9	-0.1	±0.8

Date of calibration : 2024-03-05
Date of issue : 2024-03-07

COPY



Certificate No.: S2402-0646

6.3 Measured at 8 kHz

Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptant limit
94.0	94.0	0.0	±0.8
99.0	99.0	0.0	±0.8
104.0	104.0	0.0	±0.8
109.0	109.0	0.0	±0.8
114.0	114.0	0.0	±0.8
119.0	119.0	0.0	±0.8
124.0	124.0	0.0	±0.8
129.0	129.0	0.0	±0.8
132.9	132.8	-0.1	±0.8
133.9	133.8	-0.1	±0.8
134.9	134.9	0.0	±0.8
135.9	135.9	0.0	±0.8
136.9	136.9	0.0	±0.8
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	78.9	-0.1	±0.8
74.0	74.0	0.0	±0.8
69.0	69.0	0.0	±0.8
64.0	63.9	-0.1	±0.8
59.0	59.0	0.0	±0.8
54.0	53.9	-0.1	±0.8
49.0	48.9	-0.1	±0.8
44.0	43.9	-0.1	±0.8
42.0	41.9	-0.1	±0.8
41.0	41.0	0.0	±0.8
40.0	39.9	-0.1	±0.8
39.0	38.9	-0.1	±0.8
38.0	37.9	-0.1	±0.8

Date of calibration : 2024-03-05
Date of issue : 2024-03-07

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7. Tone burst response

Time weightings	Tone burst duration, T _b (ms)	Measured value (dB)	Deviated value (dB)	Tolerance limit (dB)
Fast	200	135.1	0.1	±0.5
	2	118.0	0.0	+1.0, -1.5
SEL	0.25	108.9	-0.1	+1.0, -3.0
	200	129.0	0.0	±0.5
	2	109.0	0.0	+1.0, -1.5
	0.25	99.9	-0.1	+1.0, -3.0

8. Overload indication

Measured value (dB)		Deviated value (dB)	Tolerance limit (dB)
Positive one half cycle	Negative one half cycle	0	±1.5
139.3	139.3		

9. High level stability

Initial level (dB)	Final level (dB)	Deviated value (dB)	Acceptant limit (dB)
137.0	137.0	0.0	±0.1

Date of calibration : 2024-03-05
Date of issue : 2024-03-07

Uncertainty of measurement

Parameters	Uncertainty
1. Indication at the calibration check frequency	0.12 dB
2. Self-generated noise	
- Frequency Weighting A	0.090 dB
- Frequency Weighting C	0.090 dB
- Frequency Weighting Z	0.090 dB
3. Electrical signal test of frequency weighting	
4. Frequency and time weightings at 1 kHz	0.13 dB
5. Long term stability test	0.13 dB
6. Level linearity on the reference level range	0.14 dB
7. Tone burst response	0.14 dB
8. Overload indication	0.13 dB
9. High level stability test	0.10 dB

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%

Remark : The acoustical signal test of frequency weighting at 125Hz, 1kHz, and 8kHz is not included, along with correction values for environmental conditions in a free-field or diffuse field, and the effect of reflection and diffraction on the measurement microphone and the sound level meter.

Signature

Calibrated By:
(Mr. Chaiyaporn Somphichai)

Signature

Approved By:
(Mr. Pitupong Sarapho)

Date of calibration : 2024-03-05
Date of issue : 2024-03-07

----- End of Certificate of Calibration -----

SOUND LEVEL METER

MODEL : NL-52A

SERIAL No. : 01120949



Acoustic Laboratory (Thailand) Co., Ltd.
6157 Soi Phoom Sin 42, Sai Mai, Bangkok 10220
Tel: (+66) 02-1296780 Email: info@altbkk.com



Certificate of Calibration

Certificate No.: S2402-0649

Customer:

Eastern Thai Consulting 1992 Co., Ltd.
683 Moo 11, Sukhaphibarn 8 Rd,
Nongkham, Siracha, Chonburi 20230

Date of calibration:

2024-03-06

Date of issue:

2024-03-08

Instrument Calibrated:

Sound Level Meter

Manufacturer:

Rion

Model:

NL-52A (Meter), PMP21 (Microphone), NH-25 (Preamplifier)

Serial no:

01120949 (Meter), 230003 (Microphone), 22338 (Preamplifier)

Calibration and verification performed:

Acoustical levels are stated relative to 20µPa. Other dB levels are relative values.

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k , which with the reported effective degree of freedom corresponds to coverage probability of approximately 95%.

The sound level meter instrument submitted for periodic testing following the periodic tests of IEC 61672-3 : 2013.

Preconditioning:

The equipment was preconditioned for more than 16 hours at the specified calibration temperature and humidity

Instruments and Program:

A complete list of instruments, hardware, and software, that has been used for this calibration is separately available from the calibration laboratory.

Equipment standards used:

- Sound measuring equipment calibration unit 483B S/N31083
- Digital multimeter Keysight S/N HP34401A
- Ultra-low distortion function generator Stanford SRS DS360 S/N123625
- Acoustic sound calibrator class 1 Nori 256 S/N125626542
- Combined Pressure, Humidity and Temperature Transmitter PTU300 S/NM2320568

Traceability

The measured values are traceable to following the ISO/IEC 17025 laboratories:

Sound Pressure Level: EEI, Thailand

Reference Pressure, Humidity and Temperature: TPA, Thailand

Voltage: TPA, Thailand

Frequency: TPA, Thailand

This certificate of calibration is issued by Acoustic Laboratory Thailand (ALT). It also states that the laboratory has a satisfactory quality assurance system and traceability to accredited or national calibration laboratories. This certificate may not be reproduced without prior written permission in full.

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Certificate No.: S2402-0649

Environmental conditions:

Pressure:

101.325 kPa

Temperature:

23.0 °C

Relative humidity:

50 %RH

Measurement conditions:

100.98 ± 0.10 kPa

22.3 ± 1.0 °C

52.0 ± 2.0 %RH

1. Indication at the calibration check frequency

Reference Acoustic Signal (dB)	Measured value (dB)		Deviated value (dB)	Acceptant limit (dB)
	Before adjust	After adjusted		
93.9	94.1	93.9	0.0	±0.7

Note: Indication at the checked calibration frequency was adjusted to 93.9 dB by the sound calibrator Type NC-75 S/N: 3424715

2. Self-generated noise

Frequency Weighting	Measured value (dB)
A-Weighting	9.1
C-Weighting	12.9
Z-Weighting	17.9

3. Electrical signal test of frequency weighting at 93 dB

Frequency (Hz)	Deviation from various frequency weighting response curve			Tolerance limit (dB)
	A-Weighting (dB)	C-Weighting (dB)	Z-Weighting (dB)	
63	-0.1	-0.1	0.0	±1.0
125	0.0	0.0	0.0	±1.0
250	0.0	0.0	0.0	±1.0
500	0.0	0.1	0.0	±1.0
1000	0.0	0.0	0.0	±0.7
2000	0.0	0.1	0.0	±1.0
4000	0.0	0.0	0.0	±1.0
8000	0.1	0.2	0.1	±1.5-2.5
16000	-1.1	-1.2	0.0	±1.5-2.5

Date of calibration : 2024-03-06

Date of issue : 2024-03-08

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www.altbkk.com

Page 2 of 8

4. Frequency and time weighting at 1 kHz

4.1 Frequency weighting at 1 kHz

Frequency weightings	Measured value (dB)	Deviated value (dB)	Acceptant limit (dB)
A	94.0	0.0	± 0.2
C	94.0	0.0	± 0.2
Z	94.0	0.0	± 0.2

4.2 Time weighting at 1 kHz

Time weightings	Measured value (dB)	Deviated value (dB)	Acceptant limit (dB)
Fast	94.0	0.0	± 0.1
Slow	94.0	0.0	± 0.1
LAeq	94.0	0.0	± 0.1

5. Long term stability

Time interval (mm:ss)	Start level (dB)	Stop level (dB)	Deviated value (dB)	Acceptant limit (dB)
28:55	94.0	94.0	0.0	± 0.1

Date of calibration : 2024-03-06

Date of issue : 2024-03-08

6. Level linearity on the reference level range

6.1 Measured at 31.5 Hz

Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptant limit (dB)
84.0	84.0	0.0	± 0.8
89.0	89.0	0.0	± 0.8
94.6	94.6	0.0	± 0.8
95.6	95.6	0.0	± 0.8
96.6	96.6	0.0	± 0.8
97.6	97.6	0.0	± 0.8
98.6	98.6	0.0	± 0.8
84.0	84.0	0.0	± 0.8
79.0	79.0	0.0	± 0.8
74.0	74.0	0.0	± 0.8
69.0	69.0	0.0	± 0.8
64.0	64.0	0.0	± 0.8
59.0	59.0	0.0	± 0.8
54.0	54.0	0.0	± 0.8
49.0	49.0	0.0	± 0.8
44.0	44.1	0.1	± 0.8
42.0	42.1	0.1	± 0.8
41.0	41.1	0.1	± 0.8
40.0	40.0	0.0	± 0.8
39.0	39.0	0.0	± 0.8
38.0	38.0	0.0	± 0.8

Date of calibration : 2024-03-06

Date of issue : 2024-03-08

6.2 Measured at 1 kHz

Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptant limit (dB)
109.0	109.0	0.0	±0.8
114.0	114.1	0.1	±0.8
119.0	119.1	0.1	±0.8
124.0	124.0	0.0	±0.8
129.0	129.0	0.0	±0.8
134.0	134.1	0.1	±0.8
135.0	135.1	0.1	±0.8
136.0	136.0	0.0	±0.8
137.0	137.0	0.0	±0.8
138.0	138.0	0.0	±0.8
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	54.0	0.0	±0.8
49.0	49.0	0.0	±0.8
44.0	44.0	0.0	±0.8
42.0	42.0	0.0	±0.8
41.0	41.0	0.0	±0.8
40.0	40.0	0.0	±0.8
39.0	39.0	0.0	±0.8
38.0	38.0	0.0	±0.8

Date of calibration : 2024-03-06
Date of issue : 2024-03-08

6.3 Measured at 8 kHz

Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptant limit (dB)
94.0	94.0	0.0	±0.8
99.0	99.0	0.0	±0.8
104.0	104.0	0.0	±0.8
109.0	109.0	0.0	±0.8
114.0	114.0	0.0	±0.8
119.0	119.0	0.0	±0.8
124.0	123.9	-0.1	±0.8
129.0	128.9	-0.1	±0.8
132.9	132.8	-0.1	±0.8
133.9	133.8	-0.1	±0.8
134.9	134.9	0.0	±0.8
135.9	135.8	-0.1	±0.8
136.9	136.8	-0.1	±0.8
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	78.9	-0.1	±0.8
74.0	74.0	0.0	±0.8
69.0	68.9	-0.1	±0.8
64.0	63.9	-0.1	±0.8
59.0	58.9	-0.1	±0.8
54.0	53.9	-0.1	±0.8
49.0	48.9	-0.1	±0.8
44.0	43.9	-0.1	±0.8
42.0	41.9	-0.1	±0.8
41.0	40.9	-0.1	±0.8
40.0	39.9	-0.1	±0.8
39.0	38.9	-0.1	±0.8
38.0	37.9	-0.1	±0.8

Date of calibration : 2024-03-06
Date of issue : 2024-03-08



Certificate No.: S2402-0649



Certificate No.: S2402-0649

7. Tone burst response

Time weightings	Tone burst duration, T _b (ms)	Measured value (dB)	Deviated value (dB)	Tolerance limit (dB)
Fast	200	135.0	0.0	±0.5
	2	118.0	0.0	+1.0/-1.5
	0.25	108.9	-0.1	+1.0/-3.0
SEL	200	129.0	0.0	±0.5
	2	109.0	0.0	+1.0/-1.5
	0.25	99.9	-0.1	+1.0/-3.0

8. Overload indication

Measured value (dB)		Tolerance limit (dB)
Positive one half cycle	Negative one half cycle	±1.5
139.5	139.3	

9. High level stability

Initial level (dB)	Final level (dB)	Deviated value (dB)	Acceptant limit (dB)
137.0	137.0	0.0	±0.1

Date of calibration : 2024-03-06

Date of issue : 2024-03-08

Uncertainty of measurement

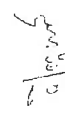
Parameters	Uncertainty
1. Indication at the calibration check frequency	0.12 dB
2. Self-generated noise	
- Frequency Weighting A	0.090 dB
- Frequency Weighting C	0.090 dB
- Frequency Weighting Z	0.090 dB
3. Electrical signal test of frequency weighting	0.13 dB
4. Frequency and time weightings at 1 kHz	0.13 dB
5. Long term stability test	0.10 dB
6. Level linearity on the reference level range	0.14 dB
7. Tone burst response	0.14 dB
8. Overload indication	0.13 dB
9. High level stability test	0.10 dB

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%

Remark : The acoustical signal test of frequency weighting at 125Hz, 1kHz, and 8kHz is not included, along with correction values for environmental conditions in a free-field or diffuse field, and the effect of reflection and diffraction on the measurement microphone and the sound level meter.

Calibrated By: 

(Mr. Chaiporn Sornpichai)

Approved By: 

(Mr. Pitupong Sarapho)

Date of calibration : 2024-03-06

Date of issue : 2024-03-08

----- End of Certificate of Calibration -----



SOUND LEVEL METER

MODEL : NL-52A

SERIAL No. : 01120946

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-52A / Microphone UC-59 / Preamplifier NH-25
Serial No. : 01120946 / 21952 / 22335
ID No. : -

Condition As Found : GOOD

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
SAHA GROUP INDUSTRIAL PARK, 683 MOO 11,
NONGKHAM, SIRACHA, CHONBURI 20230 THAILAND.

Location : -
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 11 JANUARY 2024
Calibration Date : 16 - 17 JANUARY 2024
Date of Issue : 18 JANUARY 2024

Calibrated by : Nathakorn Pisuipaisan

Approved by : T. Petchurai
(Thanakul Petchurai)

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

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Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-23	07-FEB-24
Waveform Generator	33511B	MY52302742	EF-0010-23	07-FEB-24
Digital Multimeter	33461A	MY33220104	EELBP 30/0266	13-FEB-24
Digital Multimeter	33461A	MY33220076	EELBP 29/0266	13-FEB-24
Digital Multimeter	34461A	MY60024273	EELBP 31/0266	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EF-0011-23	08-FEB-24
Condenser Microphone	4180	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KA1	34560495	AA-3002-23	14-FEB-24

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

- 3.1 National Institute of Metrology (Thailand).
- 3.2 Thailand Institute of Scientific and Technological Research (TISTR).

COPY

T. Petchurai

Summary of Measurement Result :

Parameter	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	0.2	N/A
2. Self-generated noise	0.2	N/A
3. Acoustical signal tests of frequency weightings		
125 Hz	0.3	0.6
1000 Hz	0.3	0.6
8000 Hz	0.3	0.7
4. Electrical signal tests of frequency weightings		
For 10 Hz to 4 kHz	0.3	0.6
For > 4 kHz to 10 kHz	0.3	0.7
For > 10 kHz to 20 kHz	0.3	1.0
5. Frequency and time weightings at 1 kHz	0.2	0.2
6. Long - term stability	0.1	0.1
7. Level linearity on the reference level range	0.2	0.3
8. Level linearity including the level range control	0.2	0.3
9. Tone burst response	0.2	0.3
10. Peak C sound level	0.2	0.35
11. Overload indication	0.2	0.25
12. High level stability	0.1	0.1

COPY

T. Retch.

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.98)	94.0	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
13.8

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Measured value (dB)
A - weight	10.8
C - weight	15.6
Flat	21.3

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)		
	Flat	C-weight	A-weight
125	0.1	0.2	0.2
1000	0.1	0.1	0.1
8000	0.8	0.9	1.0
			± 1.0
			± 0.7
			+ 1.5, - 2.5

COPY

T. Retch.

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)		
	Flat	C-weight	A-weight
63	0.1	0.0	0.0
125	0.0	0.1	0.0
250	0.0	0.0	0.0
500	0.0	0.1	0.0
1000	0.0	0.0	0.0
2000	0.0	0.1	0.0
4000	0.0	0.0	0.0
8000	0.0	0.1	0.1
16000	0.0	-1.2	-1.2

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.2
C - weight	94.0	94.0	0.0	± 0.2
Flat	94.0	94.0	0.0	± 0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	± 0.1
Slow	94.0	94.0	0.0	± 0.1
Leq	94.0	94.0	0.0	± 0.1

6. Long - term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.1

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	±0.8
136.0	136.0	0.0	±0.8
135.0	135.0	0.0	±0.8
134.0	134.0	0.0	±0.8
133.0	133.0	0.0	±0.8
132.0	132.0	0.0	±0.8
131.0	131.0	0.0	±0.8
129.0	129.0	0.0	±0.8
124.0	124.0	0.0	±0.8
119.0	119.0	0.0	±0.8
114.0	114.0	0.0	±0.8
109.0	109.0	0.0	±0.8
104.0	104.0	0.0	±0.8
99.0	99.0	0.0	±0.8
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	54.0	0.0	±0.8
49.0	49.0	0.0	±0.8
44.0	44.0	0.0	±0.8
39.0	39.0	0.0	±0.8
34.0	34.0	0.0	±0.8
30.0	30.0	0.0	±0.8
29.0	28.9	-0.1	±0.8
28.0	28.0	0.0	±0.8
27.0	27.0	0.0	±0.8
26.0	25.9	-0.1	±0.8
25.0	24.9	-0.1	±0.8

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8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±0.8

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.0 ; -3.0
	2	8	117.0	117.0	0.0	1.0 ; -1.5
	200	800	134.0	134.1	0.1	±0.5
Slow	2	8	108.0	108.0	0.0	1.0 ; -3.0
	200	800	127.6	127.6	0.0	±0.5
	0.25	1	99.0	98.9	-0.1	1.0 ; -3.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -1.5
	200	800	128.0	128.1	0.1	±0.5

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{ep} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
One	136.4	136.4	0.0	±2.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±1.0
Positive half cycle	135.4	135.1	-0.3	±1.0
Negative half cycle	135.4	135.1	-0.3	±1.0

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle	89.6	0.1
89.5			
			±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	137.0	137.0	0.0	±0.1

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

End of Calibration Certificate

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SOUND LEVEL METER

MODEL : NL-52A

SERIAL No. : 00230985



Acoustic Laboratory (Thailand) Co., Ltd.
6/57 Soi Phoom Sin 42, Sai Mai, Sai Mai, Bangkok 10220
Tel: (+66) 02-1296780 Email: info@altbkk.com



Certificate of Calibration

Certificate No.: S2403-0661

Customer: Eastern Thai Consulting 1992 Co., Ltd.
683 Moo 11, Sukhaphibarn 8 Rd,
Nongkham, Sriracha, Chonburi 20230

Date of calibration: 2024-03-12
Date of issue: 2024-03-14
Instrument Calibrated: Sound Level Meter
Manufacturer: Rion
Model: NL-52A (Meter), UC-59 (Microphone), NH-25 (Preamplifier)
Serial no: 00230985 (Meter), 22118 (Microphone), 22421 (Preamplifier)

Calibration and verification performed:
Acoustical levels are stated relative to 20μPa. Other dB levels are relative values.
The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k, which with the reported effective degree of freedom corresponds to coverage probability of approximately 95%.
The sound level meter instrument submitted for periodic testing following the periodic tests of IEC 61672-3 : 2013.

Preconditioning:
The equipment was preconditioned for more than 16 hours at the specified calibration temperature and humidity
Instruments and Program:
A complete list of instruments, hardware, and software, that has been used for this calibration is separately available from the calibration laboratory.

Equipment standards used:
- Sound measuring equipment calibration unit 483B S/N31083
- Digital multimeter Keysight S/N HP34401A
- Ultra-low distortion function generator Stanford SRS DS360 S/N123625
- Acoustic sound calibrator class 1 Nor1256 S/N125676342
- Combined Pressure, Humidity and Temperature Transmitter PTU300 S/NNM2520568

Traceability
The measured values are traceable to following the ISO/IEC 17025 laboratories:
Sound Pressure Level: EEI, Thailand
Reference Pressure, Humidity and Temperature: TPA, Thailand
Voltage: TPA, Thailand
Frequency: TPA, Thailand

This certificate of calibration is issued by Acoustic Laboratory Thailand (ALT). It also states that the laboratory has a satisfactory quality assurance system and traceability to accredited or national calibration laboratories. This certificate may not be reproduced other than in full.



Certificate No.: S2403-0661

Environmental conditions: Pressure: 101.325 kPa Temperature: 23.0 °C
Reference conditions: 101.02 ± 0.10 kPa 22.9 ± 1.0 °C
Measurement conditions: Relative humidity: 50 %RH
50.5 ± 2.0 %RH

1. Indication at the calibration check frequency

Reference Acoustic Signal (dB)	Measured value (dB)		Deviated value (dB)	Acceptant limit (dB)
	Before adjust	After adjusted		
93.9	93.9	93.9	0.0	±0.7

Note: Indication at the checked calibration frequency was adjusted to 93.9 dB by the sound calibrator Type NC-75 S/N: 34234715

2. Self-generated noise

Frequency Weighting	Measured value (dB)
A-Weighting	10.2
C-Weighting	14.0
Z-Weighting	19.0

3. Electrical signal test of frequency weighting at 93 dB

Frequency (Hz)	Deviation from various frequency weighting response curve			
	A-Weighting (dB)	C-Weighting (dB)	Z-Weighting (dB)	Tolerance limit (dB)
63.0	0.0	0.0	0.0	±1.0
125.0	0.0	0.0	0.0	±1.0
250.0	0.0	0.0	0.0	±1.0
500.0	0.0	0.0	0.0	±1.0
1000.0	0.0	0.0	0.0	±0.7
2000.0	-0.2	-0.2	-0.2	±1.0
4000.0	-0.3	-0.3	-0.3	±1.0
8000.0	0.1	0.1	0.0	±1.5-2.5
16000.0	-1.6	-1.7	-0.5	±1.5-2.5

Date of calibration : 2024-03-12
Date of issue : 2024-03-14





Certificate No.: S2403-0661

4. Frequency and time weighting at 1 kHz

4.1 Frequency weighting at 1 kHz

Frequency weightings	Measured value (dB)	Deviated value (dB)	Acceptant limit (dB)
A	94.0	0.0	±0.2
C	94.0	0.0	±0.2
Z	94.0	0.0	±0.2

4.2 Time weighting at 1 kHz

Time weightings	Measured value (dB)	Deviated value (dB)	Acceptant limit (dB)
Fast	94.0	0.0	±0.1
Slow	94.0	0.0	±0.1
LAeq	94.0	0.0	±0.1

5. Long term stability

Time interval (mm:ss)	Start level (dB)	Stop level (dB)	Deviated value (dB)	Acceptant limit (dB)
32:30	94.0	94.0	0.0	±0.1

Date of calibration : 2024-03-12
Date of issue : 2024-03-14



Certificate No.: S2403-0661

6. Level linearity on the reference level range

6.1 Measured at 31.5 Hz

Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptant limit (dB)
84.0	84.0	0.0	±0.8
89.0	89.0	0.0	±0.8
94.6	94.6	0.0	±0.8
95.6	95.6	0.0	±0.8
96.6	96.6	0.0	±0.8
97.6	97.6	0.0	±0.8
98.6	98.6	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	53.9	-0.1	±0.8
49.0	49.0	0.0	±0.8
44.0	44.0	0.0	±0.8
42.0	41.9	-0.1	±0.8
41.0	40.9	-0.1	±0.8
40.0	39.9	-0.1	±0.8
39.0	38.9	-0.1	±0.8
38.0	37.9	-0.1	±0.8

Date of calibration : 2024-03-12
Date of issue : 2024-03-14





Certificate No.: S2403-0661

6.2 Measured at 1 kHz

Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptant limit (dB)
109.0	109.0	0.0	±0.8
114.0	114.0	0.0	±0.8
119.0	119.0	0.0	±0.8
124.0	124.0	0.0	±0.8
129.0	129.0	0.0	±0.8
134.0	134.0	0.0	±0.8
135.0	135.0	0.0	±0.8
136.0	136.0	0.0	±0.8
137.0	137.0	0.0	±0.8
138.0	138.0	0.0	±0.8
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	54.0	0.0	±0.8
49.0	49.0	0.0	±0.8
44.0	44.0	0.0	±0.8
42.0	42.0	0.0	±0.8
41.0	41.0	0.0	±0.8
40.0	40.0	0.0	±0.8
39.0	39.0	0.0	±0.8
38.0	38.0	0.0	±0.8

Date of calibration : 2024-03-12
Date of issue : 2024-03-14



Certificate No.: S2403-0661

6.3 Measured at 8 kHz

Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptant limit (dB)
94.0	94.0	0.0	±0.8
99.0	99.0	0.0	±0.8
104.0	104.0	0.0	±0.8
109.0	109.0	0.0	±0.8
114.0	114.0	0.0	±0.8
119.0	119.0	0.0	±0.8
124.0	124.0	0.0	±0.8
129.0	129.0	0.0	±0.8
132.9	132.9	0.0	±0.8
133.9	133.9	0.0	±0.8
134.9	134.9	0.0	±0.8
135.9	135.9	0.0	±0.8
136.9	136.9	0.0	±0.8
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	53.9	-0.1	±0.8
49.0	49.0	0.0	±0.8
44.0	44.0	0.0	±0.8
42.0	42.0	0.0	±0.8
41.0	41.0	0.0	±0.8
40.0	40.0	0.0	±0.8
39.0	38.9	-0.1	±0.8
38.0	38.0	0.0	±0.8

Date of calibration : 2024-03-12
Date of issue : 2024-03-14



7. Tone burst response

Time weightings	Tone burst duration, T _b (ms)	Measured value (dB)	Deviated value (dB)	Tolerance limit (dB)
Fast	200	135.0	0.0	±0.5
	2	118.0	0.0	+1.0, -1.5
	0.25	108.9	-0.1	+1.0, -3.0
SEL	200	129.0	0.0	±0.5
	2	109.0	0.0	+1.0, -1.5
	0.25	100.0	0.0	+1.0, -3.0

8. Overload indication

Measured value (dB)		Deviated value (dB)	Tolerance limit (dB)
Positive one half cycle	Negative one half cycle	0.0	±1.5
139.1	139.1		

9. High level stability

Initial level (dB)	Final level (dB)	Deviated value (dB)	Acceptant limit (dB)
137.0	137.0	0.0	±0.1

Date of calibration : 2024-03-12
Date of issue : 2024-03-14

Uncertainty of measurement

Parameters	Uncertainty
1. Indication at the calibration check frequency	0.12 dB
2. Self-generated noise	
- Frequency Weighting A	0.13 dB
- Frequency Weighting C	0.090 dB
- Frequency Weighting Z	0.090 dB
3. Electrical signal test of frequency weighting	0.13 dB
4. Frequency and time weightings at 1 kHz	0.13 dB
5. Long term stability test	0.10 dB
6. Level linearity on the reference level range	0.14 dB
7. Tone burst response	0.14 dB
8. Overload indication	0.13 dB
9. High level stability test	0.10 dB

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%

Remark : The acoustical signal test of frequency weighting at 125Hz, 1kHz, and 8kHz is not included, along with correction values for environmental conditions in a free-field or diffuse field, and the effect of reflection and diffraction on the measurement microphone and the sound level meter.

Calibrated By:  (Mr. Chalyaporn Sompichai)Approved By:  (Mr. Pitupong Sarapho)Date of calibration : 2024-03-12
Date of issue : 2024-03-14

----- End of Certificate of Calibration -----

SOUND LEVEL METER

MODEL : NL-42

SERIAL No. : 00646443



Cert. No. : ACL24114
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24
Serial No.: 00646443 / 155616 / 26184
ID No.: -

Condition As Found : GOOD

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
SAHA GROUP INDUSTRIAL PARK, 683 MOO 11,
NONGKHAM, SIRACHA, CHONBURI 20230 THAILAND.

Location :
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 29 MARCH 2024
Calibration Date : 24-26 APRIL 2024
Date of Issue : 29 APRIL 2024

Calibrated by : Nathakorn Pisupaisan

Approved by :

T. Petchurai
(Thanakul Petchurai)

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This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

Cert. No. : ACL24114
Job No. : VC67AC0072
Pages : 2 of 8

Calibration Procedure : CP-AC-01

Calibration Method :

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-4	05-FEB-25
Waveform Generator	33511B	MY52302742	EF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	FEI_BP 21/0267	13-FEB-25
Digital Multimeter	33461A	MY53220076	FEI_BP 20/0267	15-FEB-25
Digital Multimeter	34461A	MY60024273	FEI_BP 22/0267	15-FEB-25
Programmable Attenuator	MAT-1070	62100114	EF-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KA1	34560495	AA-3001-24	05-FEB-25

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.
3. This certificate is traceable to the international system of unit maintained at :

- 3.1 National Institute of Metrology (Thailand).
- 3.2 Thailand Institute of Scientific and Technological Research (TISTR).

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Summary of Measurement Result :

Parameter	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	0.2	N/A
2. Self-generated noise	0.2	N/A
3. Acoustical signal tests of frequency weightings		
125 Hz	0.3	0.6
1000 Hz	0.3	0.6
8000 Hz	0.3	0.7
4. Electrical signal tests of frequency weightings		
For 10 Hz to 4 kHz	0.3	0.6
For > 4 kHz to 10 kHz	0.3	0.7
For > 10 kHz to 20 kHz	-	1.0
5. Frequency and time weightings at 1 kHz	0.2	0.2
6. Long - term stability	0.1	0.1
7. Level linearity on the reference level range	0.2	0.3
8. Level linearity including the level range control	0.2	0.3
9. Tone burst response	0.2	0.3
10. Peak C sound level	0.2	0.35
11. Overload indication	0.2	0.25
12. High level stability	0.1	0.1

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7. Feb 2024

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.98)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
18.6

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Measured value (dB)
A - weight	15.1
C - weight	21.0
Flat	26.1

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)		
	Flat	C-weight	A-weight
125	0.3	0.3	± 1.5
1000	-0.1	-0.1	± 1.0
8000	-1.5	-1.5	±5.0

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7. Feb 2024

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)		
	Flat	C-weight	A-weight
63	-0.1	-0.1	-0.1
125	0.0	-0.1	-0.1
250	0.0	0.0	-0.1
500	0.0	0.0	-0.1
1000	0.0	0.0	0.0
2000	0.0	0.0	0.0
4000	0.0	0.0	0.0
8000	0.0	0.1	0.1

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.2
C - weight	94.0	94.0	0.0	± 0.2
Flat	94.0	94.0	0.0	± 0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	± 0.1
Slow	94.0	94.0	0.0	± 0.1
Leq	94.0	94.0	0.0	± 0.1

6. Long - term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.3

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.1	0.1	± 1.1
29.0	29.1	0.1	± 1.1
28.0	28.2	0.2	± 1.1
27.0	27.2	0.2	± 1.1
26.0	26.3	0.3	± 1.1
25.0	25.4	0.4	± 1.1

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8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Auto	94.0	94.0	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, T _b (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.1	0.1	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
One	136.4	136.3	-0.1	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle			
89.6	89.6	0.0	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	137.0	137.0	0.0	±0.3

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

End of Calibration Certificate

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SOUND LEVEL METER

MODEL : NL-21

SERIAL No. : 01209916

Cert No. : ACL24115
Pages : 1 of 9

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-21 / Microphone UC-52 / Preamplifier NH-21
Serial No. : 01209916 / 167319 / 32087
ID No. : -

Condition As Found : GOOD
Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
SAHA GROUP INDUSTRIAL PARK, 683 MOO 11,
NONGKHAM, SIRACHA, CHONBURI 20230 THAILAND.

Location : -
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %
Received Date : 29 MARCH 2024
Calibration Date : 24 -26 APRIL, 2024
Date of Issue : 29 APRIL 2024

Calibrated by : Nathakorn Pisutpaisan
Approved by : 
(Thanakul Petchurai)

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

Cert No. : ACL24115
Job No. : VC67AC0072
Pages : 2 of 9

Calibration Procedure : CP-AC-02

Calibration Method :

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EJ-0009-4	05-FEB-25
Waveform Generator	33511B	MY52302742	EJ-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	EEL-BP 21/0267	13-FEB-25
Digital Multimeter	33461A	MY53220076	EEL-BP 20/0267	15-FEB-25
Digital Multimeter	34461A	MY60024273	EEL-BP 22/0267	15-FEB-25
Programmable Attenuator	MAT-1070	62100114	EJ-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KA1	34560495	AA-3001-24	05-FEB-25

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.
3. This certificate is traceable to the international system of unit maintained at :

- 3.1 National Institute of Metrology (Thailand).
- 3.2 Thailand Institute of Scientific and Technological Research (TISTR).


(Thanakul Petchurai)


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Summary of Measurement Result :

Parameter	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	0.2	N/A
2. Self-generated noise	0.2	N/A
3. Acoustical signal tests of frequency weightings		
125 Hz	0.3	0.6
1000 Hz	0.3	0.6
8000 Hz	0.3	0.7
4. Electrical signal tests of frequency weightings		
For 10 Hz to 4 kHz	0.3	0.6
For > 4 kHz to 10 kHz	0.3	0.7
For > 10 kHz to 20 kHz	-	1.0
5. Frequency and time weightings at 1 kHz	0.2	0.2
6. Long - term stability	0.1	0.1
7. Level linearity on the reference level range	0.2	0.3
8. Level linearity including the level range control	0.2	0.3
9. Tone burst response	0.2	0.3
10. Peak C _s sound level	0.2	0.35
11. Overload indication	0.2	0.25
12. High level stability	0.1	0.1

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J. Petcha

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.94)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
22.9

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Measured value (dB)
A - weight	22.6
C - weight	24.7
Flat	28.6

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)		
	Flat	C-weight	A-weight
125	0.3	0.3	0.3
1000	0.1	0.1	0.1
8000	0.3	0.4	0.4
			Acceptance Limits
			± 1.5
			± 1.0
			± 5.0

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J. Petcha

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)		
	Flat	C-weight	A-weight
63	-0.1	-0.2	-0.3
125	-0.1	-0.1	-0.3
250	-0.1	0.0	-0.2
500	0.0	0.0	-0.1
1000	0.0	0.0	0.0
2000	0.1	0.1	0.1
4000	0.1	0.1	0.0
8000	0.1	0.1	0.1

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.2
C - weight	94.0	94.0	0.0	± 0.2
Flat	94.0	94.0	0.0	± 0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	± 0.1
Slow	94.0	94.0	0.0	± 0.1
Leq	94.0	94.0	0.0	± 0.1

6. Long - term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.3

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	88.9	-0.1	± 1.1
84.0	83.9	-0.1	± 1.1
79.0	78.9	-0.1	± 1.1
74.0	73.9	-0.1	± 1.1
69.0	68.9	-0.1	± 1.1
64.0	63.9	-0.1	± 1.1
59.0	58.9	-0.1	± 1.1
54.0	53.9	-0.1	± 1.1
49.0	48.9	-0.1	± 1.1
44.0	43.9	-0.1	± 1.1
39.0	38.7	-0.3	± 1.1

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T. Petch

T. Petch

Cert. No. : ACL24115
Job No. : VC67AC0072
Pages : 7 of 9

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	94.0	94.0	0.0	±1.1
120	94.0	94.0	0.0	±1.1
110	94.0	94.0	0.0	±1.1
100	94.0	94.0	0.0	±1.1
90	94.0	94.0	0.0	±1.1

Level linearity on each level range

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	42.8	42.9	0.1	±1.1
120	32.5	32.6	0.1	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

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Cert. No. : ACL24115
Job No. : VC67AC0072
Pages : 8 of 9

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lepeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.1	-0.3	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±2.0
Positive half cycle	132.4	132.1	-0.3	±2.0
Negative half cycle	132.4	132.2	-0.2	±2.0

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle	-0.1	±1.5
89.4	89.3		

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Cert. No. : ACL24115
Job No. : VC67/AC0072
Pages : 9 of 9

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	137.0	137.0	0.0	±0.3

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

End of Calibration Certificate

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Y. Petch

SOUND LEVEL METER

MODEL : NL-21

SERIAL No. : 00209079



Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-21 / Microphone UC-52 / Preamplifier NH-21
Serial No.: 00209079 / 147767 / 34626
ID No.:

Condition As Found : GOOD
Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
SAHA GROUP INDUSTRIAL PARK, 683 MOO 11,
NONGKHAM, SIRACHA, CHONBURI 20230 THAILAND.

Location :
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 24 MAY 2023
Calibration Date : 30 -31 MAY 2023
Date of Issue : 01 JUNE 2023

Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Petchurai
(Thanakul Petchurai)

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

Continuation of Calibration Certificate

Calibration Procedure : CP-AC-02

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-23	07-FEB-24
Waveform Generator	33511B	MY52302742	EF-0010-23	07-FEB-24
Digital Multimeter	33461A	MY53220104	EEL.BP 30/0266	13-FEB-24
Digital Multimeter	33461A	MY53220076	EEL.BP 29/0266	13-FEB-24
Digital Multimeter	34461A	MY60024273	EEL.BP 31/0266	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EF-0011-23	08-FEB-24
Condenser Microphone	4180	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KAJ	34560495	AA-3002-23	14-FEB-24

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.
3. This certificate is traceable to the international system of unit maintained at :

- 3.1 National Institute of Metrology (Thailand).
- 3.2 Thailand Institute of Scientific and Technological Research (TISTR).

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Continuation of Calibration Certificate

Cert. No. : ACL23171
Job No. : VC66AC0063
Pages : 3 of 9

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long - term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

Note : Pass/Fail evaluation for each parameter, will be considered together from the acceptance limit and the Maximum-permitted uncertainty of measurement.

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Continuation of Calibration Certificate

Cert. No. : ACL23171
Job No. : VC66AC0063
Pages : 4 of 9

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.98)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
24.7

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Measured value (dB)
A - weight	21.8
C - weight	22.7
Flat	25.6

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)		
	Flat	C-weight	A-weight
125	0.2	0.2	0.2
1000	0.0	0.0	0.0
8000	-1.0	-0.9	-0.9
			Acceptance Limits
			± 1.5
			± 1.0
			± 5.0

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Continuation of Calibration Certificate

Continuation of Calibration Certificate

Cert. No. : ACL23171
Job No. : VC66AC0063
Pages : 5 of 9

Cert. No. : ACL23171
Job No. : VC66AC0063
Pages : 6 of 9

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)		
	Flat	C-weight	A-weight Acceptance Limits
63	-0.2	-0.1	±2.0
125	-0.2	0.0	±1.5
250	-0.1	0.0	±1.5
500	-0.1	0.0	±1.5
1000	0.0	0.0	±1.0
2000	0.1	0.1	±2.0
4000	0.1	0.1	±3.0
8000	0.0	0.3	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.2
C - weight	94.0	94.0	0.0	± 0.2
Flat	94.0	94.1	0.1	± 0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	94.0	0.0	± 0.1
Slow	94.0	94.0	0.0	± 0.1
Leq	94.0	94.0	0.0	± 0.1

6. Long - term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.3

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
135.0	134.9	-0.1	± 1.1
134.0	133.9	-0.1	± 1.1
133.0	132.9	-0.1	± 1.1
132.0	131.9	-0.1	± 1.1
131.0	130.9	-0.1	± 1.1
129.0	128.9	-0.1	± 1.1
124.0	123.9	-0.1	± 1.1
119.0	118.9	-0.1	± 1.1
114.0	113.9	-0.1	± 1.1
109.0	108.9	-0.1	± 1.1
104.0	103.9	-0.1	± 1.1
99.0	98.9	-0.1	± 1.1
94.0	94.0	0.0	± 1.1
89.0	88.9	-0.1	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	68.9	-0.1	± 1.1
64.0	63.9	-0.1	± 1.1
59.0	58.9	-0.1	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	43.9	-0.1	± 1.1
39.0	38.7	-0.3	± 1.1

Cert. No. : ACL23171

Job No. : VC66AC0063

Pages : 7 of 9

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	94.0	94.0	0.0	±0.5
120	94.0	94.0	0.0	±0.5
110	94.0	94.1	0.1	±0.5
100	94.0	94.1	0.1	±0.5
90	94.0	94.1	0.1	±0.5

Level linearity on each level range

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	43.0	42.9	-0.1	±0.5
120	33.0	32.9	-0.1	±0.5

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

Cert. No. : ACL23171

Job No. : VC66AC0063

Pages : 8 of 9

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _o peak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±3.0
One	136.4	136.2	-0.2	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle	-0.1	±1.5
89.4	89.3		

Continuation of Calibration Certificate

Cert. No. : ACL23171
Job No. : VC66AC0063
Pages : 9 of 9

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	137.0	137.0	0.0	±0.3

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

End of Calibration Certificate

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NOISE DOSI METER

MODEL : CR:110A

SERIAL No. : CB1500

CERTIFICATE OF CALIBRATION

ISSUED BY Cirrus Research plc
DATE OF ISSUE 19 January 2024 CERTIFICATE NUMBER 206866



Cirrus Research plc
Acoustic House
Bridlington Road
Hunmanby
North Yorkshire
YO14 0PH
United Kingdom

Page 1 of 2
Approved signatory
N.Smith
Electronically signed:

N.D. Smith

Dosimeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer: Cirrus Research plc Notes: Eastern Thai Consulting 1992 Co.,Ltd.
Model: CR:110A 683 Moo.11, Sukaphibai 8 Rd., Nongkham,
Serial number: CB1500 Sriracha, Chonburi 20230
Firmware version: 5.4

Test summary

Date of calibration: 19 January 2024
The calibration was performed respecting the requirements of ISO/IEC 17025:2017.
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.
The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	SIGLENT	SDG1032X	SDG1XDD06R6309
Attenuator	Cirrus Research	ZE:952	93892
Environmental Monitor	Comet	T7510	16966334
doseBadge Reader	Cirrus Research plc	RC:110A	40088

Notes

This certificate provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a coverage probability of approximately 95%.

CERTIFICATE OF CALIBRATION

Certificate Number:
206866
Page 2 of 2

Environmental conditions

The following conditions were recorded at the time of the test:

Before Pressure: 100.96 kPa Temperature: 21.6 °C Humidity: 34.1 %
After Pressure: 100.95 kPa Temperature: 21.6 °C Humidity: 34.7 %

Test results summary

Test	Result
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies
Absolute Acoustic Sensitivity	Complies

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NOISE DOSI METER

MODEL : CR:110A

SERIAL No. : CB1498

CERTIFICATE OF CALIBRATION

ISSUED BY

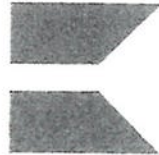
Cirrus Research plc

DATE OF ISSUE

19 January 2024

CERTIFICATE NUMBER

206877



Cirrus Research plc

Acoustic House

Bridlington Road

Hummanby

North Yorkshire

YO14 0PH

United Kingdom

Page 1 of 2

Approved signatory

N Smith

Electronically signed

Dosemeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer:

Cirrus Research plc

Notes:

Eastern Thai Consulting 1992 Co.,Ltd.

683 Moo 11, Sukaphibai 8 Rd., Nongkham,

Sriracha, Chonburi 20230

Model:

CR-110A

Serial number:

CB1498

Firmware version:

5.4

Test summary

Date of calibration:

19 January 2024

The calibration was performed respecting the requirements of ISO/IEC 17025:2017.

The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.

The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	KEYSIGHT	33511B	MY58001553
Attenuator	Cirrus Research	ZE-952	78713
Environmental Monitor	Comet	T7510	16966334
doseBadge Reader	Cirrus Research plc	RC-110A	100498

Notes

This certificate provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a coverage probability of approximately 95%.

CERTIFICATE OF CALIBRATION

Certificate Number:

206877

Page 2 of 2

Environmental conditions

The following conditions were recorded at the time of the test:

Before

Pressure: 100.96 kPa

Temperature: 21.6 °C

Humidity: 33.2 %

After

Pressure: 100.97 kPa

Temperature: 21.5 °C

Humidity: 33.4 %

Test results summary

Test	Result
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighing	Complies
Absolute Acoustic Sensitivity	Complies

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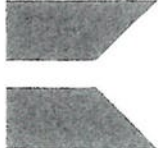
NOISE DOSI METER

MODEL : CR:110A

SERIAL No. : CB1499

CERTIFICATE OF CALIBRATION

ISSUED BY Cirrus Research plc
DATE OF ISSUE 19 January 2024 CERTIFICATE NUMBER 206881



Cirrus Research plc
Acoustic House
Bridlington Road
Hummanby
North Yorkshire
YO14 0PH
United Kingdom

Page 1 of 2
Approved signatory
N.Smith
Electronically signed:

Dosimeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer: Cirrus Research plc
Model: CR:110A
Serial number: CB1499
Firmware version: 5.4
Notes: Eastern Thai Consulting 1992 Co.,Ltd.
683 Moo.11, Sukaphibai 8 Rd., Nongkham,
Sriacha, Chonburi 20230

Test summary

Date of calibration: 19 January 2024
The calibration was performed respecting the requirements of ISO/IEC 17025:2017.
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.
The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	SIGLENT	SDG1032X	SDG1XDDQ6R6309
Attenuator	Cirrus Research	ZE:952	93892
Environmental Monitor	Comet	T7510	16966334
doseBadge Reader	Cirrus Research plc	RC:110A	40088

Notes

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CERTIFICATE OF CALIBRATION

Environmental conditions

The following conditions were recorded at the time of the test:

Before Pressure: 100.90 kPa Temperature: 21.3 °C Humidity: 31.5 %
After Pressure: 100.91 kPa Temperature: 21.5 °C Humidity: 32.6 %

Test results summary

Test	Result
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies
Absolute Acoustic Sensitivity	Complies

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